APPLICATION OF SMART VALUE CHAIN LOGISTICS FOR THE SMALL-MEDIUM BRICK MANUFACTURING ENTERPRISES OF THOHOYANDOU TOWN, SOUTH AFRICA

BY:

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THIS DISSERTATION IS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE MASTERS IN URBAN AND REGIONAL PLANNING DEGREE TO THE DEPARTMENT OF URBAN AND REGIONAL PLANNING, FACULTY OF SCIENCES, ENGINEERING AND AGRICULTURE, UNIVERSITY OF VENDA, SOUTH AFRICA

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DECLARATION

I, Mawelewele Lutendo, Student no: 14002821, hereby declare that this dissertation – Application of Smart Value Chain Logistics for the Small-Medium Brick Manufacturing Enterprises in Thohoyandou Town, South Africa- for Masters in Urban and Regional Planning Degree at the University of Venda, is hereby submitted by me; it has not been previously submitted for a degree at the University of Venda or any other institution, and that this is my own original work in the design and content execution. All reference materials contained therein have been duly acknowledged. I declare that I have not plagiarised.

Investigator: Mr. Mawelewele Lutendo

Signature: *Mawelewele.l* Date: 15 August 2023

DEDICATION

This dissertation is dedicated

To

My mother, Mawelewele Mutshinyalo Nancy, and my sister Mawelewele Ntendeni Lorah, and my brothers Mawelewele Isaac Ipfi and Mawelewele Collin Omphulusa and all those who have played their role by contributing towards the completion of this dissertation

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ABSTRACT

The study investigated the smart value chain logistics system application within the domain of the brick-making sector of Thohoyandou town, South Africa. The investigation has revealed new ways of re-imagining the operation of process inventory for produced and finished brick products from the supply chain to the distribution centers within rural towns through the utilization of Information and Communication Technology (ICT) platforms applied within the Small-Medium Brick Logistics enterprises. The Small-Medium Brick Enterprises (SMBEs) of Thohoyandou town consist of unlicensed small-scale enterprises and medium-scale enterprises. Little formal documented information was known about these enterprises in terms of the operational mode, production procedures, transportation, and socio-economic impacts on the host communities. The study aimed to demonstrate the application of the Smart Value Chain Logistics approach that could be applied to improve the transportation process in Small-Medium Brick Manufacturing Enterprises in Thohoyandou Town. The main objective was to recommend a smart value chain logistics framework. To analyze the value chain system that seeks to support the Small-Medium Brick Manufacturing Enterprises' development in the brick-making sector of Thohoyandou town. The study analysis was conducted, where the sample size of the brick manufacturing enterprises in Thohoyandou town was 7 with (100%) responses. The sample size of the key informants from the local municipality and district municipality within the transport and housing departments was 5 with (100%) responses that were analyzed using the SPSS spatial analytical tool. The total sample size of all key respondents was 12. The research methodology selected for the study was the mixed method approach using qualitative and quantitative analysis approaches. The results revealed that the application of the smart value chain logistics framework approach could be adopted to improve the brick-making enterprise's transport logistics in terms of operational efficiency, and effectiveness of the manufacturing activities.

Keywords: *Smart Logistics, Value Chains, Transport, Manufacturing, Brick Enterprises*

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LIST OF ACRONYMS

AI	:Artificial Intelligence
BRICS	:Britain, Russia, India, China, and South Africa
CCAC	:Climate and Clean Air Coalition
CBD	:Central Business District
CFS	:Commodity Flow Survey
GDP	:Gross-Domestic Product
GHG	:Greenhouse Gas Emission
GVC	:Global Value Chain theory
GPS	:Geographic Positioning System
GIS	:Geographic Information System
ICT	:Information and Communication Technology
IT	:Institutional Theory
IMT	:Intermediate Means of Transport
IoT	:Internet of things
IDP	:Integrated Development Plan
IDRC	:International Development Research Centre
KPI	:Key Performance Indicators
KII	:Key Informant Interview
LVC	:Logistics Value Chain
LIMAC	:Limpopo Manufacturing Advisory Centre
LED	:Local Economic Development
MSA	:Moving South Africa, 1999
MLTM	:Ministry of Land, Transport, and Maritime Affairs

NATMAP	:National Transport Master Plan, 2011
NLTSF	:National Land Transport Strategic Framework, 2006
NDOT	:National Department of Transport
NEMA	:National Environmental Management Act, 1998
NGO	:Non-Governmental Organization
NLTA	:National Atmospheric Emissions Inventory System
PTO	:Permission to occupy
RFID	:Radio Frequency Identification
RTSA	:Rural Transport Strategy and Action Plan
RTMS	:Road Transport Management System
RTS	:Rural Transport Strategy, 2007
RBV	:Resource-Based View theory
RDT	:Resource Dependence Theory
SMBE	:Small-Medium Brick Manufacturing Enterprise
SPSS	:Statistical Package for the Social Sciences
SMME	:Small-Micro Medium Enterprises
SADC	:Southern African Development Countries
ST	:Stakeholder Theory
SEDA	:Small Enterprise Development Agency, 2012
SEFA	:Small Enterprise Finance Agency, 2004
SPLUMA	:Spatial Planning and Land Use Management Act, 2013
SIP	:Strategic Innovation Promotion Program
SATC	:Southern African Transport Conference
SLVCM	:Smart Logistics Value Chain Management

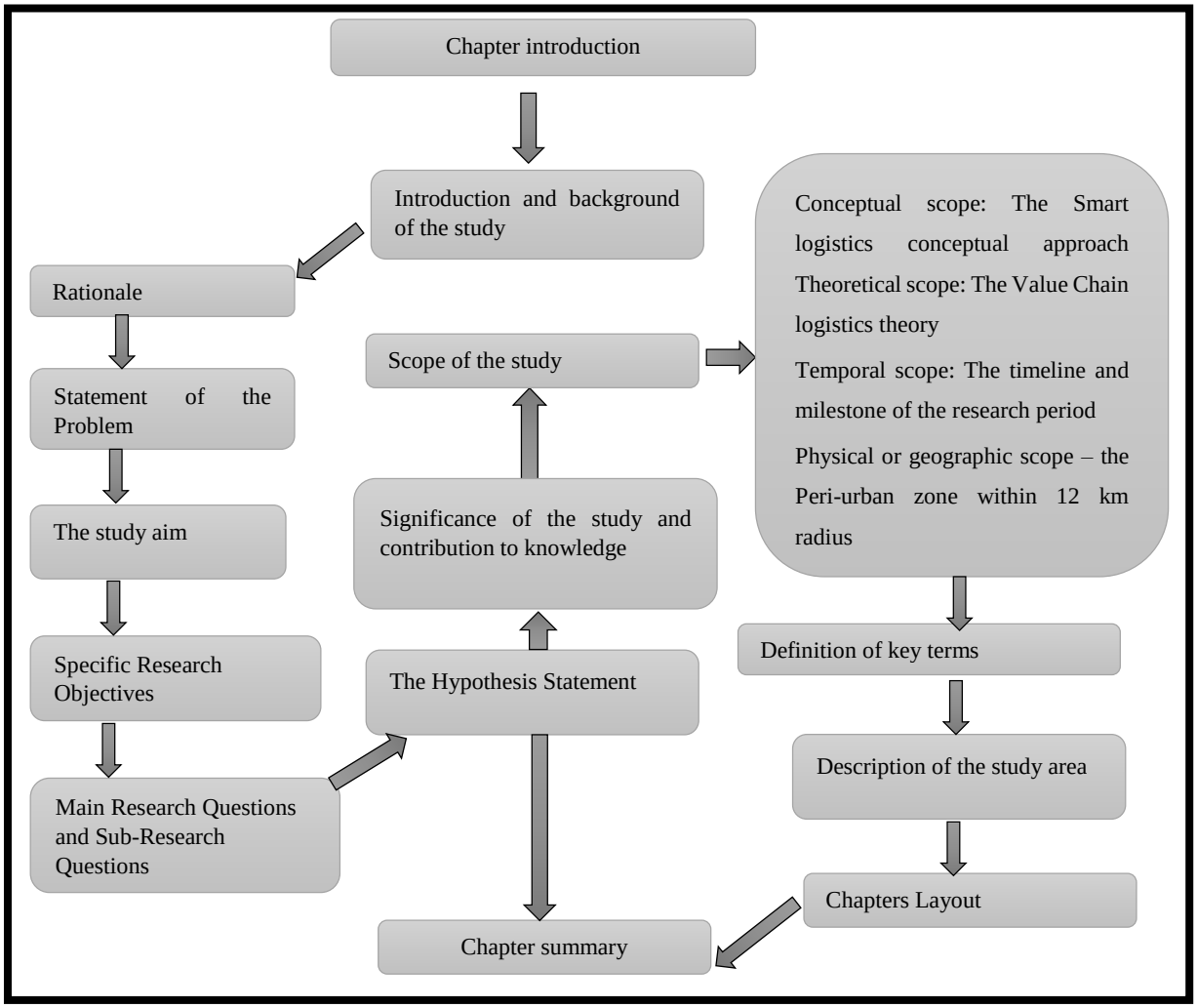
SVCLF	:Smart Value Chain Logistics Framework
TCA	:Thematic Content Analysis
TCT	:Transactional Cost Theory
TDM	:Transport Demand Management
USD	:United States Dollar
VDM	:Vhembe District Municipality
VSBK	:Vertical Shaft Brick Kiln
VTT	:Value of Travel Time

CHAPTER ONE: SETTING THE SCENE AND BACKGROUND TO THE STUDY

1.1 Chapter Introduction

This chapter presents the introduction of the whole study and tries to figure out the application of intelligent value chain logistics for the small and medium brick manufacturing enterprises in Thohoyandou town, South Africa. It includes a detailed background of the study, justification, problem definition, the study goal, specific research objectives, main research questions and sub-research questions. The hypotheses statement is given as well as the significance of the study, its contribution to knowledge, scope of the study, definitions of key terms, description of the study area, chapter structure and finally a chapter summary. Figure 1.1 below shows the structural layout of chapter one, outlined as follows:

Figure 1. 1: The structure layout of chapter one



Source: Author's construct, (2022)

Figure 1.1 above indicates the construct of the chapter one structure layout, which constitutes of fourteen components namely; chapter introduction, introduction and background of the study, rationale, statement of the problem, the study aim, specific research objectives, main research questions, and sub-research questions, hypothesis statement, the significance of the study and contribution to knowledge, the scope of the study, definitions of key terms, description of the study area, chapters layout and lastly chapter summary.

1.2 Introduction and background of the study

The brick-making industry is currently playing a key role in the economic growth of both developing and developed countries globally, more especially within the building and construction industry, (Clay Brick Association of South Africa, 2019: p.1-4). Invariably, the smart value chain logistics system also in recent times has been viewed as a new way of re-imagining how the operation of inventory control for produced and finished brick products from the supply chain to the distribution centers occurs between urban and rural spaces. The smart value chain logistics thus can be applied through utilizing Information and Communication Technology (ICT) platforms within small-medium brick logistics enterprises, (Maithel, et al, 2012: p. 1-21). The theory of logistics area, that incorporates the Logistics Value Chain (LVC), refers to the chain with a series of intrinsic logistics value, in which the logistics value chain reflects the nature of the supply chain demand and shows the origin of the driving force to form the supply chain, (Zhou and Zhang, 2010: p. 26-29). The term ‘Value Chain’ was used by Michael Porter in his book "Competitive Advantage: Creating and Sustaining Superior Performance" (1985) of an enterprise. The value chain analysis describes the activities that the organization performs and links them to the organization’s competitive position to increase the enterprise’s competitive advantage, (Michael, 1985: p 74; Dagmar, 2001: p 2).

The study focuses on the application of the smart value chain logistics approach in improving the transportation process in the Small-Medium Brick Manufacturing Enterprises of Thohoyandou Town, (Dagmar, 2001: p 2). The small-medium brick manufacturing enterprises are the formally and informally regulated Small-Medium Brick Enterprises. These enterprises focus on the manufacturing and transport distribution of brick products. Which occurs within the construction industry and the handling of the brick products from the retailers and to the communities which they serve, (Clay Brick Association of South Africa, 2019: p 1-4). Thohoyandou Town is a small rural town, fast-growing, and with a high demand for

construction materials such as bricks and other materials such as cement, tiles, and sand within the construction industry. The brick manufacturing enterprises within Thohoyandou town at a radius of 12 km are estimated to be 7 and these are Gokolo Bricks, Dithuse Brick yard, Young Xing Brick yard, Corner Sand and Brick Supply, Lufule 1 Brick-makers, Vhavenda Bricks (Pty) Ltd, and Mami group brick house. They are in the Peri-urban area of Thohoyandou town.

1.3. Rationale

Global studies have shown that the bulk of brick production is attributed to disorganized small-scale industry employing energy-inefficient traditional techniques (Uma, et al., 2014: pp. 549-553; Maithel, 2012: pp. 1-21; Bates, 2014: p. 1 of 24). Large scale brick firing in South Africa, as well as other parts of Africa, Asia, and Central America, is predominantly carried out using clamp kiln technology (Hoque, et al., 2012: pp. 154-161; Akinshipe, 2017: p. 1 of 24). This could be due to its relatively simple and inexpensive technological application compared to other firing techniques (Akinshipe, 2018: pp. 580-590). South Africa is known to be the largest producer of clay bricks, contributing over 70% of the total production volume for Southern African Developing Countries (SADC), (Swiss contact and Clay Brick Association of South Africa, 2017: p 1-36). In South Africa, about 100 brick industries produce about 3.5 billion bricks annually, 73% of them from clamp kilns (Swiss Contact and Clay Brick Association of South Africa, 2017: pp. 1-36). The study draws on the synergies of improving manufacturing activities and distribution of brick products for small and medium-sized brick companies regulated both formally and informally, and how intelligent logistics can be applied to improve material flow, value flow, information flow and transportation and delivery of the brick products from place of origin to place of destination. By examining the prospects for improving and improving the location and physical locations of brick manufacturing activities, production and inventory control, the required Smart Logistics services and innovations can be studied (Vhembe District IDP, 2013/2014: pp. 3-9).

1.4. Statement of the Problem

The Small-Medium Brick Enterprises (SMBEs) of Thohoyandou town consist of licensed and unlicensed small-scale and medium-scale enterprises. The exact nature of constraints being faced in this sector are not clear. While anecdotal evidence exists in respect of the value-added activities of manufacturing bricks and their use, the need for a structured scientific study to document the sector becomes important. Granted the fact that grey literature sources suggest

that SMBEs are facing high logistics costs; high pricing transactions of buying fuel and inadequate budgeting and funding sources, the SMBEs become overwhelmed by the amount of constraints occurring within the distribution of brick products, (Fostering Sustainability in Brick Making Micro-enterprises, 2019). In this regard, the knowledge gap states that, little and grey information exists about these enterprises, in terms of the physical location of the infrastructure, operational mode, production procedures, transportation, and socio-economic impacts on the host community (i.e., Thohoyandou town). The application of smart value chain logistics in addressing these constraints in the study area has to date not been studied in-depth and at length. This study, therefore, seeks to conduct a survey to establish and either confirm or reject these observations and provide a scientific explanation for the SMBEs' smart value chain logistics issues.

1.5. The study aim

The study aim is to interrogate the application of the smart value chain Logistics approach in the manufacturing of bricks for Small-Medium Brick Enterprises in the land use, transportation, and physical construction industry of Thohoyandou Town.

1.6. Specific Research Objectives

To achieve the study aim, the following specific research objectives were developed, namely:

1. To explore the spatial logistics of the Small-Medium Brick Enterprises in respect of constraints and opportunities for the Small-Medium Brick Enterprises in Thohoyandou town.
2. To examine the Small-Medium Brick Enterprises operational mode, land use, transportation, and socio-economic impacts on the host community (Thohoyandou).
3. To recommend a Smart Value Chain Logistics Framework that seeks to support the Small-Medium Brick Manufacturing Enterprises logistics efficiency in the brick-making sector of Thohoyandou town.

1.7. Main Research Questions and Sub-Research Questions

Table 1.1 below shows the main research questions and their sub-research questions. This section seeks to introduce the main research questions which align with each of the five specific research objectives and their sub-research questions.

Table 1. 1: Main Research Questions and Sub-research questions

Main research questions	Sub-research questions
1. How does the spatial logistics of small-medium brick enterprises manifest in Thohoyandou from a mapping and spatial configuration perspective?	(i). How can the small-medium brick enterprises be mapped to show their physical siting and locational characteristics? (ii). How can the spatial environment of small-medium enterprises be analyzed?
2. How does the operational logistics mode, and transportation impact the manufacturing and distribution of brick products in the study area?	(i). What are the main operational modes impacting the logistics, and transportation in brickmaking within small-medium brick enterprises? (ii). How can the concept of value chain logistics be used to analyse the constraints impacting small-medium brick enterprises operations?
3. What logistics recommendation in developing the small-medium brick enterprises in Thohoyandou town be?	(i). What could constitute a rationale for recommending a smart value chain logistics framework for developing small-medium brick manufacturing enterprises? (ii). How can the Smart Logistics conceptual approach be applied to support small-medium brick enterprises in the study area?

Source: (Author's Construct, 2021)

1.8. The Hypothesis Statement

This study adopts the following two hypotheses, namely:

- *Alternative hypothesis*: H_a:

  The application of the smart value chain logistics approach for Small-Medium Brick Enterprises (SMBEs) manufacturing in Thohoyandou Town will enhance the logistics,

transportation, and pricing strategies of brick products in the SMBEs market of Thohoyandou town.

- *Null hypothesis:* H_0:

  The application of the smart value chain logistics approach for Small-Medium Brick Enterprises (SMBEs) manufacturing in Thohoyandou Town will not enhance the logistics, transportation, and pricing strategies of brick products in the SMBEs market of Thohoyandou town.

1.9. Significance of the study and contribution to knowledge

Brick manufacturing is recognized as one of the major contributors to economic growth in many parts of the world and across South African regions, including Bangladesh, India, and Ghana, (Maithel, *et al*, 2012: p. 1-21). The study is of significance in terms of bringing in an intersection of transportation planning, within the planning and infrastructure development, construction, and local economic domains within small rural towns and their small-medium brick enterprises, (Mudau et al, 2014: p 2-10). In the study of the enterprises in brick making sector of Thohoyandou town, the Small-Medium Brick Manufacturing Enterprises, the Thulamela Local Municipality, the Vhembe District Municipality, and the construction industry academics and also the transport logisticians will benefit from the outcomes of the research outputs, inputs, and contributions to the existing knowledge on the academic and livelihood of the host community, (Piketh, et al, 2021: p. 1-24). The importance of logistics in integrated land use, and transportation is to improve the distribution and movement of goods and products from one point to another point. In terms of the value chain, it is about how value-added activities can be created to improve pricing implications, expand livelihood options, and diversify the local economic models in Thohoyandou Town, (Mudau et al, 2014: p 2-10).

1.10. Scope of the study

This section on the scope of the study seeks to introduce the conceptual scope, which is the smart logistics conceptual approach, the theoretical scope, which is the value chain logistics theory, the temporal scope of the study, and the physical and or geographic scope, which is the Peri-urban zone within the 12 km radius.

1.10.1. Conceptual scope: The Smart logistics conceptual approach

The Smart Logistics of rural freight transportation unravel the need for traffic consolidation to increase access to rural markets and reduce transport costs. This enables the manufacturing suppliers who produce local products for the urban areas as well as in some parts of the rural areas to make use of smart technologies for tracking trucks as they deliver products and smartly manage the value flow of manufacturing products from the point of origin to the point of destination, (Uckelmann, 2008: p 204).

1.10.2. Theoretical scope: The Value Chain logistics theory

The theory of logistics management of the value chain is characterized by five steps in the value chain system that give a given company the opportunity to create value that exceeds the cost of providing its goods or services to customers. These activities or steps that the company has to carry out are inbound logistics, operations, outbound logistics, marketing, sales and finally service (Abecassis, 2006: p1). Logistics is the art of managing the supply chain and the science of managing and controlling the flow of goods and products between the point of origin and the point of consumption in order to meet the needs of customers. It involves the integration of information, transportation, inventory, warehousing, material handling and packaging (Krishnan, 1991: p2). (Porter, 1985: p. 74) defines the value chain as a representation of a company's value-adding activities based on its pricing strategy and cost structure. So, in relation to this claim, the whole management of the logistic process should benefit from the added value of their activities within the logistic company.

1.10.3. Temporal scope: The timeline and milestone of the research period

The research study is conducted for the sole purpose of meeting the requirements of a master's degree for which there are time constraints within a specific timeframe. The temporal scope, therefore, indicates the limit or constraints of time management for completing the research study. The time dimension and the length of this research study is for a period of 2 years.

1.10.4. Physical or geographic scope – the Peri-urban zone within a 12 km radius

The scope of the physical and or geographic features or diagrammatic elements of mapping and the Peri-urban zone within the 12 km radius, shows the spatial map configuration of the radius that covers all the seven existing small-medium brick enterprises within the Thohoyandou boundary. Its centre is longitudinal: 30 27' 28, 8" E; 22 58' 25, 8" S with a circumference of 75.14 km and an area of 452.47 km^2. Figure 1.2 presents a spatial map that shows the study area's spatial remit of study.

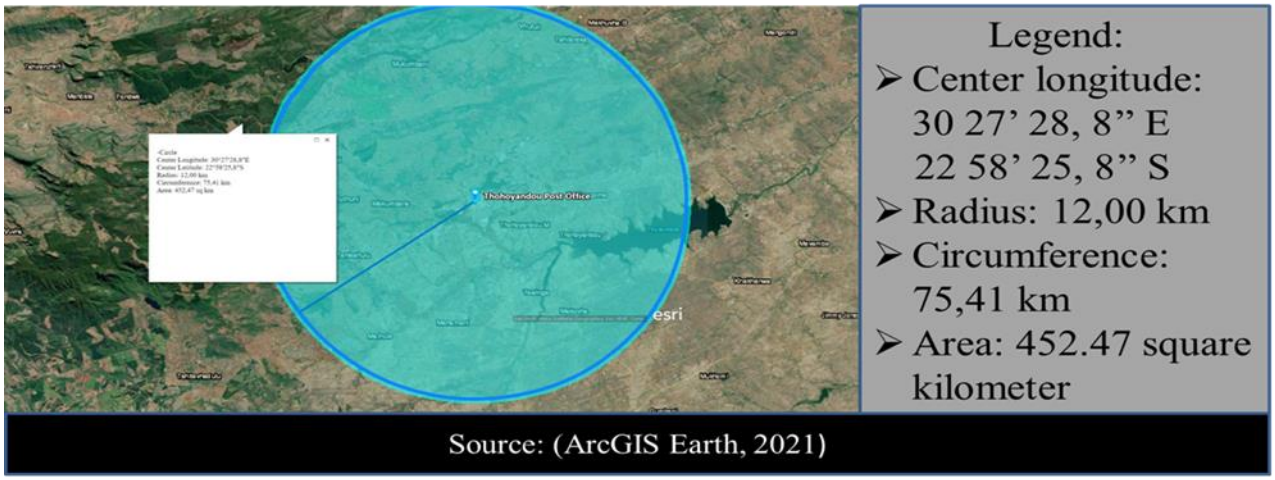


Figure 1. 2: Spatial Map Configuration of the Radius

The above diagram shows the spatial map configuration of the 12 km radius. In short, the study units included were restricted to the 12 km radius from the centre of Thohoyandou town. This excluded any study units outside of the 12 km radius orbit.

1.11. Definition of key terms

This section focuses on the meaning and definitions of key terms which are relevant and related to the study. This section will define the following terms: Bricks, Transport logistics, Value Chain, Value Chain Analysis, and lastly Small-Medium Brick Manufacturing Enterprises (SMBEs).

Bricks: The brick product is a product made of clay or slate and fired into a durable ceramic product. Brick gets its colour from the minerals in the fired clay or from coatings applied before or after the firing process (Civilsir, 2021: p. 1; Campbell, et al., 2003: p. 1 of 7).

Transport logistics: Transport logistics includes all steps in the shift of cargo logistics and the interaction between the different institutions that intervene in the international transport of goods, the operators that carry it and the transport intermediaries that offer intermediation services between the shifts of cargo (Darja, 2018: pp. 11961203; De Castro, 1993: p. 1199).

Value chain: The value chain describes the full range of activities required to produce a product or service from conception through the various stages of production (with a combination of physical transformation and the use of various manufacturing services), delivery to the end user and the final product Disposal after use, (Carla, 2020: https://www.investopedia.com/contributors/101361/, retrieved on 03/02/2022 at 15:41).

Value chain analysis: Value chain analysis describes the activities within and around an organization and relates it to an analysis of the organization's competitive strength (Carla, 2020: https://www.investopedia.com/contributors/101361/, accessed 2022-03-02 at 15:00: 41 Michael, 1985: p.1).

SMBEs: These are formally and informally regulated small-medium brick enterprises some licensed and some unlicensed in the brick-making sector of South Africa, they focus on the manufacturing of brick products within the construction industry and the distribution of the brick products to the retailers and the communities which they serve, (Clay Brick Association of South Africa, 2019: 1-4). Plate 1-2 is a picture that shows a glimpse of the typical Small-Scale and Medium-Scale Brick Manufacturing Enterprises' operations and activities.

Plate 1-2: are showing Small-Scale and Medium-Scale Brick Manufacturing Enterprises:

Source: https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.youtube.com%2Fwatch, (Accessed on 2021/11/04 at 22:18 pm)

1.11.1. Map of the study area

Figure 1.3 overleaf is the map of the study area that shows the study area's location from a national to a local context. Starting from the map of South Africa, then followed by the provincial map of Limpopo Province, then the geographic boundary of Thohoyandou and then the final map figure which is the study area of Thohoyandou town.

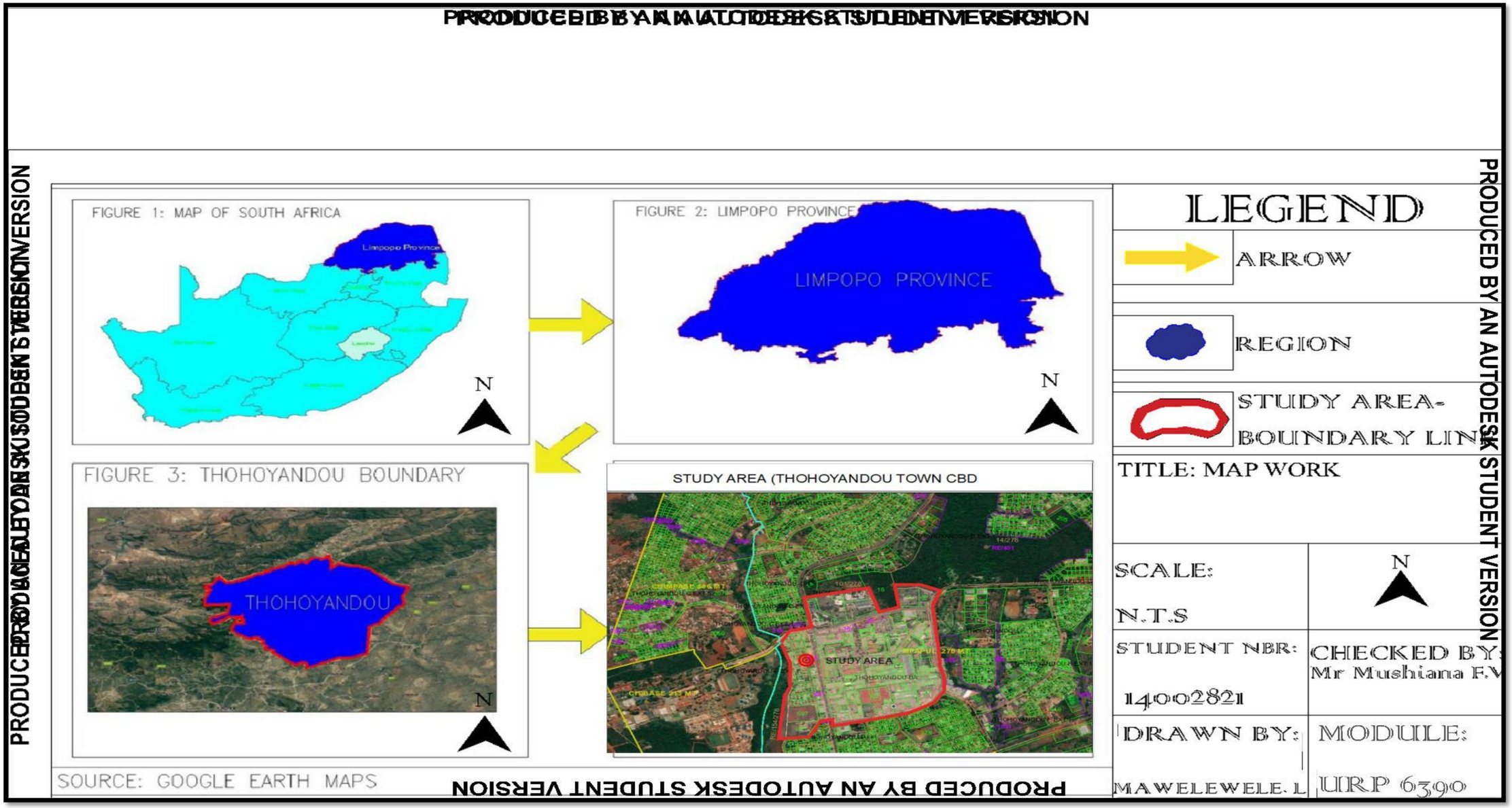


Figure 1. 3: The Physical scope of the geographic context of Thohoyandou

Source: Google Earth Maps

Figure 1.3 maps are the geographic representation of the location of Thohoyandou town, which is depicted on the cadastral boundary of the South African regional spatial mapping and is adopted from Google Earth Maps.

The preceded section focused on the geographic representation of the location of Thohoyandou town, which is depicted on the cadastral boundary of the South African regional spatial mapping and is adopted from Google Earth Maps. The following section is on the description of the study area that is, its location, geographic position, and history.

1.12. Description of the study area

The study will be conducted in a geographic area that includes the small town of Thohoyandou. Thohoyandou was the former capital of the Bantustan of Venda. It was built in the late 1970s. The city of Thohoyandou was declared the capital of the Venda nation when Venda was founded in 1979. The name Thohoyandou means 'head of the elephant' and derives from the name of King Thohoyandou who ruled the Vhavenda kingdom in the early 18th century. The GPS coordinates of Thohoyandou are L 22.9758 5, L 30.4717 6, its population is estimated at 69453 with a household count of 17345 (406.94 per km2). Thohoyandou area covers (1629.48 per km2). It has 52% women and 48% men, the first language is Tshivenda with 85% and other languages with 7% (Census 2011, GIS DVD).

1.13. Chapters Layout

The dissertation is comprised of the following twelve chapters. *Chapter one:* This chapter is concerned with setting the scene and background to the study. This objective is achieved via an exposition of the problem under investigation and a general introduction presenting an overview of what the study is about and its location. *Chapter two:* Exploring theoretical foundations and frameworks in respect of the smart transport and logistics value chains debates. The chapter's analysis presents in context what is already known and not about the topic being studied. *Chapter three:* Reviewing the legislative and policy framework is achieved in terms of exploring the policies and regulations that transport logistics and SMMEs in the study. *Chapter four:* presents Case studies in small chain logistics for brick manufacturing enterprises. The outcome of the chapter is achieved via reflective analysis of the best practices in small chain logistics for brick manufacturing enterprises. *Chapter five:* This chapter presents the study adopted research methodology. The distinct types of data collection methods and data

analysis tools applied to meet the research objectives are presented. *Chapter six*: This chapter explores the study area in respect of transport and logistics implications in the study area. Invariably, the chapter that focuses on the situational conditions and profiling of the study area. *Chapter seven*: This index an analysis of objective one. The analysis of objective one is based on the mapping of the spatial distribution of the SMBEs within a 12 km radius and the analysis of the existing value chain logistics used by the Small-Medium Brick Manufacturing Enterprises in Thohoyandou town. As well as on the identification of constraints and opportunities that influence the manufacturing and distribution of small-medium brick enterprises (SMBEs) and products in Thohoyandou town. *Chapter eight*: This focuses on an analysis of objective two. The analysis of objective four is based on exploring the Small-Medium Brick Enterprises in respect of operational logistics modes, land use, transportation, and socio-economic impacts on the host community. *Chapter nine*: This is dedicated to an analysis of objective three. The analysis of objective three is to recommend the smart value chain logistics framework that seeks to support the Small-Medium Brick Manufacturing Enterprises development in the brick-making sector of Thohoyandou town. *Chapter ten*: This chapter presents the summary, conclusions, and recommendation of the study. This chapter summarizes the major aspects that have been presented, makes recommendations, and suggests strategies for future work.

The previous section on the chapter's layout focused on highlighting the dissertation's ten chapters and what each chapter of the research study intends to address. The following sections presents the chapter summary.

1.14. Chapter summary

Chapter one is the initial part of the whole research study. It aims to provide introductory information and sets the scene about the study area and how the research study will unfold as it is being conducted. It starts with the introduction and background to the study and starts to give insights into the meaning of the study based on the initial findings gathered so far. The introduction highlights the need for addressing the challenges of logistics value chain demand and supply chain management. This is within the transport, construction, physical planning, and local economic domains and their impacts on the host community and within the small-medium brick manufacturing enterprises, through the application of the smart value chain

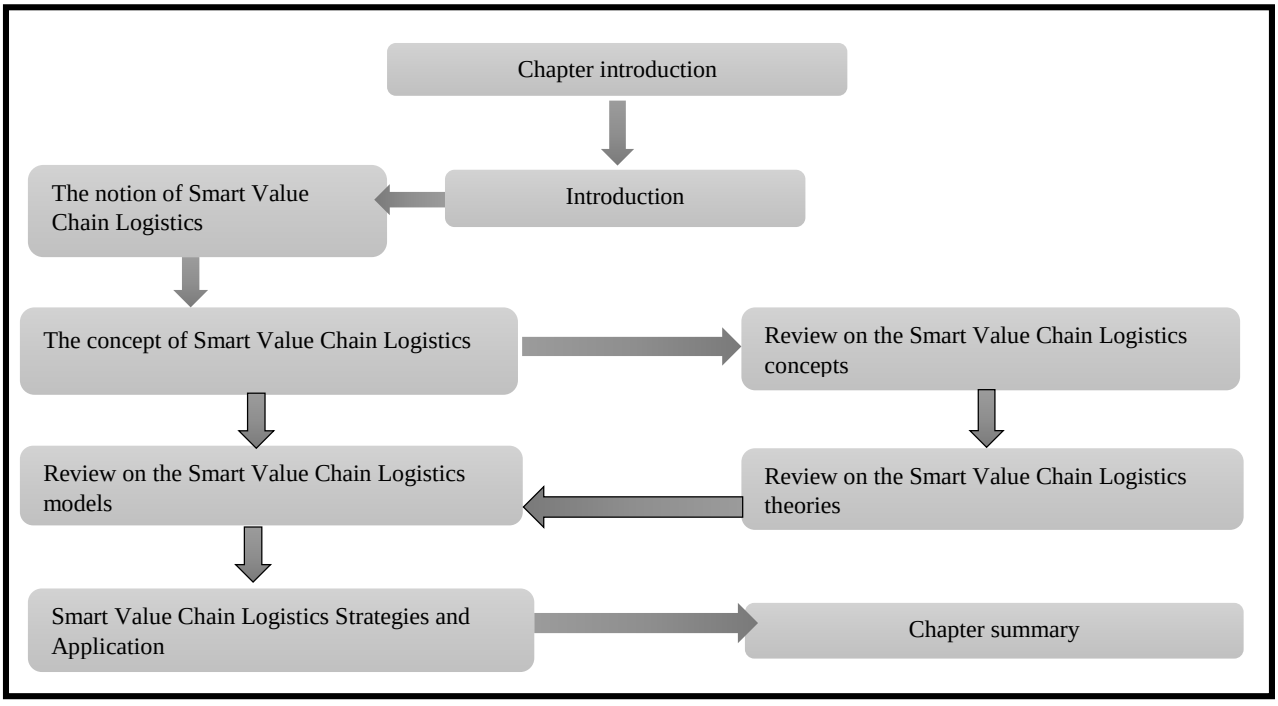
logistics in small towns in this case Thohoyandou Town and its rural counterparts. The rationale of chapter one is about what the study seeks to identify, explore, and interrogates in the field visits to the study area; the study seeks to explore the major implications and concerns of transport logistics, operational mode, production processes, and manufacturing impacts on brick manufacturing to their markets in Thohoyandou Town and its rural hinterlands.

CHAPTER TWO: EXPLORING THEORETICAL FOUNDATIONS AND FRAMEWORKS: SMART TRANSPORT AND LOGISTICS VALUE CHAINS DEBATES

2.1. Chapter Introduction

This chapter presents the exploration of the theoretical foundations and frameworks: Smart transport and logistics value chains debates for the study. This is achieved by conducting the literature findings on the application of the smart value chain logistics for the small-medium brick manufacturing enterprises in Thohoyandou town, South Africa. It comprises an introduction, explores the notion of the smart value chain logistics, unravels the basis of the concept of smart value chain logistics, and considers relevant value chain logistics and supply chain theories, smart value chain logistics models, smart value chain logistics strategies and their application before summarising the issues presented in the chapter. Figure 2.1 below shows the structure layout of chapter two, which is outlined as follows:

Figure 2. 1: The structure layout of chapter two



Source: (Author's own construct, 2022)

Figure 2.1. above indicates the construct of the chapter two structure layout, which is constituted by nine components as depicted in the figure.

2.2. An introduction to the overview of chapter two review

This chapter provides an overview of previously studied and conducted research and their findings. The review is based on existing knowledge, available resources, and the existing knowledge gap. The chapter reviews the conceptual and theoretical approaches together with presenting a conceptual framework layout that is used in the study. A chapter summary ties down the chapter's work. The following section however focuses on the notion of smart value chain logistics, to address the relevance of the study and to defend the position of the study.

2.3. The notion of smart value chain logistics

In the manufacturing of brick products within small-medium brick enterprises, the Smart Logistics conception and incorporation is seen as a dynamic, intelligent combination of technology, administration, and manufacturing activities (human activities) allowing an operator supervising the activities of manufacturing products, to predict deficient performance in the operational mode and production procedures, (Stock and Lambert, 2001: P. 58). The Smart Logistics Value Chain Management (SLVCM) thus becomes part of the operational planning process to control the efficiency of product and service flow, from raw materials procurement, warehouse management, transport cost management, and value chain to the point of use or the consumers, (Uckelmann, 2008: p 204). It also helps to minimize the activities' impacts on a given area, be it socio-economic and transport process impacts on the host communities (in this case Thohoyandou town), (Kijewska, *et al*, 2016).

2.4. The concept of smart value chain logistics

Incorporating the intelligent logistic values into the system of manufacturing and processing brick products helps to increase the capacity to convert raw materials, materials and energy into finished products and components at low production costs per unit. The manufacturing function is vital to the quest to produce durable, high-quality brick products. When small and medium-sized brick manufacturing enterprises engage in such manufacturing operations, the activities should not operate in isolation from the enterprise market. Thus, the intelligent logistic system becomes a means to connect the manufacturing function to the market and henceforth increase the firm's competitive advantage through strategies that maximize profit

and increase the rate of income through proposed pricing strategies (Stock and Lambert, 2001: p. 58).

2.5. Review on the smart value chain logistics concepts

The table below, presents a review of the smart value chain logistics concepts from the perspective of a bibliometric review in respect of the small-medium brick manufacturing enterprises of South Africa in Thohoyandou town.

Table 2. 1: Database of authors, year of publication, and concepts

Author's name	Concept	Methodology	Journal/article name	Year of publication
Wu *et al*.	SMART Supply Chain	The aim and goal of the concept is to have the right item in the right quantity at the right time in the right place at the right price in the right condition for the right customer.	Smart supply chain management: a review and implications for future research.	2016: p. 395-417
Browne *et al*.	Urban consolidation freight concept	People might see opportunities to consolidate retail supply at suburban depots, thereby streamlining the movement of goods in the cities.	Urban freight consolidation centers: final report.	2005: p. 653-654
Browne *et al.*	Hub-and-Spoke freight systems	For example, if a logistics company based in Thohoyandou wants to send 500kg of goods to a customer in Pretoria, hub-and-spoke is a fast yet cost-effective way to deliver.	Urban and freight consolidation centers: final report.	2005: p. 653-654
Browne *et al.*	Reverse logistics	Reverse logistics is the movement of products back down the supply chain, either to capture their remaining value or to dispose of them.	Urban and freight consolidation centers: final report.	2005: p. 653-654
European shippers' council	Collaborative logistics turn	There are limits to how much a single company can do to improve logistics efficiency.	Identifying bottlenecks and their solutions in freight transport logistics.	2007a: p. 653-654
European shippers' council	Telematics	Telematics are used to control and monitor remote devices and systems, which has found wide application in road freight transport.	Identifying bottlenecks and their solutions in freight transport logistics.	2007a: p. 653-654
European shippers' council	The compact terminal concept	The compact terminal is a new modular design for a cost-effective, high-performance intermodal terminal capable of handling rail-bound containers, swap bodies and trailers.	Identifying bottlenecks and their solutions in freight transport logistics.	2007a: p. 653-654

Browne *et al.*	Third places logistics concept	The Third Places, flexible hubs near homes, transportation hubs and public spaces, serve as shared workspaces and locations for the delivery and collection of goods.	Urban and freight consolidation centers: final report.	2005: p. 653-654
Jabeur *et al.*	Smart Logistics	Smart Logistics essentially aims to efficiently coordinate the planning and disposition of ICT infrastructure, people, and G-Policy.	Toward leveraging smarty logistics collaboration with a multi-agent system-based solution.	2017
Radiovojevicg milosavlijevic	Logistics 4.0	It's all about the application of Internet of Things, cloud computing, big data, block chain, wireless sensor networks, robotics and automation, augmented reality, drones, 3D printing and driverless transport vehicles in road freight transport.	4th logistics international conference, Belgrade, Serbia: the concept of logistics 4.0.	2019
Zang, heije	Intelligent logistics (IL)	IL is an integrated application based on information technologies, emphasizing the synergy of philosophy, technology, management, and efficiency as a system.	Research on a basic connotation and implementation framework of smart logistics.	2011
Xiujian lan	Rural logistics	Refers to logistics activities in rural areas and includes transportation, loading, unloading, packaging and storage activities for production.	On development strategy of the rural logistics market.	2014
Taniguchi, *et al.*	City logistics	Is the process of full optimization of logistics and transport activities of private companies with the support of advanced information systems.	Introduction In city logistics: network modeling and intelligent transport systems.	2001a
Ross	Supply chain management	Strives to unite the collective productive competencies of value-adding activities within a logistics company.	"Competing through supply chain management: creating market-winning strategies through supply chain partnerships" ("Competing Through Supply Chain Management - Google Books").	1998
Potrol	Freight villages (terminals)	The goods are consolidated in the freight center before being delivered to the urban areas. The process helps reduce the required number of trucks used for delivery and handling.	Inner freight transport and city logistics.	2003
Michael P	Value chain concept	Is engaged in the production of raw materials and links with other companies engaged in trade, assembly, processing, and production.	Competitive advantage: creating and (sustaining) superior performance.	1985: p. 9
Starkey	Rural transport hubs as a development concept	For transportation purposes, central locations serve as rural hubs connected to other locations by spokes.	Rural transport services in Africa, lessons from rapid appraisal surveys in Burkina Faso, Cameroon, Tanzania, and Zambia.	2007

Source: Author's own construct, (2022)

The review of the smart value chain logistics concepts facilitated the exploration of the theoretical foundations and development of a framework of Smart transport and Logistics value chains. The following section however focuses on the review of the Smart Value Chain Logistics theories to address the research topic's theoretical approaches.

2.6. Review on the smart value chain logistics theories

The table below, presents a schematic review of the smart value chain logistics theories applicable to small-medium brick manufacturing enterprises of South Africa in Thohoyandou town.

Table 2. 2: Database of authors, year of publication, and theories: Value Chain Logistics theories and Supply Chain theories

Author's name	Theories	Methodology	Journal/article name	Year of publication
Porter	Value configuration theory	The theory builds on, extends, and transforms porters value chain framework for the analysis and development of organization value-adding activities.	Value Chain and Performance in Agro-Allied Small and Medium Scale Enterprise in Sokoto State, Nigeria.	1985: p. 11
Uzzi	Social network theory	The theory emphasizes the embedded views of companies firms in horizontal, vertical, vertical, and business value chain relationships with other logistics companies firms supporting inputs and services.	Social Structure and Competition in Inter-firm Networks: The Paradox of Embeddedness.	1997: p. 12
Schmitz	Governance theory	The theory outlines four key parameters that define the production process: what is produced, how it is produced, when it is produced and how much is to be produced.	Dynamics, Innovation and Development Elsinore, Denmark, June 14-16, 2004, Theme: 'Local Upgrading in Global Chains': recent findings paper to be presented at the druid summer conference 2004.	2001: p. 12
Gibbon; Bair; Gereffi	Global Value Chain (GVC) theory	(GVC) The analysis originates from the commodity chain approach and examines the relationships between multinational companies, the leading	Upgrading Primary Production: A Global Commodity Chain.	2008; 1994: p. 12

		companies, and other participants in the international value chain.		
Kaplinsky and Morris	Upgrading theory	The characteristics of physically transforming the physical transformation of products over time and their distribution across geographic locations are known as input-output relations.	*Handbook for Value Chain Research. "Working Paper Prepared for the IDRC*, Brighton, UK, Institute for Development Studies".	2001: p. 1
Mitra *et al.*	Resource-based view (RBV) theory	The theory shows that the behaviour of firms can be interpreted as a search for competitive. advantage. It also shows that a company's human capital management, technology, control, and innovation can be the best alternatives for competitive advantage.	Cloud resource adaptation: a resource-based perspective on value creation for corporative growth technological forecasting and social change, article in press.	2017
Touboulic and Walter	Stakeholder theory (ST)	The stakeholder management rationale for supply chain formation envisions firms at the centre of an association of stakeholders.	Theories in sustainable supply chain management: a structured literature review.	2015
Huang *et al.*	Institutional Theory (IT)	Institutional theory suggests that institutional environments put pressure on firms to be legitimate and to conform to prevailing social norms	Institutional pressures on resources commitment and returns management.	2016
Williamson	Transactional cost theory	Theory specializes in how an employer should organize their cross-border reach if they want to reduce their total manufacturing and transaction costs.	Comparative economic organization. The analysis of discrete structural alternatives.	1985; 1991
Jajja *et al.*	Resource dependence theory (RDT)	(RDT) provides inter-firm governance as a strategic response to conditions of uncertainty and interdependence between exchange partners, and building.	Linkages between firm innovation strategy, suppliers, product innovation, and business performance: insights from resource dependence theory.	2017
Karen *et al.*	Logistics theory	Logistics theory is key in transportation demand and research. In this case, it resonates with the concept of supply chain management, in which logistical verification can be described as managing the upstream and downstream relationships with suppliers, distributors, and customers so that greater customer value is delivered with less overall cost.	Logistics Theory Building.	2007

Source: Author's own construct, 2022.

The review of the smart value chain logistics theories, focused on exploring the theoretical foundations and framework of Smart transport and Logistics value chains debates. The following section however focuses on the review of the Smart Value Chain Logistics models that explains the systems of the logistics and value chains constructs and their structures in an interconnected thread of various chains.

2.7. Review on the smart value chain logistics models

The table below, presents an exposition review of the smart value chain logistics models relevant in understanding models and strategies that can be useful for the small-medium brick manufacturing enterprises of South Africa in Thohoyandou town.

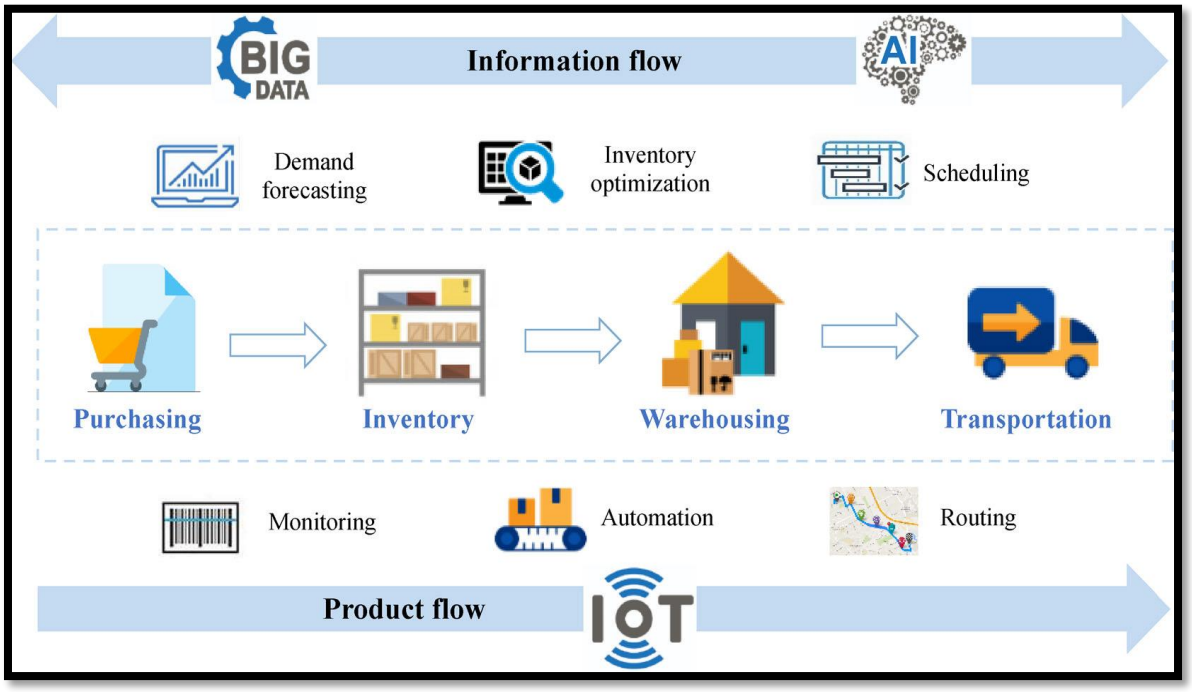
Annexure A: Smart value chain logistics models

Figure name and strategy	Model

Figure 2.2: Smart logistics model

The strategy of the model:

It is widely recognized as a smarter and more efficient way to plan, manage, and control logistic activities using smart technologies (Zhang, 2015: 2-10; Barreto et al., 2017; He, 2017). As shown in the model figure, technologies such as Internet of Things (IoT), big data analytics and AI used in intelligent logistics differ from those used in traditional logistics by four characteristics.



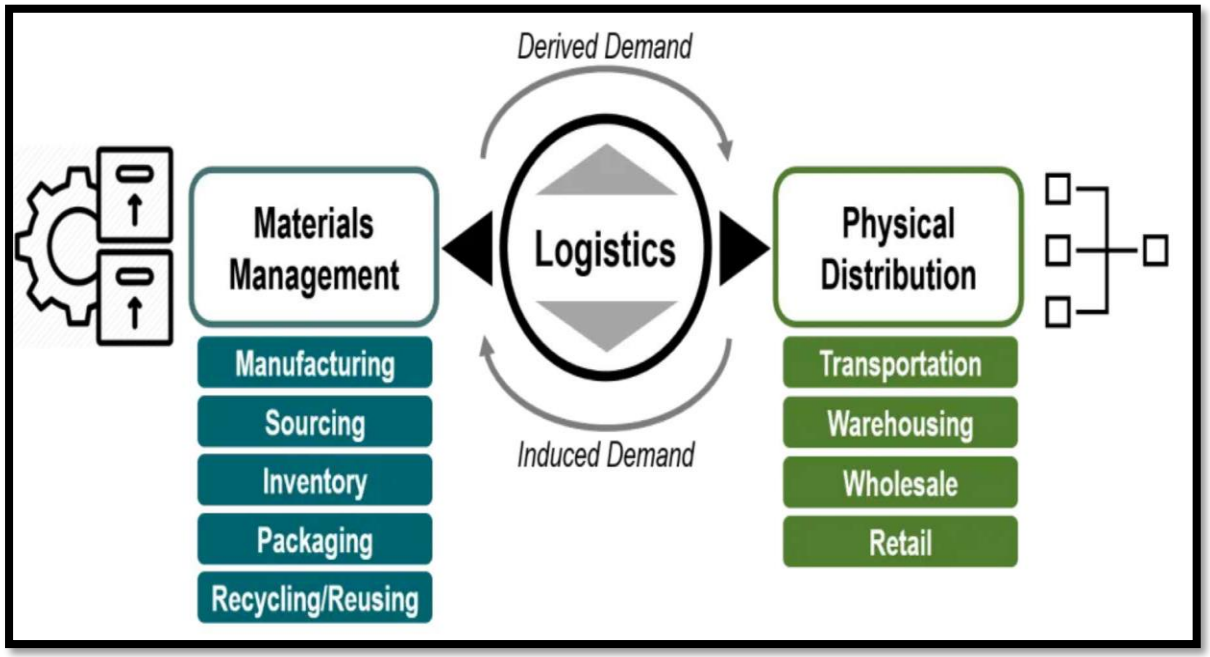
Zhang G, (2015); 15(1): 2–10, 233

Figure 2.3: Logistics model

The strategy of the model:

The figure shows the logistics model, highlighting logistics as a derived demand and as reverse logistics in terms of induced demand. Material management, in this case, the manufacturing processes, sourcing and outsourcing, inventory control of produced goods, packaging, and handling of products. And lastly recycling/reusing existing usable materials is the result that leads to the physical distribution of such raw materials, which are managed by an enterprise, through transportation, warehousing, wholesale, and retail consumption.

The strategy is the management of materials through manufacturing, sourcing, inventory, packaging, and recycling/reusing. Up to physical distribution which will deal with the transportation, warehousing, wholesaling, and delivery to the retailer for consumption.



Rodrigue J, (2020); p 456

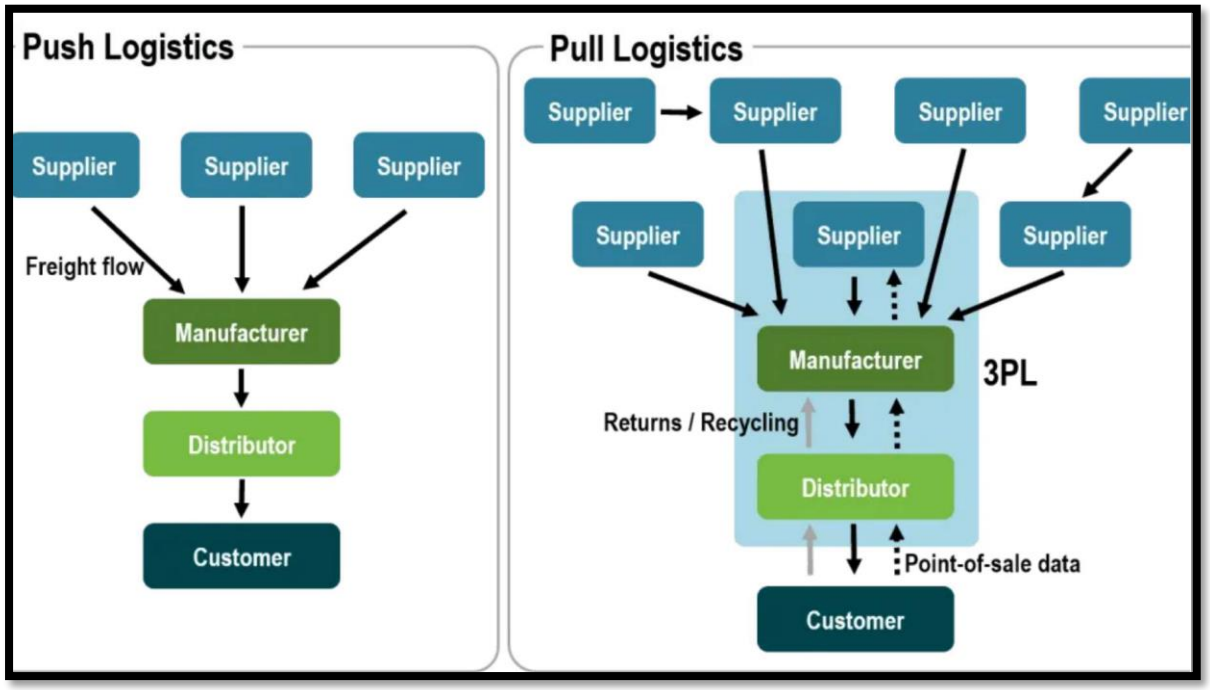
Figure 2.4. Push and Pull Logistics model **The strategy of the model:** The strategy is to promote push and pull logistics through the supplier in the freight flow to the manufacturer, from the manufacturing to the distributor, then from the distributor to the customer.	 Rodrigue J, (2020); p 456

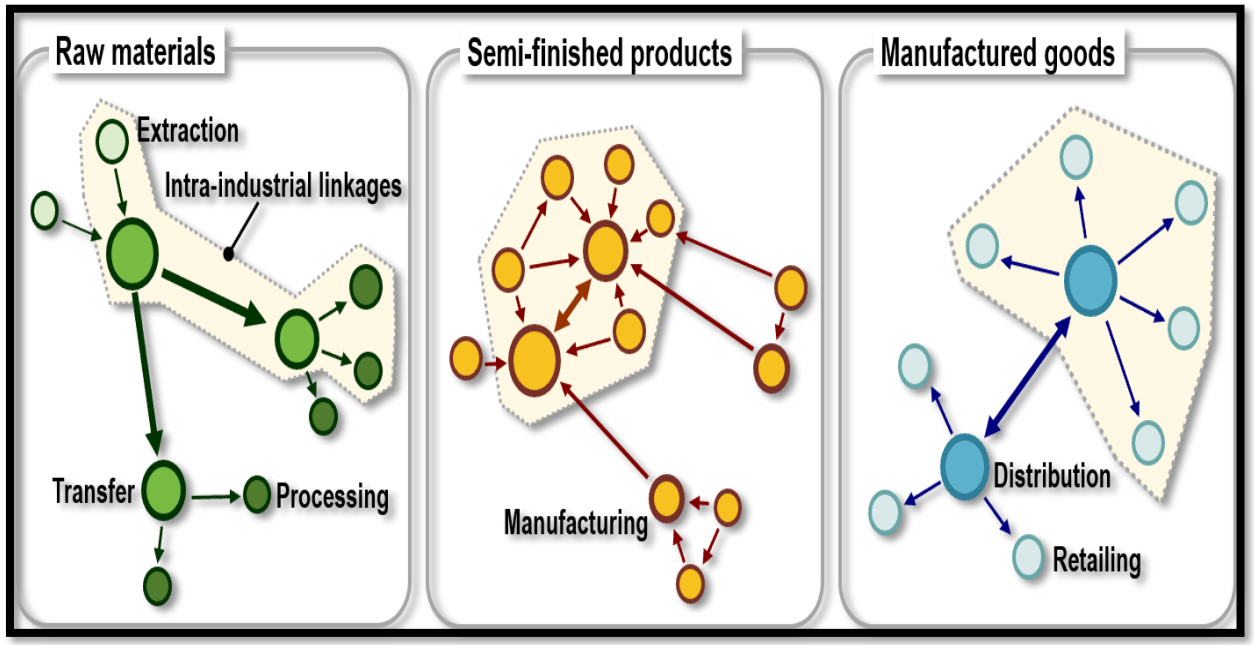
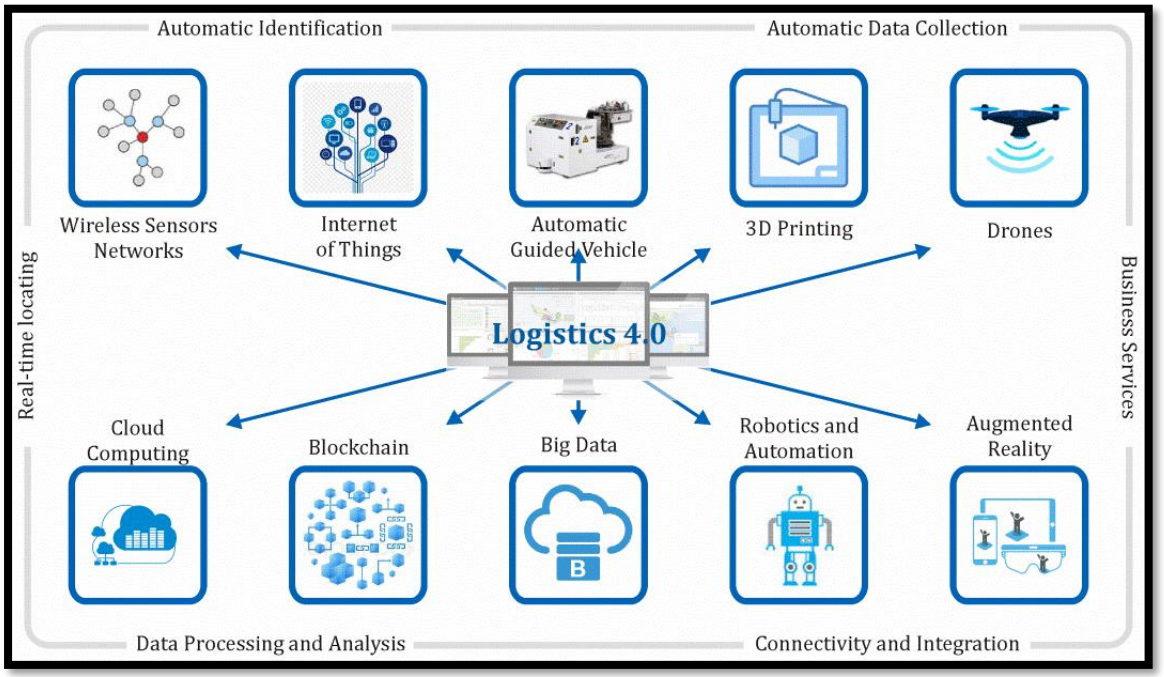
Figure 2.5. Value Chains Freight model **The strategy of the model:** The strategic approach is through the extraction of raw materials moving along the intra-industrial chain, then to processing, again it seeks to reach the point of processing semi-finished products and then to the manufacturing of the products. The manufactured products are then distributed to the retailers for consumption.	 Rodrigue, J. (2020); p 456

Figure 2.6. Model of Logistics 4.0

The strategy of the model:

Logistics 4.0 is called Smart Logistics because its components enable intelligent management of processes. The components of Logistics 4.0 are (Wang, 2016): automatic identification, real-time location, automatic data collection, connectivity and integration, data processing and analysis, and business services.

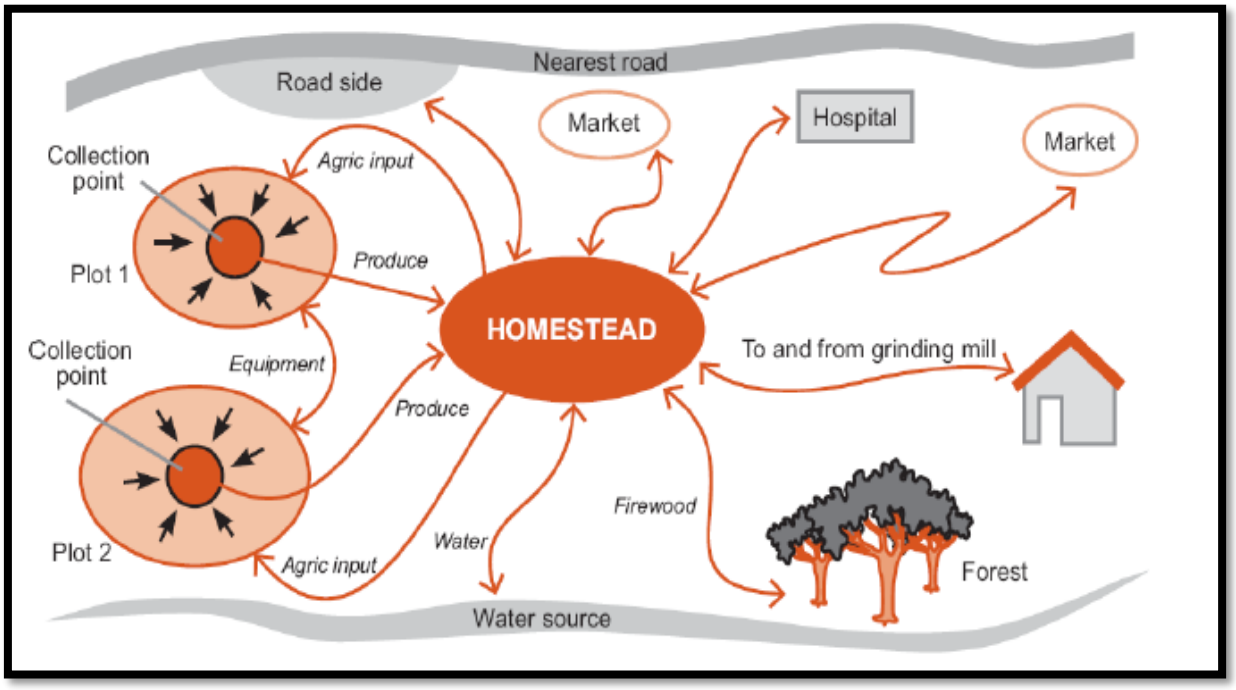


Kayikci, Y. (2018); p 782-789

Figure 2.7. Rural Transport Logistics and the First & Last Mile Challenge in Africa model

The strategy of the model:

. The model illustrates the idea of the first and last mile adopted to elaborate the grand challenge of rural transport logistics in Africa. The products are collected from the plots, distributed to the homestead or warehouse and from there directly to the roadside, to shopping points or to local and regional markets. Transportation is by footpaths, railroad tracks, trails and roads by head-load, intermediate means of transport (IMTs) or motor vehicles.

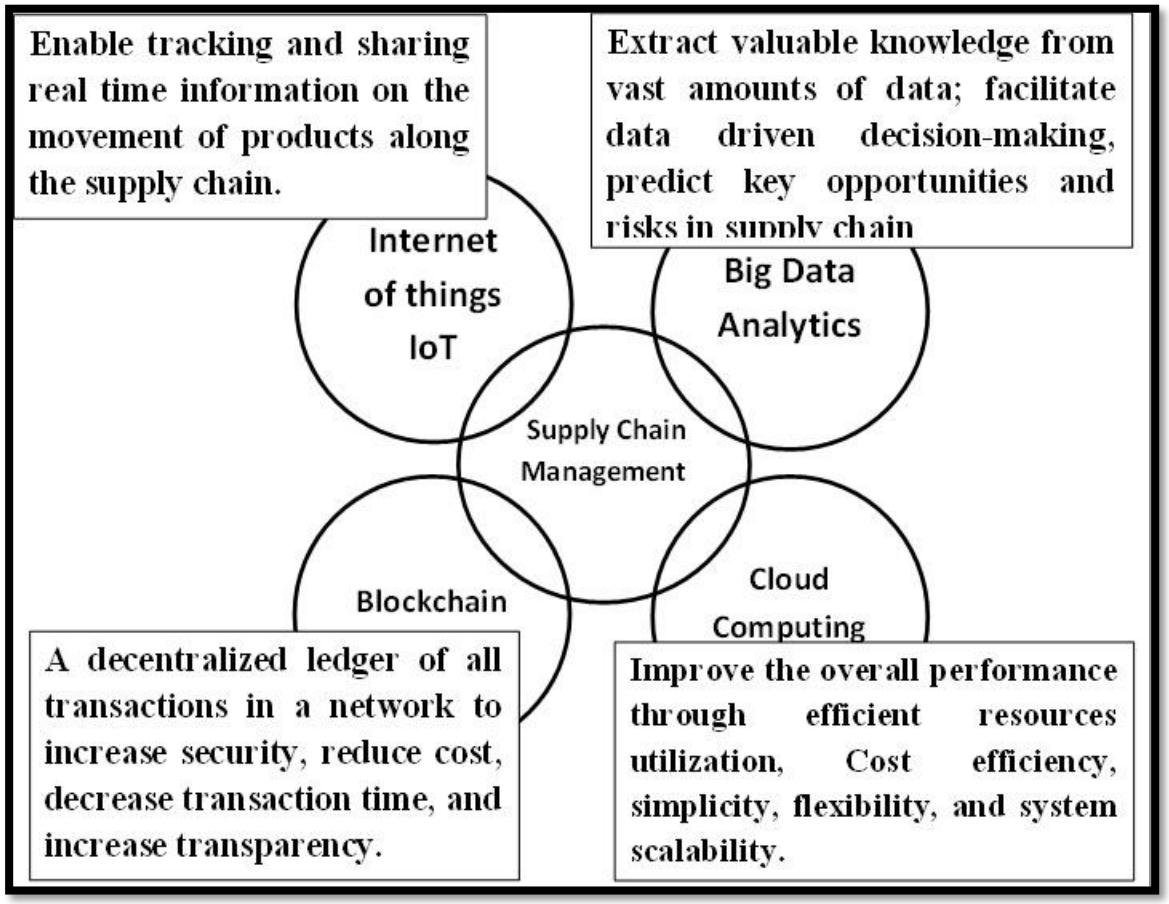


Crossley, P *et al*, (2009)

Figure 2.8. A Proposed Smart Supply Chain Model

The strategy of the model:

This study considers an intelligent supply chain model that integrates cloud computing, big data analytics, the Internet of Things (IoT), and blockchain for supply chain management. The proposed intelligent supply chain model is shown illustrated in the figure.

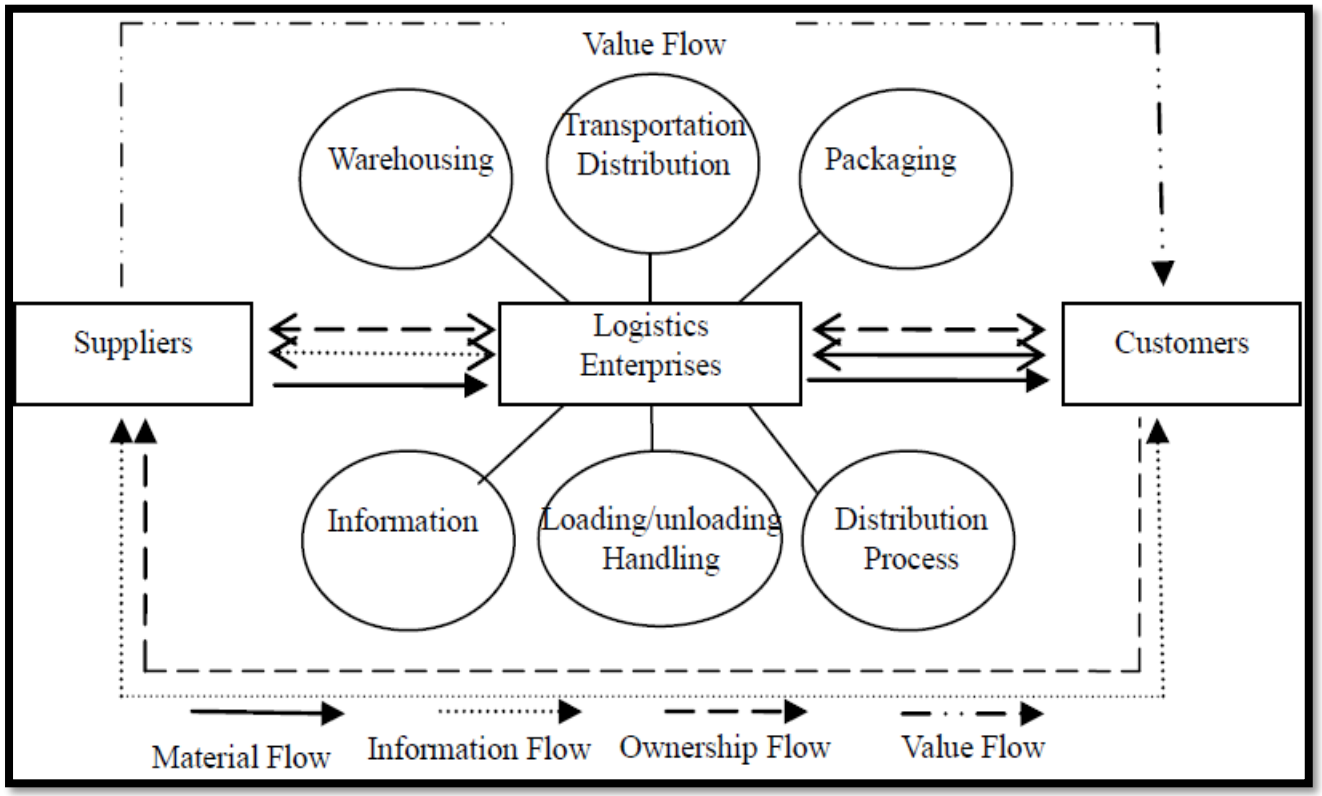


ElMesmary H, (2019); ISSN: 2277-3878, Volume-8 Issue-4

Figure 2.9. “Value flow model” in the Logistics Value Chain

The strategy of the model:

The logistics value chain reflects the company's history, strategy and tactics. All these activities in the enterprises can be divided into basic activities and secondary activities, and the basic activities are considered as key activities in the enterprises.



Zhou, X. (2011); p 34-37

Figure 2.10. Porter's Value Chain Model

The strategy is explained in the model representation:

The figure shows the conceptual model of the value chain, which consists of the main activities of the company: Inbound logistics: It deals with the reception, storage and distribution of inputs. Manufacturing plants: converting inputs into finished products. Outbound Logistics: It deals with the collection, storage and distribution of products or services to customers. Marketing and Sales: Include activities that create public awareness of the product. Services: Any activity that adds value to a product or service. Supporting Activities: These activities support the primary activities and include procurement, technology development, human resource management, and infrastructure (Porter, 1985: 182).

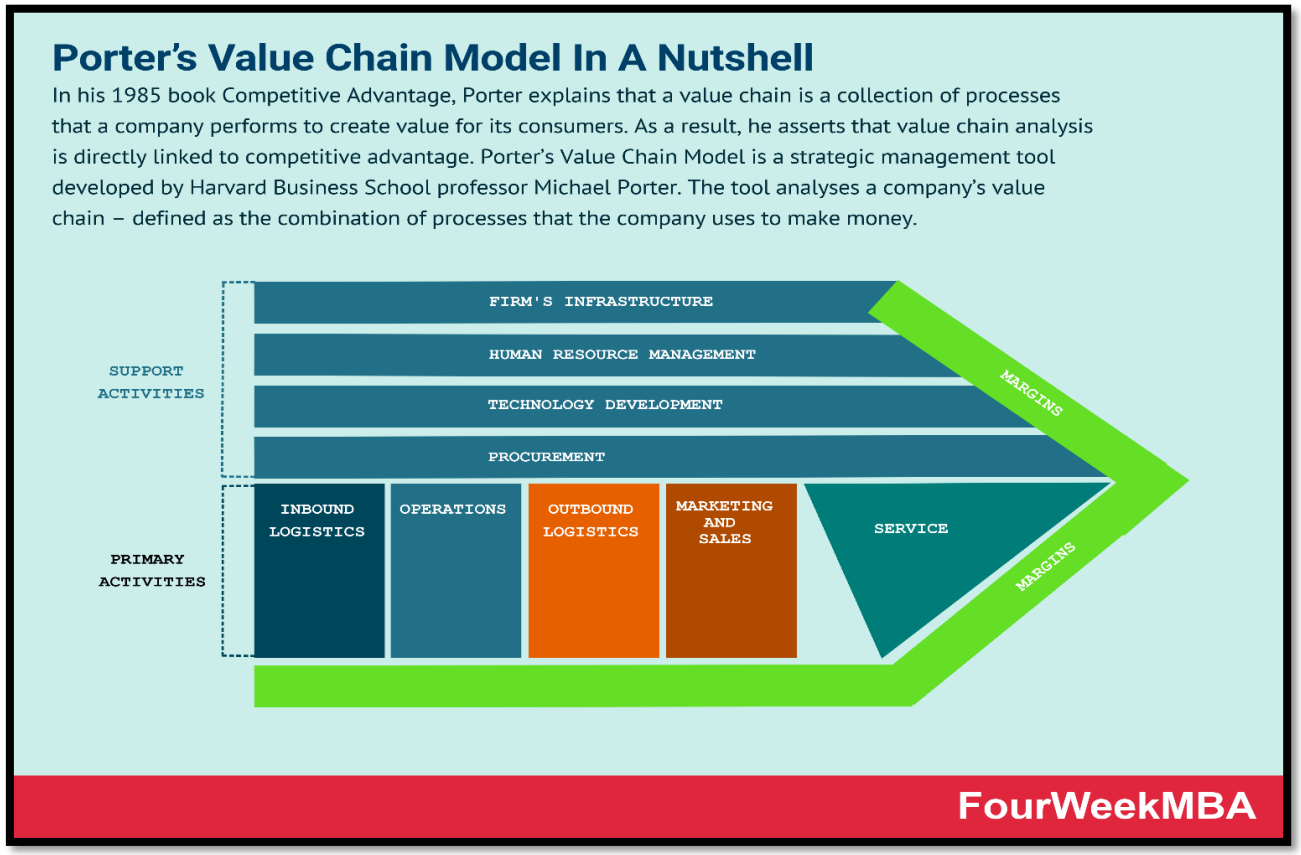
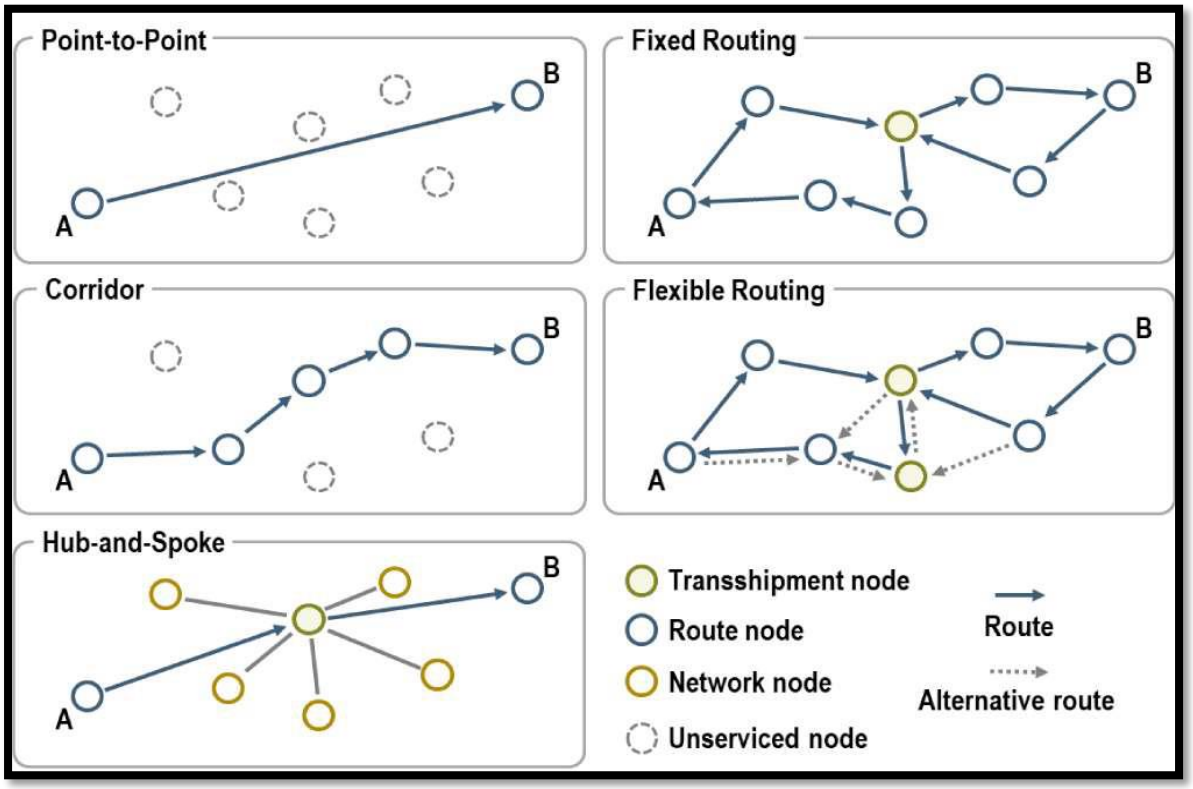


Figure 2.11. Distribution and network strategies

The strategy of the model:

The strategies of the model are point-to-point, fixed routing, corridor chain, flexible routing and finally hub-and-spoke.

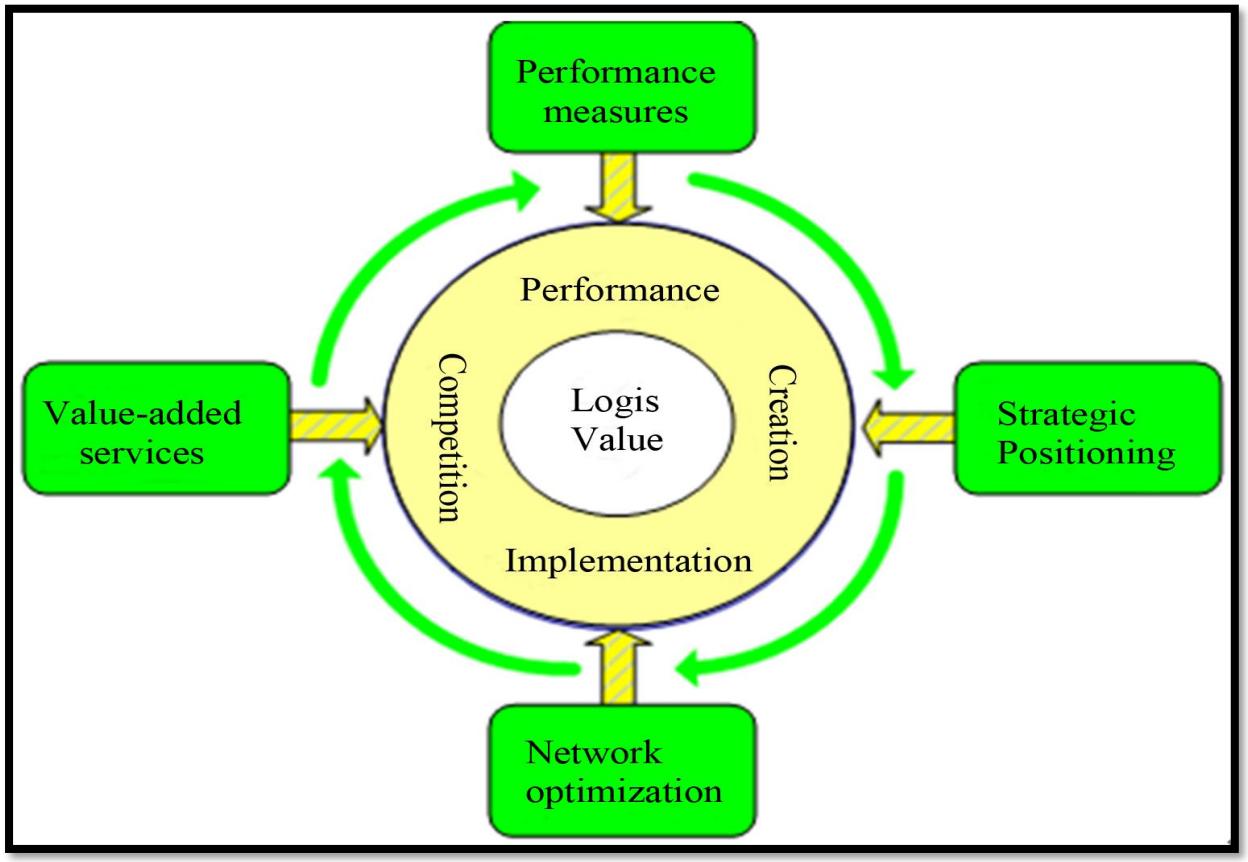


Woxenius, J. (2002)

Figure 2.12. Logistics competitiveness model of express delivery

The strategy of the model:

Performance evaluation is a necessary determinant for a logistic system process to successfully perform its functions. The logistics companies should have an internal and external monitor mode that provides data for strategic positioning, network optimization and value-added services.



Zhou X, (2013); p 131-135

The review of the smart value chain logistics models focused on emphasizing the strategy of each model and to the smart logistics value chains of the small-medium brick manufacturing enterprises. The following section, however, focuses on the smart value chain logistics strategies and application that explains the strategies of the logistics concept.

2.8. Smart value chain logistics strategies and application

Logistics strategy - is a set of guiding principles, driving forces and entrenched attitudes that help coordinate goals, plans and policies that are reinforced by conscious and unconscious behavior within and between network partners (Harrison et al, 2008: p.26).

The authors discuss logistics strategies, including the typology of Bowersox and Daugherty (1987), and pay special attention to the organizational aspects of logistics strategy. The typology of Bowersox and Daugherty is a qualitative typology that distinguishes three different logistics strategies:

(i) Process strategy consists of "a broad group of traditional logistics activities managed as a value-added system." (Bowersox and Daugherty, 1987, p. 51).

(ii) Marketing strategy: "typically involves a limited number of traditional logistics functions that are managed across different business units." (Bowersox and Daugherty, 1987, p. 52).

(iii) Information strategy, also known as channel strategy, consists of "coordination between organizations and uses logistics to achieve collaboration and cooperation" (Bowersox and Daugherty, 1987, p. 53).

McGinnis and Kohn (1990) define a classification of logistics strategies, those being:

(i) a centralized logistics strategy - focused on customer service and coordination of logistics, with a moderate emphasis on integrated computer systems (McGinnis and Kohn (1990)).

(ii) integrated logistics; Strategy – integrated computer systems, focused on coordinating logistics and customer service (McGinnis and Kohn (1990));

(iii) Less Integrated Logistics Strategy – less importance of integrated computer systems, less emphasis on logistics) Moderate focus on coordination and customer service (McGinnis and Kohn (1990)) and,

(iv)) Inefficient logistics strategy – Moderate focus on integrated computer systems and customer service; less emphasis (McGinnis and Kohn (1990)).

The table below presents an overview of the strategic application of the logistics theory and model in transport logistics of the selected small-medium brick manufacturing enterprises of South Africa in Thohoyandou town.

Table 2. 3: The strategic application of the logistics theory and model in the transport logistics of the selected SMBEs

Elements of the Value Flow	Description
Transportation distribution	• Transportation and traffic consolidation is the linkage activity in logistics and is often the single largest cost in the logistics process. In terms of small-medium brick logistics enterprises the transport distribution of brick products enables the enterprise to improve on its competitive advantage and profit management, (Stock & Lambert, 2001: chapter 2-19).
Packaging	• Packaging includes advertising, marketing, protection, and storage of goods and brick products from the supply chain to the distribution centres of logistics hubs and facilities. From a logistics perspective, the packaging process deals with two major aims, and these are: to protect the brick product from losing its quality and durability while it is being stored or transported from point A to point B, (Stock & Lambert, 2001: chapter 2-22).
Distribution process	• The distribution logistics process provides the physical, organizational, and information links between the source (output store of manufacturing enterprises) and consumers, the input store or point of acceptance, (Straka, 2013: p. 25). According to DHL Logbook, (2008: p. 25); argues that "the distribution process within the logistics enterprise, includes all activities related to the provision of finished goods and products to the customer. The various products may be shipped directly from the manufacturing process through other regional distribution warehouses."
Loading/Unloading Handling	• The product handling process is a function of the automated pallet handling vehicles, which are used to carry and load or off-load the brick products pallets to the trucks that are going to deliver the products from point-of-origin to point-of-consumption. This is either done at the manufacturing sites or in the storage facilities that store brick products. The loading/unloading of brick products is the prerequisite function of logistics enterprises when they start to distribute their products to customers. Whether the products arrive and are delivered in good condition or bad condition, it is the responsibility of the enterprise to ensure that damage costs are covered to damaged products, and that on the contracting agreement between the receiver and the deliverer, there is a guarantee of after-last service to boost customer satisfaction and to gain trust for the enterprise, (Stock & Lambert, 2001: chapter 2-23).
Information (ICT & Digitized Logistics Platforms)	• Digital logistics ambitions to optimize logistics choices and automate execution approaches through integrating superior technology which include the Internet of Things (IoT), Artificial Intelligence (AI), and Big Data evaluation into 3

	principal sections particularly warehouse, transportation, and last-mile delivery. The answer of ICT-pushed logistics structures contains of 7Rs which might be the famous necessities for the logistics control systems, and those are the Right Product, Right Quantity, Right Condition, Right Place, Right Time, Right Customer, and Right Price. The capacity to transhipments, tracking of overall performance at any stage of detail, and reply for this reason in real-time, is the inspiration for plenty logistics capabilities and a prerequisite for the optimization of freight trips, (Cook, 2014: p. 5; Langer and Vaidyanathan, 2014: p. 5).
Physical location, Siting & Warehousing	• First, we will need to look at the location and siting positions of the storage facilities, logistics hubs, truck inns, and warehouses in the host community (Thohoyandou), for the small-medium brick manufacturing enterprises. In this case, the physical siting of the brick supply enterprises should be identified and analysed as a result of justifying the relevance of the site position and its warehouse new location. So that we can either reject or confirm the rightful sites of the enterprises. Warehousing can be regarded as that part of the logistics enterprise system that stores brick products from the extracted raw materials, parts, and goods-in-process to manufactured and finished products between point-of-origin and point-of-consumption. The warehousing should best determine the right time and the right place for the utility of brick products to be stored for the item to be produced and consumed, (Stock & Lambert, 2001: chapter 2-20).

Source: (Author's own construct, 2022).

Table 2.4. highlights the various logistics enterprise activities and functions in the Value Chain activities for the small-medium brick manufacturing enterprises of South Africa in Thohoyandou town.

Table 2. 4: Showing various logistics enterprise activities and functions in the Value Chain

Elements of the chain	Description
Support activities	Activities necessary to increase the value and quality of a product or service (providing infrastructure to carry out key activities, including technology development, human resources, infrastructure, and procurement).
Systems/technology	Activities involving product design and creation and improvement of key activities in the value chain.
Human resources management	Activities focused on attracting, retaining, and developing well-trained employees.
Enterprise infrastructure	Activities to create the necessary organizational infrastructure, including financial, reporting, general and strategic management.
Procurement	Activities that provide resources for inputs to the main activity. purchase of materials. This includes obtaining and providing input to the migration process.
Primary activities	Activities necessary to manufacture or provide the product or service (including internal/inbound logistics, business/operations, external/outbound logistics, marketing and sales and service).
Inbound logistics	Activities necessary to produce or provide products or services (including internal/inbound logistics, business/operations, external/outbound logistics, marketing, sales and services).

Operations	Activities related to the flow of goods, services and information in organizational activities dealing with receiving, storing and managing raw materials and parts. Activities related to raw material to final product transition processes Activities related to assembly, testing, packaging, and maintenance.
Outbound logistics	Activities related to distribution and delivery of goods to market and provision of services Activities related to packaging, storage, and testing.
Marketing and sales	Activities that connect end users to products or services.
Customer service	Activity organizations that add value to products after sale and provide support services to consumers.
Procurement	Although a support activity provides purchased input as well as human resources, technology, and infrastructure, it is also increasingly recognized for its strategic and primary importance to an organization.
Margin	The excess that the customer is willing to pay for the cost of inputs and activities.

Source: (De Bruyn & Kruger, 1998).

The table below presents the function and possible endowment of rural town transport logistics central locations for the small-medium brick manufacturing enterprises of South Africa in Thohoyandou town.

Table 2. 5: Transport Logistics functions and endowment of rural towns in South African Master Plan for the Small-Medium Brick Manufacturing Enterprises of Thohoyandou town.

Central Location	Function	Facilities for Traditional Supply Chains	Facilities for Modern Supply Chains	Communication facilities
Satellite Centre	Buying point Transshipment hub	Short storage facilities Loading facilities	Pre-facilities safe conditions for storing products	Telephone Fax Fleet
Multi-purpose rural town service centre	Local market transshipment hub	Storage facilities Loading facilities services Logistics procurement agency	Packaging houses Unloading facilities	Telephone Fax Internet Fleet
Major Rural Service Centre	District Market Transhipment hub	Additional to the above: Transport brokering service		

Source: (Department of Transport, 2007; Sieber, 2011).

The preceded section focused on the review of the smart value chain logistics strategies and application of the logistics theory model and the various logistics enterprise activities. The

following section, however, focuses on a chapter summary that seeks to summarize the debates reviewed.

2.9. Chapter summary

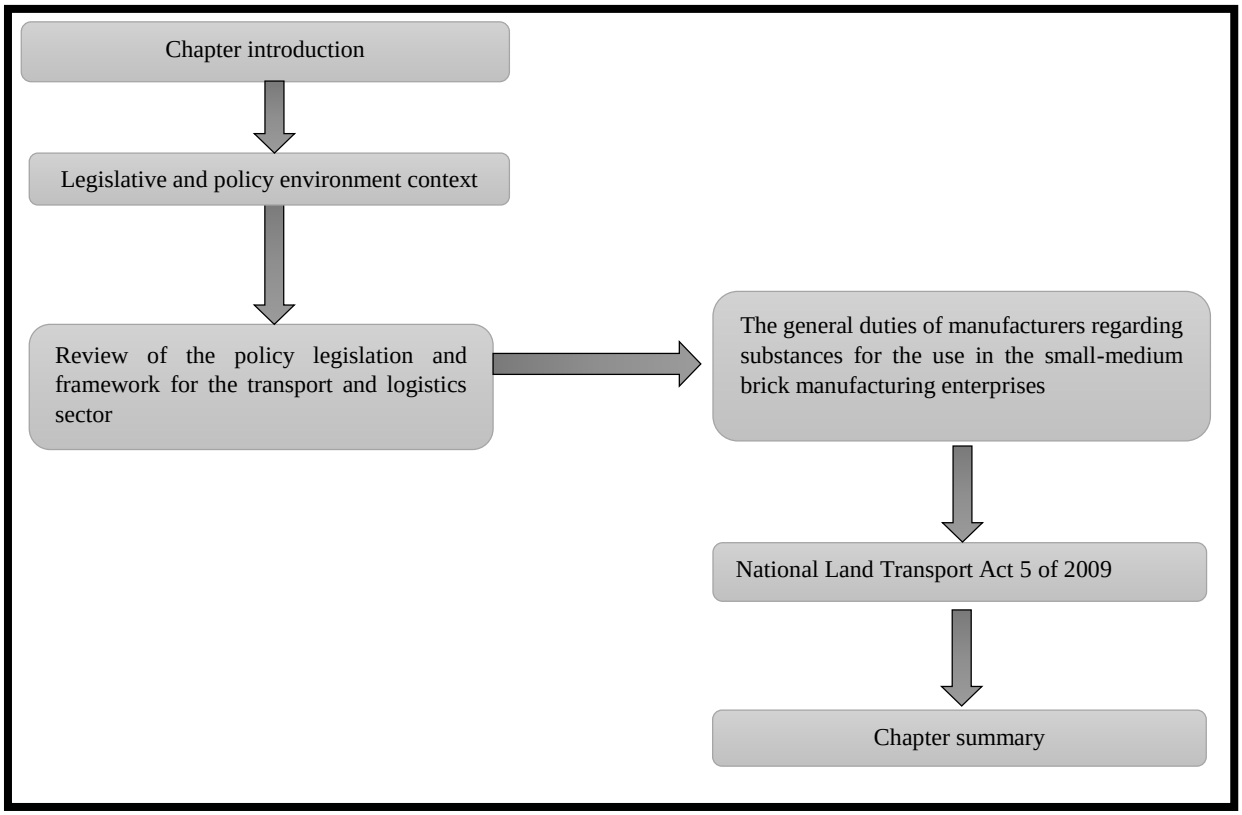
The chapter on literature review was based on the exploration of the theoretical foundations and frameworks of the smart transport and logistics value chains debates. The approach sought to introduce the synthesis of the available literature regarding the research topic and how the phenomenon studied is being explored and understood. It introduced the chapter introduction, the broad introduction, the notion of the smart value chain logistics, the concept of the smart value chain logistics, a comprehensive review of the theories, concepts, and models, and the application of strategies of the smart value chain logistics as applied within the transport logistics, construction enterprises, and local economic development of the localized study area (Thohoyandou town).

CHAPTER THREE: POLICY AND LEGISLATIVE FRAMEWORKS

3.1. Chapter Introduction

This chapter presents the review of policy and legislative frameworks. This is conducted within the purview of exploring the policy environment that informs the informal brick industry, the formal brick industry, and the transport logistics sector of Thohoyandou town, South Africa. The chapter comprises of an introduction, a review of the policy and legislative framework for the transport and logistics sector, the general duties of manufacturers regarding substances for use in small-medium brick manufacturing enterprises, the National Land Transport Act 5 of 2009, and its mandate, and lastly a chapter summary. Figure 3.1 below shows the structure layout of chapter three, which is outlined as follows:

Figure 3. 1: The structure layout of chapter three



Source: Author's construct, (2022).

Figure 3.1. above indicates the construct of the chapter three structure layout, which gives guidance in navigating the chapter.

3.2. Legislative and policy environment context

The policy environment of South Africa regulates and informs the SMMEs, transport, and logistics sector for the formal and informal brick manufacturing industry in Thohoyandou town, South Africa. It monitors the way a brick manufacturing sector and its logistics enterprises enforce regulations, legislations, policies, and frameworks, which govern the way brick manufacturing enterprises operate their activities. Policies that will be reviewed are from international, national, provincial to local levels that inform the SMME's operational strategies and production. Local logistics enterprises of brick-product manufacturing can use the guiding policies to safely run their manufacturing activities.

3.3. Review of policy and legislation frameworks for the transport and logistics sector

The table below seeks to highlight a review of policy and legislative frameworks for the transport and logistics sector, the national policies, acts, and agencies, year of enactment and publication, application to the SMMEs in the transport logistics sector, and link to the SMBEs (Small-Medium Brick Manufacturing Enterprises).

Table 3. 1: The database of policies and legislations that govern SMMEs and their link to the SMBEs transport and logistics sector

National Policies, Acts, and Agencies	Year of enactment and publication	Application to the SMMEs (Small-Micro Medium Enterprises) in the transport and logistics sector	Link to the SMBEs (Small-Medium Brick Manufacturing Enterprises)
The National Small Business Act 102	1996	The act supports SMMEs that deal with transportation logistics management within small-scale manufacturing, fishing, or small-scale/backyard farming.	Regarding (SMBEs), the law seeks to classify (SMBEs) according to classification/classification: 1. survivalist, 2. micro, 3. very small, small, 5. middle. These categories of (SMBEs) are then applied to the sectors in which they operate. B. Manufacturing department of brick products.
Cooperatives Act No. 6	2013	The cooperatives act allows for the establishment of a primary cooperative, which is aimed at supplying employment and services in the transport and logistics sectors to enhance community development. A secondary cooperative in this regard is formed by several primary cooperatives such as (SMMEs, SMEs, and SMBEs), to supply sectoral services. At the tertiary level, the SMMEs cooperatives are formed by multi-sectoral cooperatives to advocate policy for the government and the private sector.	In the (SMBEs) it looks to rationalize the workers (personnel staff) of the primary cooperatives to a collective goal of labour regarding self-managed enterprises such as the (SMBEs).
Companies Act 71	2008	This activity promotes the development of the South African economy by promoting entrepreneurship and efficiency in companies engaged in logistics transport and promoting the efficient and responsible management of companies (companies).	The law recognizes (SMBE) companies as private, i.e., commercial enterprises. This states that a commercial enterprise is a private enterprise if it is not a state enterprise, and its charter prohibits and restricts the offering of securities to the public. the transferability of the security;

Northern Province Development Corporation Act	1995	The mission of the act is to set up and advance a sustainable SMME sector through the provision and facilitation of businesses and investment opportunities.	The strategic applications of the act toward (SMBEs) development are financing, projects, property management, and utilities.
National Land Transport Act No. 5	2009	The constitution and the National Land Transport Act are truly clear with respect to the fact that every single municipality will have to or must prepare a Freight Logistics Strategy.	In the case of the (SMBEs), the act enables the local municipality to establish a collaborative partnership with the localized logistics enterprise that deals with the manufacturing of brick products, this will be supported by the prepared freight logistics strategy by the municipality to function as a guideline towards the development of the enterprise.
Transportation planning and logistics strategies and policies			
National Freight Logistics Strategy	2005	This strategy demonstrates the government's intention to make freight transport central to the country's economic development. As mentioned earlier, this strategy makes freight forwarding and freight logistics more important for the movement of goods and services within the country.	The movement of brick products and services in the supply chain involves logistics costs that affect the logistics manufacturing enterprises in the brick-making sector of South Africa. These costs are but one of the many elements in the chain that figure out whether our local export enterprises are competitive in the international market environment.
National Transport Master Plan (NATMAP)	2011	Currently, road freight market features in the field of SME logistics companies are to the extent that road freight companies offer competitive rates on key corridors for the transportation of brick products and freight logistics related products. A road freight system can be seen as a way of exploiting the complexity of freight transportation caused by heavy trucks carrying brick products. Logistics companies therefore become dependent on the availability of suitable road space and road conditions for transporting the manufactured product (bricks).	One of the major causes of concern for provinces in managing the impact of large numbers of freight vehicles mostly from the transport system of the brick manufacturing enterprises of Thohoyandou on the provinces' roads, is the lack of facilities for parking, fuelling, driver rest, ablution and sanitary facilities and the impacts that these have on the environment (The informal truck stops in Makhado, Thohoyandou and Musina are inadequate for the levels of truck traffic).
National Land Transport Strategic Framework (NLTSF)	2006	The NLTSF is a strategic framework that informs integrated transportation and land use planning nationally. Therefore, the framework should: Promote transport coordination and integration at the national level. Form the basis for preparing the local land. Transport planning integrated with the transport framework. It provides a reporting	This framework discusses general land transport policies, including those that affect local transport. Implementation of decisive freight forwarding strategy. development of local transport; safe operation of public transport (and freight) in the South African brick industry.

		mechanism on the progress of each transportation plan and project through NLTSF's Key Performance Indicators (KPIs).	
Moving South Africa's Action Agenda	1999	Moving South Africa (MSA) is a high-profile, data-driven SA 20 million (Rand) project for NDOTs looking at the right transport strategies for the next 20 years. The aim was to establish by 2020 a national strategy for transportation in the freight logistics sector in South Africa.	In terms of freight transport, the MSA freight transport strategy includes: "Build density in the transport system by focusing freight flows on selected corridors through supporting and reinforcing current trends to build the backbone of the System." Improve firm-level competitiveness by removing obstacles, improving integration, ensuring sufficient reinvestment to maintain infrastructure, restoring price and value signals between customers and providers, and building an industry platform that drives differentiation and innovation.
White Paper on National Transport Policy	1996	The vision for South Africa's transport system articulated in the white paper is in a manner that is environmentally and economically sustainable while supporting government strategies for economic and social development".	In the case of land freight transport, these policy objectives are aimed at creating a level playing field, enabling fair competition between different land transports, and promoting integration, intermodal and partnerships between freight transport modes of brick manufacturing logistics companies. should be translated into measures to promote.
Transport planning and business enterprises agencies and strategies			
Small Enterprise Development Agency (SEDA)	2012	SEDA's responsibility is to advance policymaking that helps SMEs maintain and improve their business competitiveness and implement development assistance projects through transport planning and logistics cost reductions that promote entrepreneurship and economic growth.	Government agencies define small business organizations as "small business organizations, that are, composed of persons representing small and medium enterprises in all economic sectors, whether established or registered under the law, and contributing to the growth of their businesses that contribute to GDP scale.
Small Enterprise Finance Agency (SEFA)	2004	In the transportation sector of SMBE, agents use both wholesale and direct financing as channels to mitigate cost risks and other financial constraints such as material financing, fuel costs and maintenance.	In the case of SMEs, the agency must support the company by opening opportunities for investments that finance fuel costs, reduce the high transaction costs of material acquisition, and logistics costs based on the credit history and income of the company.
Road Transport Management System		RTMS encourages consignees, shippers, and road carriers to implement management systems that maintain road infrastructure, improve road	Road safety and road infrastructure are public concerns that are strictly regulated by the government. Over-regulation, road deterioration and a high number of accidents seriously threaten the long-term sustainability

		safety, and increase productivity in the logistics value chain. It is a self-directed self-regulation scheme.	of the road logistics value chain system of brick manufacturing companies. In the future, the system aims to support the freight transport system of logistics companies through the DoT National Freight Logistics Strategy.
Rural Transport Strategy (RTS)	2007	"The provision of rural transport infrastructure and services consists of the following major categories and associated delivery operators:" Wholesale Transport from Commercial Producers and Transporters to Refineries, Distribution Centres, Markets and Suppliers.	The most important research areas of land transport in the development of SMEs in the transport logistics sector are the following: Development of rural load transport logistics; rural infrastructure and services; rural transport and development; Labour-based rural road construction; Use of information and communications; Development technologies; Department of Transportation and Management Systems.
Provincial policies and strategies	**Year of amendment**	**The policy objectives for the transport and logistics sector**	**Link to the (SMBEs)**
Kwazulu-Natal's freight transport policy	2004	The objectives of the freight transport policy are to enhance the cost efficiency of the overall transportation system of the province of KwaZulu-Natal, through optimal resource allocation and usage, within the financial capability of the province.	The policy seeks to support and improve employment creation and SMME opportunity potential in freight transportation, by facilitating distribution and transport services in the industry, agriculture, and government departments.
Western Cape provincial freight strategy		In developing the freight strategy, five (5) principles were identified to guide freight transport delivery in the Western Cape which is: freight transport network efficiency; inclusive economic development; freight transport network safety; environmental sustainability; and cost optimization.	Its key theme is to promote the efficiency of logistics enterprises such as the SMBEs towards environmental sustainability and economic development.
Acts for the development of permits and land rights occupancy (National policies)			
National Acts	**Year of enactment**	**Act's focus and compliance**	**Application to (SMBEs) in the transport and logistics sector**
National Environmental Management Act (NEMA)	1998	The act states that: every person who causes, has caused, or may cause significant pollution or degradation of the environment with respect to the manufacturing of brick products, must take reasonable measures to	The widespread application objective of the integrated environmental management in the transport sector is to promote the integration of the principles of environmental management set out in section 2 into the making of all decisions which may have a significant effect on the

		prevent such pollution or degradation from occurring, continuing, or recurring.	environment, such as transport logistics movement and manufacturing activities.
Spatial Planning and Land Use Management Act No. 16 (SPLUMA)	2013	Zoning and alternative land use management: Zoning gives emphasis on the rule governing what and where certain individuals and institutions can and cannot build and prepare in towns. The act further regulates what gets built, and on what part of the development. It sets the basic parameters of where and how people live, work, play, create jobs, and exercise their citizenship.	The act enables the issuing of development permits such as permission to occupy (PTO) of such land zoned for a specific land use function such as institutional land use in this case the (SMBEs). It recognizes any part of zoning regulation on any proclaimed piece of land that will seek to give approval for what needs to be relocated and built on a new piece of land.
International Smart Logistics policies/programs			
Country/region	**Year**	**Policies/programs**	**Policy focuses with respect on the transport logistics sector**
US	1993	Commodity Flow Survey (CFS).	Collect material flow data to create transportation plans and assess demand for transportation facilities.
	2012	The moving ahead for progress in the 21st century.	US$105 billion will be invested in the development of ground transportation networks and infrastructure.
France	2015	Logistics Strategic Plan 2025.	focuses on developing logistics innovations and linking smart logistics and smart manufacturing.
	2018	Digital industrial transformation: Measures for mid-caps and SMEs.	Intelligent Internet of Things and intelligent transportation are proposed in France as the 'industry of the future'.
China	2013	Guidance on advancing logistics informatization.	Promote the standardization, digitization, automation, and intelligence of logistics information gathering.
	2016	The implementation of “Internet +” efficient logistics.	Addresses the applications of RFID, integrated sensors, robotics, and big data analytics in the logistics industry to enable logistics intelligence.
	2019	Opinions on promoting high-quality development of the logistics industry and facilitating the formation of a strong domestic market.	Develop a high-quality network of logistics facilities and a common logistics information platform to enable the logistics industry to supply the real economy.
European Union	2019	The Trans-European Transport Network (TEN-T) policy.	Facilitate the development of pan-European transport networks with innovative applications, modern technologies and digital solutions.

Russia	2018	The State of the Union Address 2018.	Development of a digital platform for the logistics industry compatible with the global information space.
Japan	2018	Strategic Innovation Promotion Program (SIP) phase two.	Develop related services with self-propelled systems.
UK	2018	Industrial strategy: Artificial intelligence sector deal.	promotes the development of artificial intelligence and data-driven economy.

Sources: McCarthy and Swilling, 1985; White Paper on Transport Policy, 1996; Moving South Africa, 2000; DOT, 2007; Schoeman, 2010: 23-24; 28-29; Chakwizira, Bikam and Mashiri, 2014: 649-650

The above review of policy and legislative frameworks for the transport and logistics sector was based on highlighting the national policies, acts, and agencies, year of enactment and publication, application to the SMMEs in the transport logistics sector, and link to the SMBEs (Small-Medium Brick Manufacturing Enterprises) of the smart logistics value chains for the small-medium brick manufacturing enterprises of South Africa in Thohoyandou. The following section however focuses on the general duties of manufacturers regarding articles and substances for use in the Small-Medium Brick Manufacturing Enterprises.

3.4. General duties of manufacturers regarding articles and substances for use in the Small-Medium Brick Manufacturing Enterprises

Act on Amendments to the Occupational Health and Safety Act no. 181 of 1993, any person or personnel who manufactures bricks, imports bricks, sells bricks or supplies any other substance must:

3.4.1. Ensure that the substance is safe and does not present a health hazard when used safely, if reasonably possible; and

3.4.2. Take the necessary steps to ensure that information about the use of the substance at work is available in the brick products in this case and that the health and safety risks associated with such substance are safe and without health risks when used safely and the procedures to be followed in the event of an accident caused by such a substance.

3.4.3. The purpose of the Act is to protect people in addition to occupational health and safety and to ensure the health and safety of people in connection with the use of machines and machinery in the manufacture and manufacture of bricks. ensure at work health and occupational safety risks arising from or related to the activities of people at work; forms an advisory committee on occupational health and safety; and to regulate related matters (Occupational Health and Safety Act No. 85, 1993: page 9/27).

The previous section focussed on the general duties of manufacturers regarding articles and substances for use in the Small-Medium Brick Manufacturing Enterprises. The following section will focus on the National Land Transport Act 5 of 2009 and its mandate.

3.5. The National Land Transport Act 5 of 2009 and its mandate

The National Land Transport Act 5 of 2009 was brought into operation on 8 December 2009. The Act fundamentally altered the landscape of transportation provision in South Africa, wherein the local municipality sphere of government has been given the responsibility to cater to the bulk of functions related to land transportation by road usage. The local sphere of government is now responsible for the development, implementation, and monitoring of land transport strategies be from the logistics, freight, value chain, and supply chain perspective in their areas in terms of the National Land Transport Act section 11c, chapter 2 of the National

Land Transport Act (NLTA) no. 5 of 2009. In section 11c chapter 2 of the National Land Transport Act no. 5 of 2009, the functions and roles of the local municipality sphere are outlined with respect to the national, and provincial spheres of government which is responsible for the provision of land transport in South Africa.

3.5.1. Roles of local municipalities regarding transport functions (National Land Transport Act no. 5 of 2009)

The National Land Transport Act No. 5 of 2009 contains land transport functions of administrative districts, in this case, it only outlines some of the functions under a local government that plan to direct and regulate road transport logistics, goods and land transport. The National Land Transport Act (No. 5 of 2009) (NLTA) empowers the Minister of Transport to delegate tasks to the most appropriate branch of government in accordance with section 99 and section 156 (4) of the Constitution. (Municipal Systems Act (No. 32 of 2000), (MSA, 2000).

The local administrative district is responsible for the development of land transport policies and strategies in the field of logistics and cargo logistics for those companies that distribute products (bricks) through transport logistics, in this case transport policy is an international journal aimed at improving quality. Transport policy and strategic analysis, designing and sharing are new ways of mapping policy through management practices and applications to bridge the gap between transport theory and practice. The development of the land freight transport policy and strategy of the local government is based on national and provincial guidelines that contain their vision and purpose in accordance with the objectives and mission of the Department of Transport, (National Land Transport Act, No. 5 of 2009).

Travel Time and Cost Effectiveness are both travel time savings and unit cost of travel time that are determined for each travel category; the total travel time savings of the project can be calculated in this regard. The value of travel time (VTT) means the cost of the time spent on each trip generated. In which the task of the municipality is to ensure the operation of the transport logistics system and that there is a reduction of travel time and costs at achieving what the project was intended for. The local sphere of government planning is also responsible

for the monitoring of costs at any metered distance from those who use freight logistics transport, wherein the cost should be at a reasonable amount of distance, (The National Land Transport Act 5 of 2009).

The local municipality as the sphere of government has its function to develop, implement and monitor a key indicator strategy by preventing, minimizing, or by reducing any unforeseen change or impact of the land freight transport system on its designated areas. The municipality aims at harnessing the harmful toxic chemicals emitted by heavy vehicles that carry loads and tons of freight goods on road land. The land freight transportation system has an impact on the environment which may lead to air pollution through gas emissions by trucks that deliver freight goods. Here the function of the local municipal sphere is to identify and monitor the evaluation and implement the land transportation system within the logistics domain that will seek to mitigate the emission of gases into the atmosphere, (Hisashi, 2005).

The previous section focussed on the National Land Transport Act 5 of 2009 and its mandate. Hence, the following and upcoming section will dwell on the case studies from BRICS countries that are in the domain of transport and logistics strategies (Box 1).

3.6. Chapter Summary

The chapter three review was based on the policies and legislative frameworks which was responding to study aim, and focus needs for policy and legislative frameworks that impact on SMMEs. It sought to introduce the synthesis of the available literature regarding the policy environment that informs the study conceptual approach and theoretical approach. The review was based on the policies governing the transport and logistics sector that are found in the SMMEs and the SMBEs dealing with the manufacturing of brick products in South Africa. It introduced the chapter introduction, context of policy and legislative review, reviewed the policy and legislative framework for the transport and logistics sector, the general duties of manufacturers regarding substances for the use in the small-medium brick manufacturing

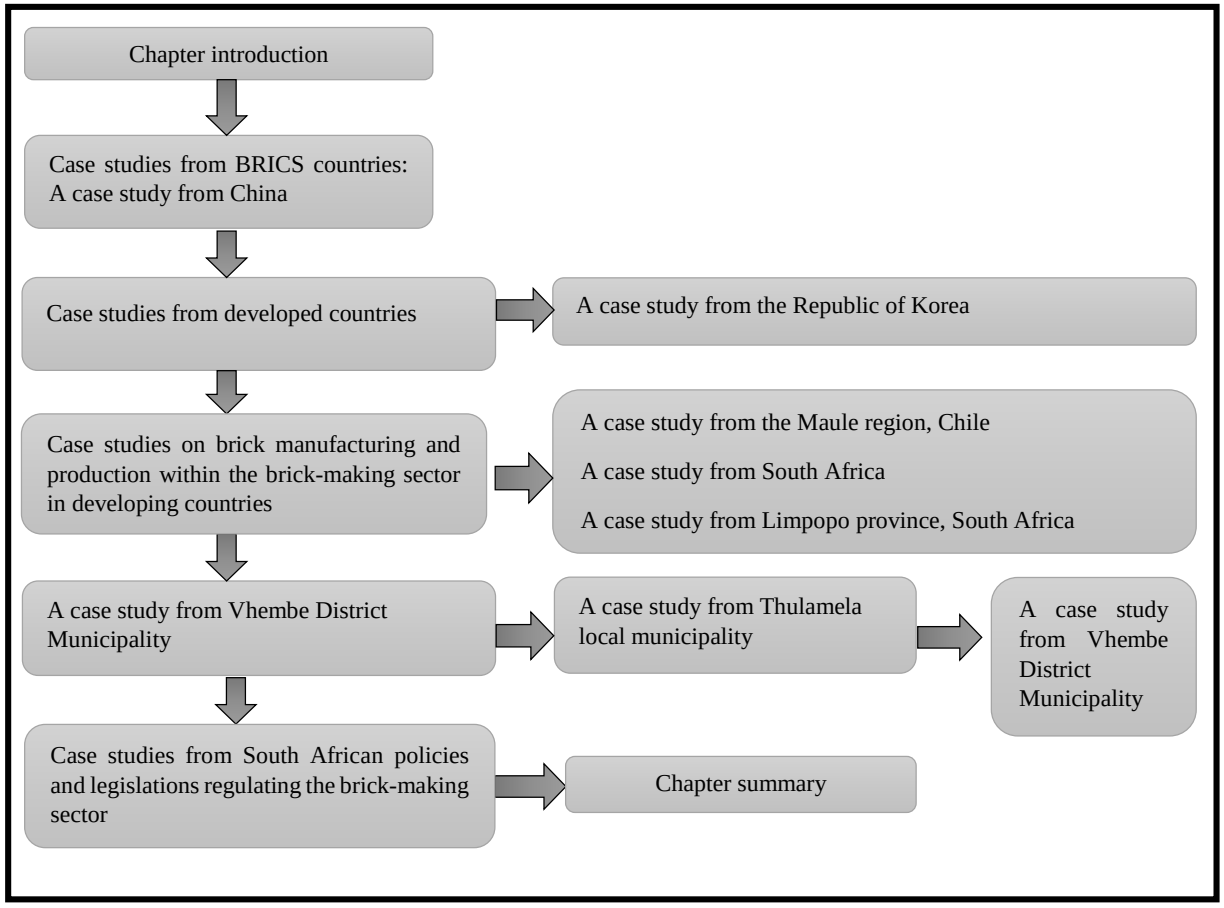
enterprises, the National Land Transport Act 5 of 2009, and its mandate and lastly chapter summary.

CHAPTER FOUR: CASE STUDIES IN SMART VALUE CHAIN LOGISTICS FOR BRICK MANUFACTURING ENTERPRISES

4.1. Chapter Introduction

This chapter presents the review of case studies in smart value chain logistics for brick manufacturing enterprises. The chapter comprises a chapter introduction, introduction, case studies from BRICS countries, case studies from developed countries, case studies on brick manufacturing and production within the brick-making sector in developing countries, case studies from Vhembe District Municipality, case studies from South African policies and legislations regulating the brick-making sector and lastly chapter summary. Figure 4.1 below shows the overall outline structure of the components contained in chapter four as follows:

Figure 4. 1: The structure layout of chapter four



Source: Author's construct, (2023).

Chapter four constitutes of ten sub-headings as illustrated in Figure 4.1. The review of case studies introduces the best practices from international, national, provincial, and local perspectives.

4.2. Case studies from BRICS countries

The preceding section discusses in brief case studies from BRICKS countries, (Box 1) it focussed on the transport and logistics sector and its governing strategy.

4.2.1. A case study from China

The following case study from China below, presents a discussion on a case study from a comprehensive policy framework for logistics perspective, based on a national logistics strategy of China.

Box 1: A case study on comprehensive policy framework for logistics: National Logistics Strategy in China:
China's national logistics strategy is regarded as the main responsibility and focus of the reformed Ministry of Transport in 2008. In addition to planning policies, standards and norms, the ministry oversees the implementation of traffic plans. The purpose of the strategy is to support the implementation process, a nationwide inter-ministerial logistics conference where different agencies meet once or twice a year. The Ministry of Transport of China supports knowledge-based logistics services by accelerating the establishment of a public information platform for the transport and logistics industry. An important part of the integration of different logistics information systems is the development of basic information standards and information exchange specifications. One of the milestones that the state government confirms is the five-year plan, which is the 12th plan covering the years 2011-2015. The plan contained the social and economic policy of the entire economy as well as the priorities of the Ministry of Roads. From a planning perspective, it mentions developing third-party logistics, integrating logistics resources, improving logistics infrastructure, increasing efficiency, and reducing logistics costs. At the same time, China's transport, logistics and regional development have also shown weaknesses in recent years. For example, some studies point to increasing consumer demand and uneven distribution of cold chain logistics. As part of the 14th Five-Year Plan for National Economic and Social Development and the Long-Term Goals for 2035, the Chinese government proposed a "two-cycle" development paradigm, emphasizing the need to build a strong domestic market and promote the smooth. circulation of factors of production. and the organic integration of production, distribution, circulation, and consumption. China's supply chains and problems of uneven regional development are likely to improve in the 14th FYP (China's 14th Five-Year Plan: Transportation, Logistics and Regional Development: 2021, p. 16).

Source: Author's construct, (2023)

The preceded case study from the BRICS countries (box1), highlighted the focus within the transport and logistics sector and its governing strategy. The following section will focus on the case studies from developed countries (Box 2).

4.3. Case studies from developed countries

The preceding section below discusses in brief, case studies from developed countries, (Box 2) it focusses on the comprehensive logistics plans and policies governing the Ministry of Land, Transport, and Maritime Affairs mandate.

4.3.1. A case study from the Republic of Korea

The following case study is discussed based on a developed country called the Republic of Korea. It highlighted the comprehensive plans and regulations from a logistics perspective.

Box 2: A case study of the Republic of Korea:
The Republic of Korea has developed comprehensive logistics plans and regulations since the 1990s. Prior to this argument, logistics plans focused on one mode of transportation at a time. Since the 21st century, logistics policy has focused on the development of logistics as an industry as a task supporting production, and on the development of the Republic of Korea as a logistics centre. The Act on the Promotion of the Marketing of Goods, which entered into force in 1991, was replaced in 2007 by the Comprehensive Logistics Policy Framework Law. In this case, a 10-year national logistics master plan is drawn up every five years based on the instructions given in 1991. the law. The Logistics Policy Framework Act provides a legal framework for the development of the logistics industry. The purpose of the logistics policies in accordance with the Comprehensive Framework Law is to systematically develop the logistics industry by "promoting fast, accurate, convenient and safe logistics and harmoniously integrating government policies transferred to logistics". The Ministry of Land, Transport and Maritime Affairs (MLTM) is authorized to prepare a ten-year national logistics general plan every five years, which determines the direction of the national logistics policy. The content of the plan is described in the framework law and covers issues related to each logistics function (transportation, storage, loading and unloading, packaging, and handling). and political coordination for each mode of transport; prioritization of logistics sites and equipment and investment plans (and disinvestment); measures to improve logistics efficiency through standardization; collaboration; and improving information literacy (The Korea Transport Institute, 2012; National Logistics Master Plan for 2011–2020: p. 37).

Source: Author's construct, (2023)

The previous section dwelled on the case studies found within the developed countries, Singapore. The following section will focus on the case studies within the brick manufacturing and production operations of the brick-making sector in developing countries.

4.4. Case studies on brick manufacturing and production within the brick-making sector in developing countries

The preceding section is based on case studies that are within the brick manufacturing and production from brick-making sector in developing countries.

4.4.1. A case study from the Maule region, Chile

The following case study is from the Maule region, Chile. The case study is based on the brick production in the Maule region, Chile.

Box 3: A case study of brick production in Maule Region, Chile: Maria Eliana Vega Fernandez, regional ministerial secretary of the environment, Maule region, Chile (developing country):
According to Maria Eliana Vega Fernandez (2015), the Maule region accounts for 30-50 percent of all brick production and manufacturing in Chile. In this country, brick making is manual work, which means special work that requires manual preparation of the raw material for mixture, and the main work mechanisms are hand moulding, open sun drying and burning presses using wood and biomass as fuel. Currently, there are estimated to be approximately 1,200 brick production units operating in the Maule region, producing up to 345 million bricks per year. There are currently no national estimates of air pollution or black carbon emissions associated with brick production in Chile. Currently, there are no regulations and standards for artisan brick production, only industrial brick production. The Chilean government has intensified its search for information related to the size and status of the brick industry. The government is in a favourable position to undertake a project diagnosis and clean production contract for artisanal brick producers (Climate and Clean Air Coalition (CCAC) Brick Initiative, 2015: p. 12). Chile is a leader in several climate and clean air coalition initiatives, all of which seek to realize the many benefits of joining global climate and air action. One of the most important results of this collaboration is Chile's work with the CCAC Action Program to include black carbon mitigation in their long-term development strategies (Annual Report August 2019-2020: pp. 1-13).

Source: Author's construct, (2023)

The previous section on Box 3, focused on the case study from Maule region, Chile. The following section will dwell on a case study from South Africa.

4.4.2. A case study from South Africa

The case study from South Africa (Box 4), is based on the South African Clay Brick sector on-environment policies and regulations.

Box 4: A case study of South African Clay Brick sector on- Environment policies and regulations: Luca De Giovanetti, Swiss contact, South Africa:
According to Giovanetti, 2015: p. 13, "The South African perspective highlighted the fact that up to 97% of South African brick production is through the formal brick industry. In this case, the formal brick industry in South Africa is regulated and regulated. general brick production and manufacturing policies, according to norms and standards. It's evenly distributed across the country." Just as approximately 68% of brickmakers use kiln presses in a formal setup, while only 24% of brick makers use tunnel kilns. For other brick manufacturers using Hoffman or Vertical Shaft Brick Kiln (VSBK) technology for firing where coal is the main fuel. Compliance with the health and safety requirements of environmental legislation only applies to the official brick industry (Swiss Contact and Clay Brick Association of South Africa, 2017: pp. 1–36). All official brick making companies that produce bricks are officially regulated and standards must be followed in all brick making activities. The informal brick industry lacks regulatory compliance and guidelines that seek to support the processes, norms and standards of brick production and manufacturing in their businesses. From the

perspective of the official brick industry, there are many policies and regulations applicable to the brick industry, ranging from occupational health and safety, mining, air pollution, environmental management, labour and product standards. Currently, the South African government is preparing a strategy to replace presses with modern firing techniques in the formal brick sector. As for the informal sector, the strategy may be based on improving local economic conditions for brick producers rather than environmental or legal compliance (Clay Brick Association of South Africa, 2019: pp. 1-4; Climate and Clean Air Coalition (CCAC) Brick Initiative, 2015: p. 13).

Source: Author's construct, (2023)

The previous section focussed on the case study from the South African perspective. However, the following section will focus on a case study from Limpopo province, South Africa.

4.4.3. A case study from Limpopo province, South Africa

The following case study is from the Limpopo province (Box 5), south Africa that is based on the Limpopo SMME strategy and the Limpopo manufacturing advisory centre mandate.

Box 5: A case study of Limpopo province South Africa:

"The purpose of the Limpopo SMME strategy is to create a framework in the business environment to reach the following:" ("DEPARTMENT OF ECONOMIC DEVELOPMENT, ENVIRONMENT AND TOURISM")

Increasing the share of small businesses in the province's economic growth has had a greater impact on job creation and lower property levels in the province. Ensuring that the province's growing economy contributes to GDP. Ensuring effective and efficient coordination and integration of SME programs in the province. The strategies of the framework are as follows: they are the provision of relevant business information on development, the coordination and integration of business development support the competitiveness of companies in access to local and international markets. Increase the availability of financial resources, business development and promotion.

Limpopo Manufacturing Advisory Centre (LIMAC)

The mission of the centre is: to improve the competitiveness and growth of small and medium-sized manufacturing enterprises in South Africa. His clients are small and medium-sized manufacturing companies in the region. The organization helps its customers easily obtain high-quality business and technical support to increase productivity and competitiveness. The organization meets the following needs of SMEs, helps to diagnose the problems of SMEs, and increases their productivity and competitiveness. It improves the use of intelligent technologies; it uses better management practices. Better development of the human skills of the workforce. This will improve access to finance and increase awareness of the resources available (Limpopo SMME Strategy: Limpopo Province, February 2006: p. 18-19).

Source: Author's construct, (2023)

The previous section on Box 5 focussed on the case study from the Limpopo province, South Africa. The following section will focus and dwell on a case study from the Vhembe District Municipality.

4.5. A case study from Vhembe District Municipality

The following Box 6 is a case study from Vhembe district municipality. The case study is based on local economic development strategy for enterprises that manufacture brick products.

Box 6: A case study of Vhembe District Municipality on Local Economic Development strategy for enterprises that manufacture brick products:
Local Economic Development in the enterprise's development perspective within the Vhembe District Municipality: In the context of Vhembe district, the district has recently prepared a business strategy from the point of view of local economic development, which enables the district to carry out and implement various strategic assessments, the starting point of which is to improve the potential of small businesses and medium enterprises in the region. It also allows the development team in the region to identify trends and track past data, as well as compare and correlate current data and specific gaps in the field. Several industrial, construction, retail, tourism, agricultural and mining business enterprises operate in the region, which are mostly classified as the main enterprises of the region. Certain business establishments are geographically located in four local governments in the Vhembe region, and they are Thulamela Municipality, Makhado Municipality, Musina Municipality and finally Collins Chabane Municipality. Previous findings have shown that the district has an uneven distribution of businesses across sectors in the Vhembe region, with the retail sector said to be the largest in both the municipality and the region. Small and medium-sized brick production companies in the Vhembe region are also negatively affected by lack of contracts with the producer's poorly trained workforce, poor infrastructure, lack of financing, and lack of spatial and business information. Despite these challenges, approximately, 4375 businesses are registered in the region in 2009, of which only 5% of those businesses are in the manufacturing industry (VDM draft 2020/21 IDP overview: pp. 126-139).

Source: Author's construct, (2023)

The previous section on Box 6 was focused on a case study from the Vhembe district municipality. Whilst the following section on Box 7 will focus on a case study from the Thulamela Local Municipality.

4.6. A case study from Thulamela local municipality

Box 7 showcase's a brief discussion on a case study from Thulamela local municipality. The case study is based on the domain of Local Economic Development in the enterprises development perspective for SMMEs services that manufacture brick products.

Box 7: A Case Study of Thulamela Local Municipality on Local Economic Development in the enterprise's development perspective for SMMEs services that manufacture brick products
Local Economic Development in the enterprise's development perspective within the Thulamela Local Municipality:

Local Economic Development: is an economic development approach that emphasizes the importance of local activities: an inclusive process where local people from all sectors work together to promote local business leading to a sustainable and sustainable economy (Thulamela Municipality IDP 2020/21 - 2022/23). : pp. 309–310).

Small, Medium and Micro Enterprises (SMME) Service Delivery Challenges lack of infrastructure.
There is no road maintenance in Thulamela municipality in terms of logistics and cargo movement or mobility in terms of traffic. Currently, there is a lack of logistics centres that include warehouses, transshipment facilities, loading and unloading facilities, and logistics infrastructure serving logistics transportation information. As for small and medium-sized brick producing enterprises, there is no longer space to expand development in the outskirts of Thohoyandou town in Thulamela municipality (Thulamela Municipality IDP 2020/21 – 2022/23: pages 315-317).
Lack of land in areas declared for commercial development.
The municipality of Thulamela does not have land for the extension of the development that could serve the development of business in the declared areas of the municipality. This becomes a question when you look at the development of our logistics companies and the facilities where they handle, load, unload, store and distribute their locally produced and manufactured products and goods. Even some companies in this case are small and medium brick manufacturing companies are poorly positioned and positioned. For example, you can usually find a brick manufacturing plant next to a major distribution route where it shouldn't be. The lack of land necessary for the development of logistics companies in the declared areas prevents the growth and development of logistics infrastructure, hubs, and sites. Therefore, there is a need to propose an intelligent value chain logistics framework to help analyze, interpret, identify and justify assumptions and concerns related to the unavailability of land for expansion of development. Instead of expanding outwards, we can create further development, put businesses in appropriate places and deal with changing zones of land use next to the appropriate road type for the respective zones (Thulamela Municipality IDP 2020/21 - 2022/23: p. 315-317).

Source: Author's construct, (2023)

The previous section on Box 7 focussed on a case study from the Thulamela Local Municipality. Whereas the following section on Box 8 will dwell on a case study from the Vhembe District Municipality.

4.7. A case study from Vhembe District Municipality

Box 8 shows a case study from the Borough of Vhembe on the contribution of the Borough's freight logistics strategy to local and regional economic development in the Borough of Vhembe: experiences, perspectives, and options.

Box 8: A case study from Vhembe District Municipality on the Contribution of District Freight Logistics Strategy to local and regional economic development in Vhembe District Municipality: Experiences, Prospects, and Options

Vhembe District (VDM) commissioned a study in 2012 to develop a freight logistics strategy for the district. The main objective was to dismantle the logistics of goods transport in the district and to inform the district about the situation of goods transport in relation to the type, origin and destination of goods products, the condition and capacity of the main corridors, and the necessary resources to avoid bottlenecks. The main objective of developing a goods logistics strategy is to consider the entire supply and value chain processes related to the movement of goods from, within, between and through the district. The challenges of VDM freight logistics are as follows:
Fragmented cargo planning responsibilities and lack of logistics infrastructure; poor market access leading to high transport and logistics costs; intrusion of trucks into the road network of the region, which has a significant

negative impact on the condition and lifespan of the road network; and limited freight transport unique to VDM, and similarities are apparently addressed in the 2007-2014 Rural Transport Strategy and Action Plan (RTSA) (Mashiri and Naude, 2006; Chakwizira et al., 2008; Chakwizira and Mashiri, 2009; 2012: p. 649). The analysis that determined the freight and logistics strategy for the Vhembe district was the SWOT analysis, in which the identified strengths of the VDM freight logistics were the tarred provincial roads, which are in reasonable and good condition, along with the tarred municipal road network that is in order a fair condition. Weaknesses in VDM's freight logistics were highlighted by insufficient truck stops in Makhado and Thohoyandou, the towns' gravel road network in poor or very poor condition, and a lack of funds to implement a road traffic management system. VDM Freight Logistics Opportunities found that if the main roads are in good condition and drivers do not have to make detours to avoid driving on bad or very bad roads, there is an opportunity to reduce trucking operating costs. VDM cargo logistics hazards revealed road damage caused by truck overloading, delays at border stations for trucks traveling to SADC countries, (Proceedings of the 33rd Southern African Transport Conference (SATC 2014): p. 649-661).

Source: Author's construct, (2023)

The previous section on Box 8 focused on a case study from the Vhembe District Municipality. The following section will seek to highlight the case studies from South African policies and legislation regulating the brick-making sector.

4.8. Case studies from South African policies and legislations regulating the brick making sector

The preceding section discusses case studies of South African policy and legislation governing the brick industry from a local perspective. The case studies covered are Case study on GHG reporting regulations and their impact on the small and medium sized brick industry in South Africa, Case study on South African energy reporting regulations and their impact on small and medium sized brick manufacturing. The South African industry and a case study of the South African carbon tax legislation and its impact on the small and medium sized brick industry in South Africa.

4.8.1. A case study on Greenhouse Gas Reporting Regulations and their impacts on the small-medium brick making industry of South Africa

The following case study discussion is on greenhouse gas reporting regulations and their impacts on the small-medium brick making industry of South Africa.

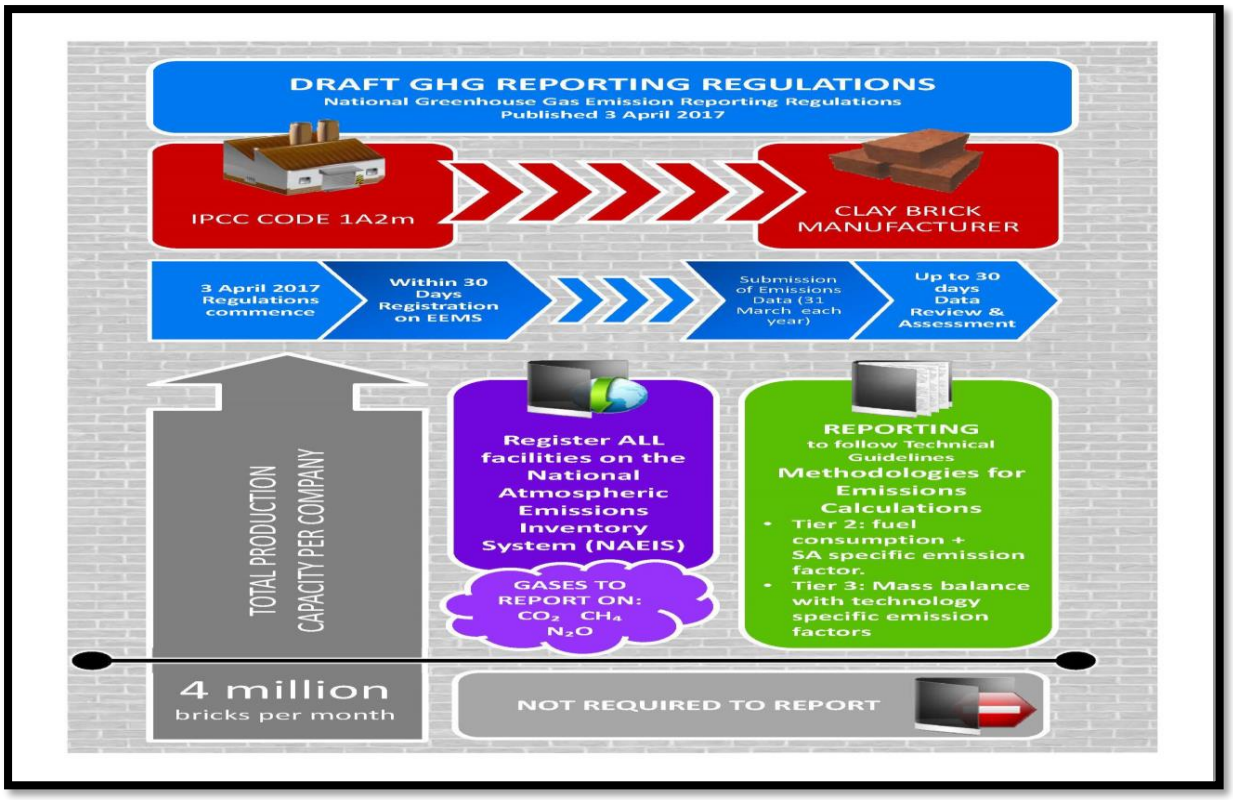


Figure 4. 2: Draft GHG Reporting Regulations, 2017

Source: (Louw *et al*, 2017: p4)

National greenhouse gas emissions reporting regulations require the various brick manufacturing companies to be able to report directly from their factories on their greenhouse gas emissions and combustion levels in South Africa. Brick manufacturing companies producing more than 4 million bricks per month across all South African plants are required to report their direct GHG emissions impacts and damage control assessment reports to the relevant GHG emissions agency. In response to the above argument, brick manufacturing companies that exceed the threshold of 4 million bricks per month must register all their facilities with the National Atmospheric Emission Inventory System also known as (NAERS), (Louw *et al*. 2017: p. 4).

4.8.2. A case study on South African Energy Reporting Regulations and their impacts on the small-medium brick making industry of South Africa

The following case study discussion is on South African energy reporting regulations and their impacts on the small-medium brick industry of South Africa.

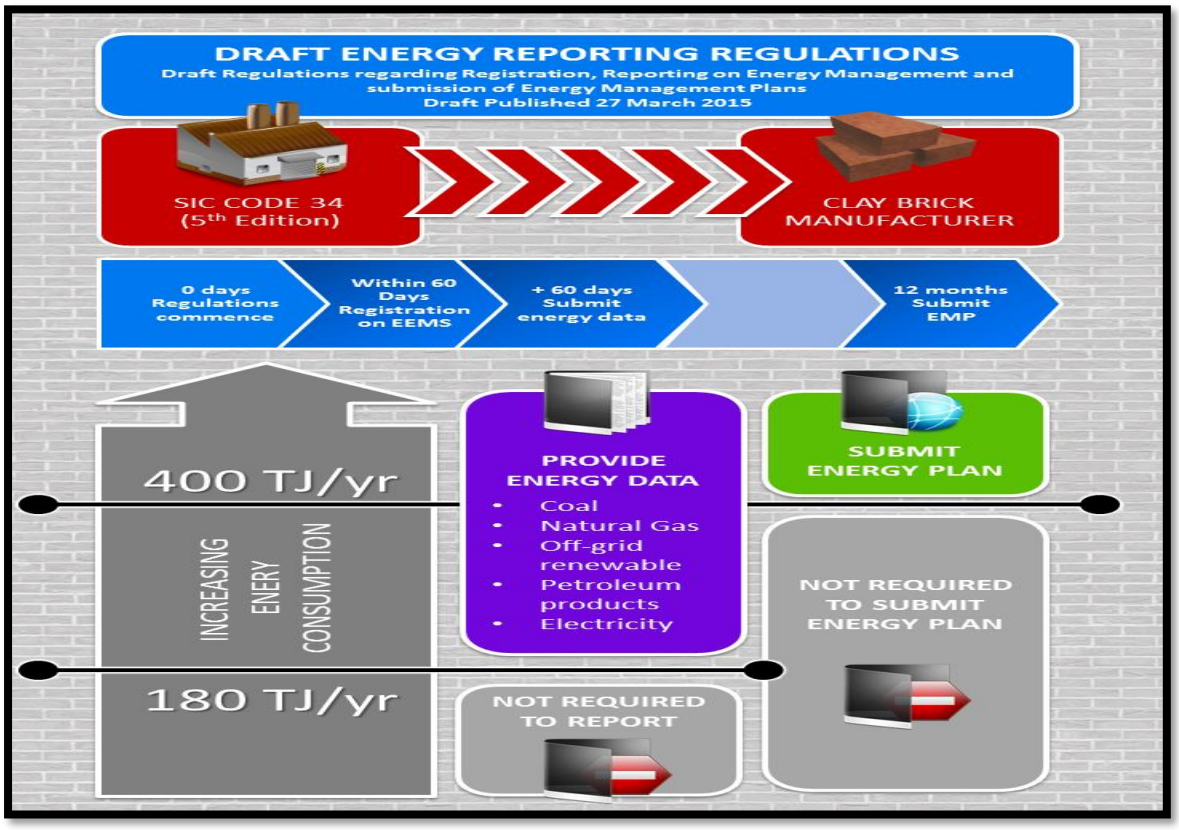


Figure 4. 3: Draft Energy Reporting Regulations, 2015

Source: (Robbie *et al*, 2017: p3-4)

The South African Department of Energy is committed to regulating and transforming the energy sector to enable the provision of secure, sustainable, and affordable energy. In this case, in March 2015, the Department of Energy published the draft regulation on registration, reporting on energy management and presentation of energy management plans. On managing and regulating the energy consumption and energy efficiency of brick manufacturing companies exceeding 180 TJ threshold power, (Robbie *et al*, 2017: 3-4).

4.8.3. A case study of South African Carbon Tax Legislation and its impact on the small-medium brick manufacturing sector of South Africa

In the small-medium brick-making industry of South Africa, the enterprises regulate under the Carbon Tax legislation which seeks to examine and measure the impacts of manufacturing the brick products, and the value costs that is exceeding the pricing tag and bill of covering the manufacturing and production processes within the enterprises. It is estimated that the small-medium brick manufacturing enterprises both formal and informal in South Africa, emits roughly 2.6 million tCO_{2e}/year this is according to the (Swiss contact and Clay Brick Association of South Africa, 2017: p 1-36). The purpose of the carbon tax is to cover the emissions of greenhouse gases that occur during the burning of fossil fuels, but also in this case the emissions of chemical processes, called process emissions, and the emissions of organic sources, the so called fugitive emissions. Below is the following case study on South Africa's carbon tax legislation and its impact on South Africa's small and medium-sized brick manufacturing sector.

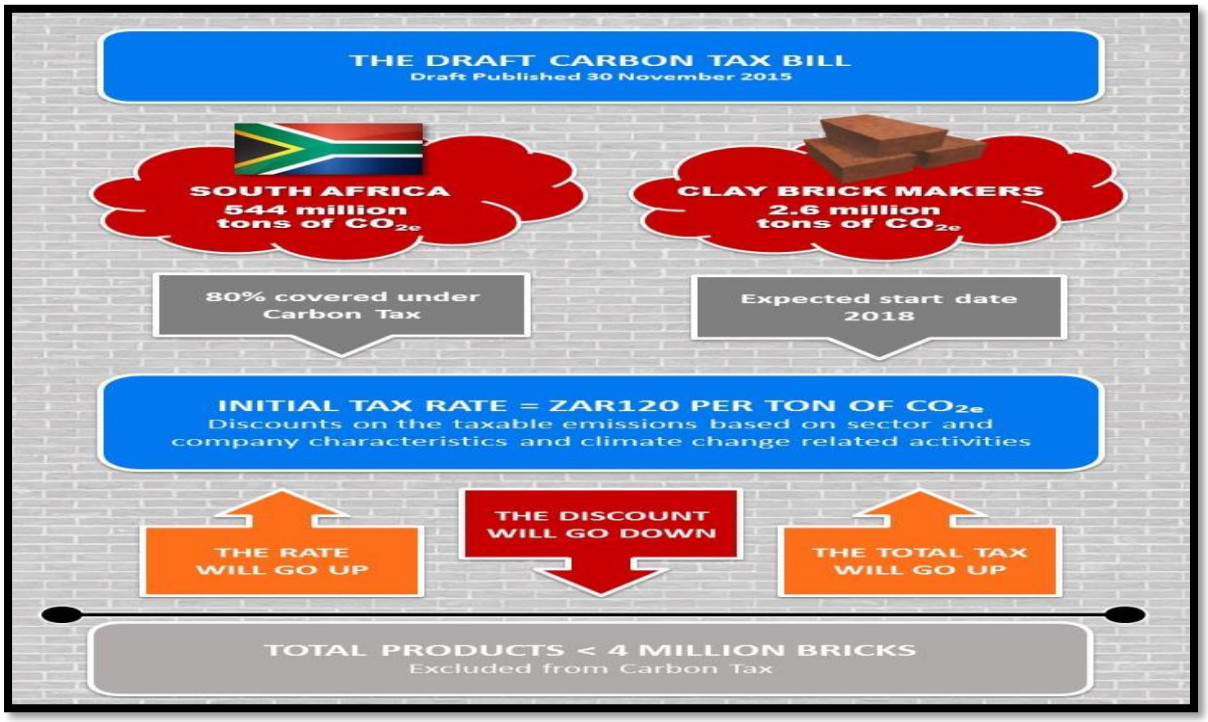


Figure 4. 4: The Draft Carbon Tax Bill, 2015

Source: (Lodewijk, *et al*, 2017: p8)

The brick production process essentially causes process and/or fugitive emissions, with the component of the formula dealing with carbon sequestration in the manufacturing sector. The activity is included from the carbon tax formula. The formula below outlines the components of the carbon tax formula that are relevant to the small and medium brick manufacturing sector., (Lodewijk *et al*, 2017: p8).

Brick product Carbon Tax formula.

$$X = (E-D) * (1-C) * R$$

Where:

X is the tax to be paid per year (in ZAR)

E is the total fossil fuel combustion related GHG emissions (in TCO2e)

D is the petrol and diesel related GHG emissions (in TCO2e)

C is the sum of percentages of allowances discount (in %) which are applicable according to Schedule 2 of the Draft Carbon Tax Bill and determined accordingly

R is the Carbon Tax rate (in ZAR/tCO2e)

4.9. Chapter summary

The chapter four review was based on the case studies of smart value chain logistics for brick manufacturing enterprises related to the study aim and focus. It sought to introduce the synthesis of the available literature regarding the best practises known internationally, nationally, regionally and locally on the basis of study environment that informs the study conceptual approach and theoretical approach. It introduced the chapter introduction, case studies from developed countries, case studies from BRICS countries, case studies on brick manufacturing and production within the brick-making sector in developing countries, case

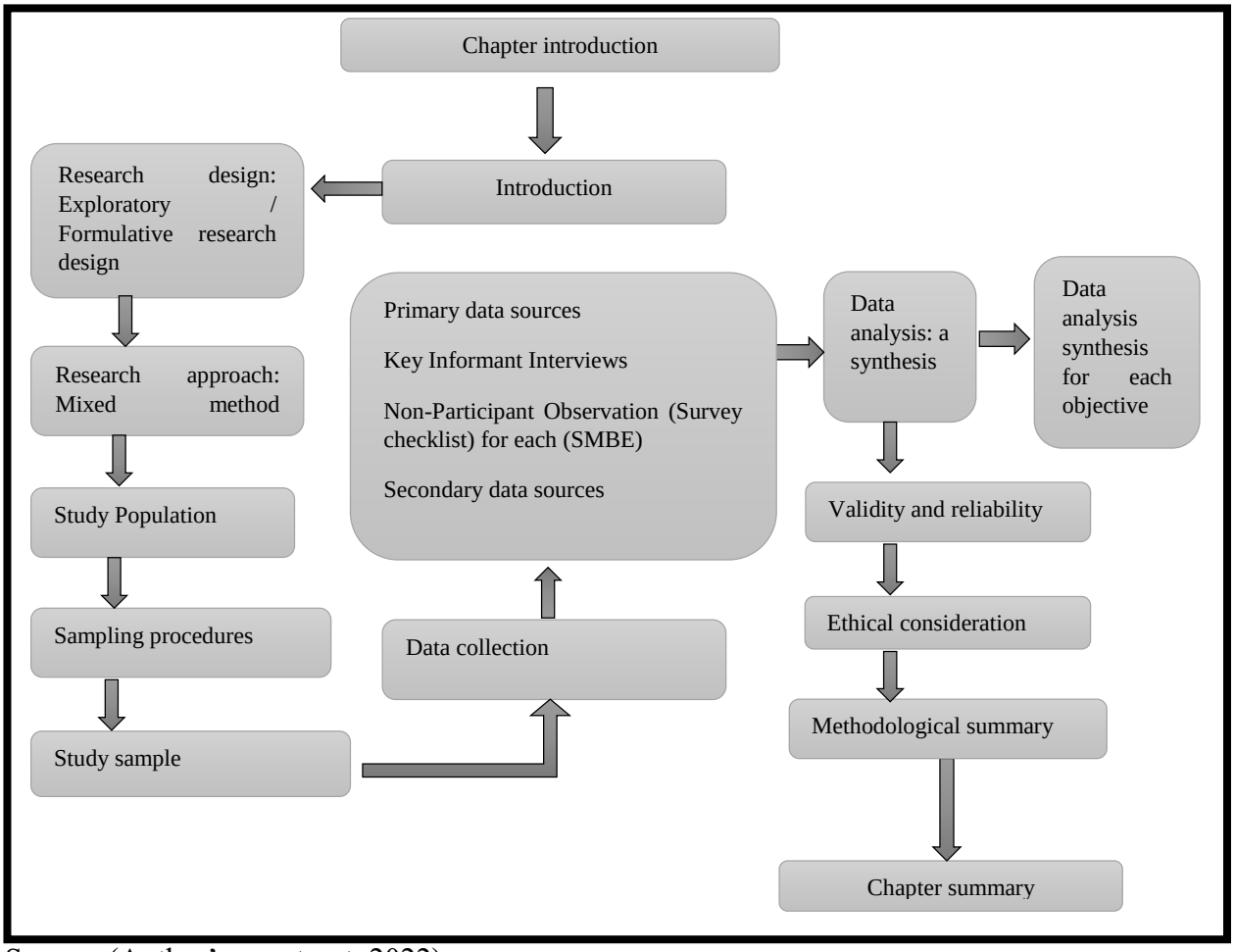
studies from Vhembe District Municipality, case studies from South African policies and legislations regulating the brick-making sector and lastly chapter summary.

CHAPTER FIVE: RESEARCH METHODOLOGY

5.1. Chapter Introduction

This chapter introduces the research methodology of the study because it seeks to apply methods in data collection and testing methods that produce better results that are further quantified and interpreted. It includes a comprehensive introduction, research design: exploratory/Formulative research design, research method: mixed method, research population, sampling procedures, study sample, data collection, data analysis: synthesis, validity and reliability, ethical consideration, methodological summary and finally the chapter summary. Figure 5.1 below shows the structure of Chapter Five and is presented as follows:

Figure 5. 1: The Structure Layout of chapter five



Source: (Author's construct, 2022)

5.2. Introduction

In the research methodology, a research plan called Research/Formulative research design approach was introduced, the structure of which appears as a reference matrix for the research work. As a methodological approach, a mixed method was used, which included both qualitative and quantitative methods, with the aim of describing the variables and quantifying them with the help of presentation and analysis tools such as KII (Key Informant Interviews: Semi-structured questionnaire interview), field photos, texts, content analysis, qualitative and quantitative analysis. Purposive sampling design, which was used to take elements from the study population, was chosen as the sampling method. Different methods and research methods were emphasized in the research to solve the problem situation. In this research, the researcher not only needed to know how to construct certain indices or tests, checklists, and calculate the mean, mode, median and standard deviation, or chi-square, but he also needed to know which ones. methods or techniques were and were not relevant to their research topic. In this chapter, the researcher designed his method for his problem to develop a systematic way to solve and deal with the perceived problem using the preliminary analysis method. According to (Irny et al., 2005: p. 4), methodology is a systematic theoretical analysis of methods applied in a research field. (Schwardt, 2007: p. 195), defines research methodology as a theory of how research should proceed. Defining the research problem also provides an understanding of how and for what reasons hypothetical questions were raised about the specific collected data and method used.

The previous section was based on the introductory part of chapter four, which highlighted the items to be discussed in the chapter. However, in the previous section, there will be a focus on a research design which is the exploratory approach of the study.

5.3. Research design: Exploratory / Formulative research design

Leedy, (1997: p. 195), defined research design as a research plan that provides a general framework for data collection. It is also mentioned that the purpose of an acceptable research design is to obtain results assessed to be reliable and valid. It can be elaborated that it is a strategic action framework that acts as a bridge between the research question and the realization and implementation of the research strategy (Langkos, 2014). The selected research

design approach was exploratory/Formulative research design. This type of research approach/design focused on identifying which variables/elements are important for further research to gain a greater understanding of the phenomena. These established priorities for further research and gathered information about the practical problems of researching single and summary claims, as well as discussing the refinement of research concepts. Exploratory research was conducted on a clearly defined problem, such as the problem statement of this study, where it was found that little was known about the nature of the problem or the specific topic. specific field of study. The nature of the problem was multifaceted and there was a need to study the phenomena. Exploratory type of research paved the way for the researcher to choose the best research design, data collection method and topics. By its very nature, exploratory research often concludes that a perceived problem does not actually exist.

The previous section was based on the research design which is the exploratory/Formulative approach of the research study. The following section will focus on the mixed-method approach.

5.4. Research approach: Mixed method approach

Table 5.1: Gives an emphasis on the choice of research approach, its method of approach, and the analysis tools and their application in how to study the characteristics of the phenomenon studied in the study area.

Table 5. 1: Research approach: Mixed method approach and analysis tools

Choice of research approach	Method of approach	Analysis tool/s of approach
Mixed method approach (qualitative and quantitative methods): The Exploratory/Formulative research design approach was used in the research design. The guiding approach for the exploratory component of the	The mixed research approach selected was both qualitative and quantitative. With respect to the qualitative methodology, the rationale was to identify and describe study variables that will then be measured and quantified using quantitative methodology	The value chain analysis tool was adopted to measure the enterprise's value-adding activities and marketing of clay brick products manufactured in the process. Critical path analysis has been conducted to identify the logistics value chain critical paths and time delays along the logistics value chain

research was the need to understand in detail the phenomenon under study in the study area	With respect to quantitative methodology, the study results came from questionnaire samples administered. The information gathered was analysed using tables, graphs, and texts Tables have been employed Graphs and mapping Observational survey and lastly Questionnaire	Qualitative and quantitative data analysis was applied Pictures/Photographic evidence & analysis/interpretation has been utilized Texts – content analysis and thematic analysis was adopted Geospatial and locational analysis was formulated SPSS analysis tool was utilized

Source: Author's construct, (2022)

The above table 5: focused on the selected choice of research approach, the method of approach, and the analysis tools approach which are required to determine the results and interpretations of data collected during the study. The following section will be based on the study population.

5.5. Study Population

The study population of the small-medium brick enterprises was estimated to be (7) in a radius of 12 km from the Thohoyandou CBD central point. Key informants' representative samples from the local municipality and district municipality within the transport and housing departments and the small-medium brick enterprises officials have been engaged to analyze the operational mode, transportation, and manufacturing processes of the (SMBEs). The combined true population of the sample space (frame) was (12).

The previous section was based on the study population which was highlighting the target group samples of the SMBEs from the 12 km radius. The following section will however focus on elaborating on which sampling procedures will be deployed for the study.

5.6. Sampling procedures

The sampling design for the study population selected was a non-probability sampling design: the purposive sampling technique, which was based on the characteristics of the population and the objective of the study, here the elements of the study population selected for the sample

were chosen by the judgment of the researcher which was the criteria for choosing the elements of the study population.

The previous section focused on the sampling procedures that will be deployed for the interpretation of the results. The following section will focus on the study sample.

5.7. Study sample

The sampling population of the small-medium brick manufacturing enterprises was a study sample used to determine the true population of elements selected. The population of the small-medium brick manufacturing enterprises was a total of 7, within the 12 km radius boundary of the Thohoyandou study area. This then brought to a total of 100% interview samples of the group.

Table 5.2: Gives an emphasis on the sample elements selection criteria making use of the purposive sampling technique in which divisions and key informants were determined.

Table 5. 2: The sample elements and their percentages

Sample elements	Divisions/departments	Numeric indicator of the respondents	Percentage indicator of the key respondents
1. Vhembe district municipality	Local Economic Development (LED)	1	20%
	Transport	1	20%
2. Thulamela Local Municipality	Local Economic Development (LED)	1	20%
	Road and water services	1	20%
	Housing and electricity	1	20%
3. Total	5 divisions sampled	5 key informants/respondents	100% of the total interview samples of the key informants/respondents

Source: Author's construct, (2022)

The above table 5.2 showcased the criteria for the selection of the sampled divisions, elements of key informants, and their corresponding percentages which were adequate to bring to a total of 100% total interview samples on a total of 7 respondents and 7 divisions. The following section will however focus on the data collection procedures and methodologies utilised to determine the results which will be interpreted.

5.8. Data collection

Data collection plays a very important role in qualitative analysis. This study used different methods of data collection, all of which fell into two categories, primary and secondary data (Douglas, 2015: p. 2). Data collection was the process of collecting and measuring information about the variables of interest in a specific and systematic way that allowed the researcher to answer the research questions and evaluate the results. The main purpose of data collection was to collect high-quality evidence, which was then transformed into a comprehensive data analysis that provided convincing and reliable answers to the questions posed (Kabir, 2016: p. 202).

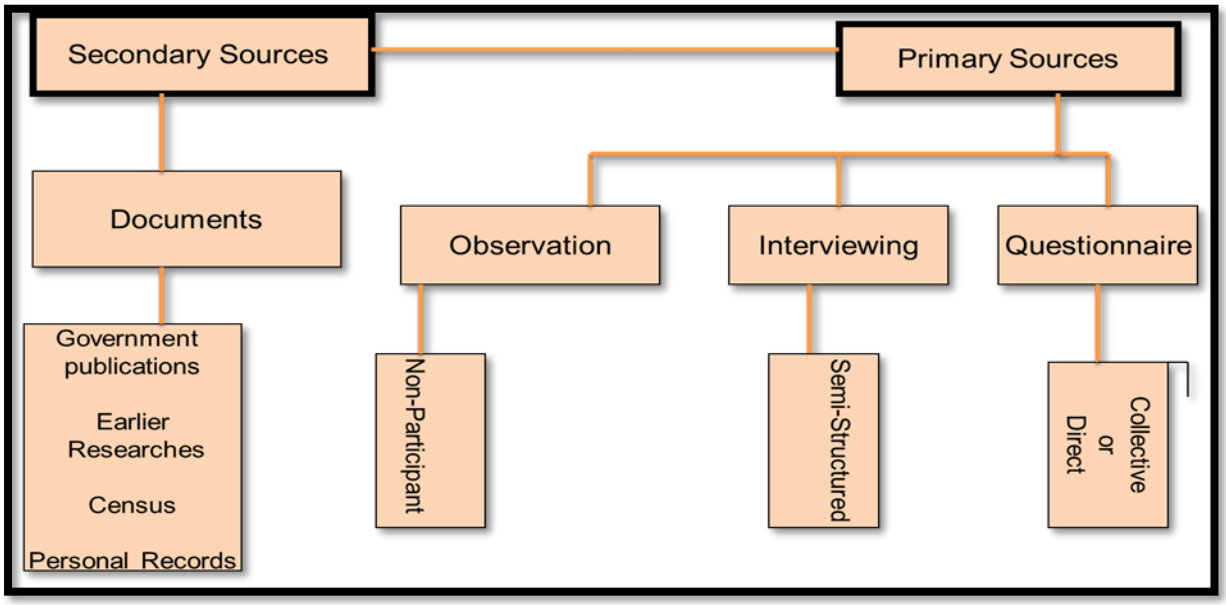


Figure 5. 2: Method of data collection

Source**: (**Kabir, 2016: p. 202**)**

5.8.1. Primary data sources

Collecting the primary type of data source was considered in this research study. As the study focused on a township, it was easy to identify and address data collection processes in the study area. In collecting primary data, the following methods were used:

5.8.1.1. Key Informant Interviews

Key Informant Interviews were conducted to optimize the collection of raw data based on individuals' expertise, perspectives, and experiences, particularly, when sensitive topics were being explored and when there were specialized areas of concern in an expert's field. The categories of people were classified as follows: municipal officials, municipal planning departments (transport, LED, and housing departments), and the primary data sources that were collected from the small-medium brick enterprises in the study area. This data collection method was initiated using the semi-structured interview technique, this type of questionnaire interview was used to gain an understanding of the underlying reasons and motivations for people's attitudes, preferences, or behavior. The research interview was a face-to-face (personal) type of interview, which has been conducted in a structured manner.

5.8.1.2. Non-Participant Observation (Survey checklist) for each (SMBE)

The method of observation/survey was conducted in a form of a reconnaissance field survey study from the sampled SMBEs, focusing on the most critical aspects and reflecting on the condition and the implications faced by the manufacturers of the brick products in terms of safety, and security. The reconnaissance was a non-participatory survey done by the researcher. The researcher did not get involved in the activities of the group of manufacturers but remained as a passive observer, watching, and recording its activities and drawing conclusions thereafter, and taking pictures as evidence of his fieldwork survey. The study employed five observation survey checklists, which covered the orientation of built infrastructure within the SMBEs, the physical siting and conditions of the environment for the SMBEs, the operational mode within the SMBEs, the production procedures and manufacturing processes of brick products for each SMBE and lastly transport logistics process of the SMBEs.

5.8.2. Secondary data sources

In collecting secondary data, the following instruments were used:

Secondary data were obtained from literature, research papers, policy documents, and government publications, and lastly case study approach for best practices.

Criteria for itemizing the data procedures:

GIS software package for analyzing the spatial characteristics and physical attributes of the study area for map analysis purposes. Both open-ended and closed-ended questionnaires have been employed.

The previous section was based on the data collection procedures which are, the primary data sources and the secondary data sources. The following will focus on the data analysis synthesis of the study analysis approach.

5.9. Data analysis: a synthesis

Qualitative and quantitative data analysis

The study was largely qualitative and quantitative in nature, based on 12 Key Informant Interviews. Thematic Content Analysis (TCA) and Value Chains Analysis have been employed and utilized to analyze qualitative data that became quantified. The data that was analyzed was descriptive and interpretive in nature and it provided explanations and verbal analysis of the development of small-medium brick manufacturing enterprises and enabled the researcher to understand the characteristics of the SMBEs logistic chains, (Clarke, 2006: p. 10-30).

Table 5.3: gives an emphasis on the notion of each objective chapter of analysis in analyzing each objective making use of the analysis tools and approach of each objective and its content to its chapter write-up.

Table 5. 3: The Thematic content analysis process for each objective

Phase	Process for the analysis of each objective
1. Familiarizing with data	Transcription of verbal data from the interviews
2. Generating initial codes	Production and coding of initial codes from data
3. Searching for themes	Sorting different codes into potential themes
4. Reviewing themes	Reviewing and refining themes of data
5. Defining and naming themes	Identify, define, and refine themes
6. Producing the chapters	Data extractions, description of data themes, and writing the data analysis report

Source: (Braun and Clarke, 2006: p. 16-23).

The table above shows the representation of the application of the Thematic content analysis for each objective.

5.9.1. Data analysis synthesis for each objective

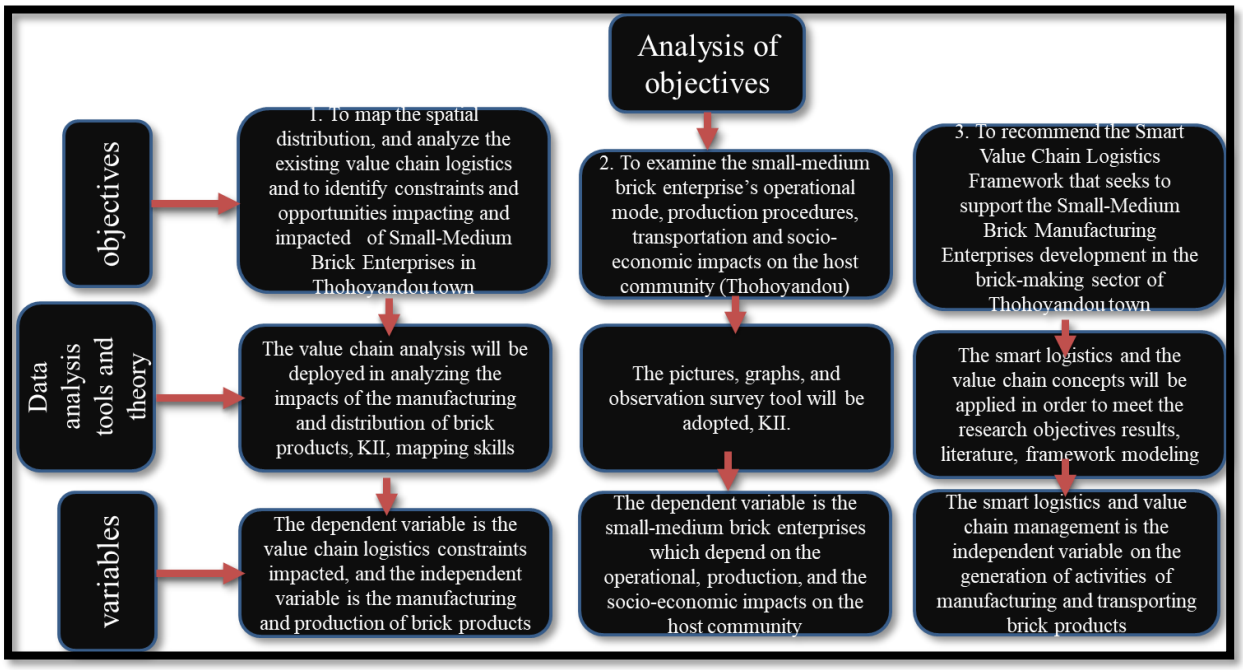


Figure 5. 3: Data analysis of each objective a synthesis

Source: Author's construct, (2022)

Given that the preceding section has highlighted the analysis of the study based on the data collection analysis synthesis. the following section will seek to discuss on the explanatory phase of the validity and reliability of the results to be interpreted.

5.10. Validity and reliability

Validity of results

To identify factors that necessitate the risk of not achieving or yielding valid results due to incorrect interpretations and analysis gathering of data, to address the implications of research outputs.

Reliability of results

Attaining results or obtaining reliable results is taken as a risk factor if the researcher did not correctly rely on the information gathered to obtain results.

The previous section was based on the explanations and descriptions of the validity and reliability of the results which are to be interpreted. The following section will focus on the ethical considerations of research ethics.

5.11. Ethical consideration

Research ethics standards defined in Chapter 13 of the Research and Innovation Policy of the University of Venda (2010) were followed in the research. The research proposal was presented to the Department of Urban and Regional Planning of the School of Environmental Sciences, the Departmental Committee of the Faculty of Sciences, Engineering and Agriculture, and finally to the Higher Degrees Committee of the University of Venda (UNIVEN), where a letter of approval was issued, see Annexure J. The Ethical certificate issued with an (Ethical Clearance no. *FSEA/22/URP/06/2006)* was obtained on the 20th of June 2022 see attached Annexure I, the ethical considerations which were considered in the ethical clearance certificate were honesty, integrity, carefulness, openness, and respect for intellectual property.

The previous section focused on the ethical considerations of the entire study that will be utilized and followed to the of making informed choices about the research following policy guidelines on the research ethics conduction. The following section will focus on the methodological summary which will be in a form of the Research Framework Matrix table.

5.12. Methodological summary

The Research Framework Matrix

The Research Framework Matrix was the design approach to research that has been adopted by the researcher in analyzing and indicating the research objectives that coincided with the research questions. The data collection instruments were both the primary and secondary data

sources, followed by analysis and presentation tools, sampling design techniques, identified target groups, and outcomes.

Table 5. 4: The Research Framework Matrix

RESEARCH OBJECTIVES	RESEARCH QUESTIONS	DATA COLLECTION INSTRUMENTS		ANALYSIS AND PRESENTATION TOOLS	SAMPLING METHOD	TARGET GROUPS	OUTCOMES
		PRIMARY	SECONDARY				
1. To map the spatial distribution of the Small-Medium Brick Enterprises and analyze their existing value chain logistics, to identify constraints and opportunities impacting and impacted within the Small-Medium Brick Enterprises in Thohoyandou town	(a). How can the small-medium brick enterprises be mapped to show their physical siting and locational characteristics? (b). How can the spatial environment of small-medium enterprises be analyzed?	KII Questionnaire sample (collective)	Articles Journals Government publications	Texts Mapping (GIS) Content analysis	Purposive sampling technique	Brick manufacturing suppliers Small-medium brick enterprises GIS department from the Local Municipality	The spatial distribution fully indicates the opportunities for locating the SMBEs premises and their service areas so that they can collaborate with the local authorities for future investments
2. To examine the small-medium brick enterprise's operational mode, production procedures, transportation, and socio-economic impacts	(i). What are the procedures for examining the impacts of operation, production, and transportation in brickmaking	KII Non-Participant Observation	Government publications Articles Journals	Verbal communication of ideas by means of texts. Observation Reconnaissance survey	Purposive sampling technique	Small-medium brick enterprises	The value chains of the enterprises are fully monitored and analyzed to determine the competitive advantage of the enterprises through value chains logistics scenario analysis

on the host community (Thohoyandou).	within small-medium brick enterprises? (ii). How can the concept of value chain logistics be used to examine and identify the issues constraining small-medium brick enterprises operations?						
3. To recommend the smart value chain logistics concept to support small-medium brick enterprises development in the brick-making sector of Thohoyandou Town	(i). What could constitute a rationale for recommending a smart value chain logistics framework for developing small-medium brick manufacturing enterprises? (ii). How can the Smart Logistics conceptual approach be	KII Non-Participant Observation	Research related documents Government publications Acts and regulatory mandate documents	Models Texts Content analysis Scenario analysis Value chain analysis	N/A	Transport planners Housing sector Municipal officials in the town planning domain	Long-term development of the small-medium brick manufacturing enterprises and its contribution to the construction, physical infrastructure, and transportation industries in the host community

	applied to support small-medium brick enterprises in distributing brick products?						

Source: Author's construct, (2022).

The above Table 5.4 on the Research Framework Matrix, preceded with the identification of research objectives, together with their research questions, the data collection instruments in this case the primary and the secondary data collections, analysis, and presentation tools, and lastly sampling method followed by the target groups.

The previous section focused on the research methodological summary comprising the research framework matrix table. The following section however will dwell on the chapter summary of the drawing conclusions from the chapter.

5.13. Chapter summary

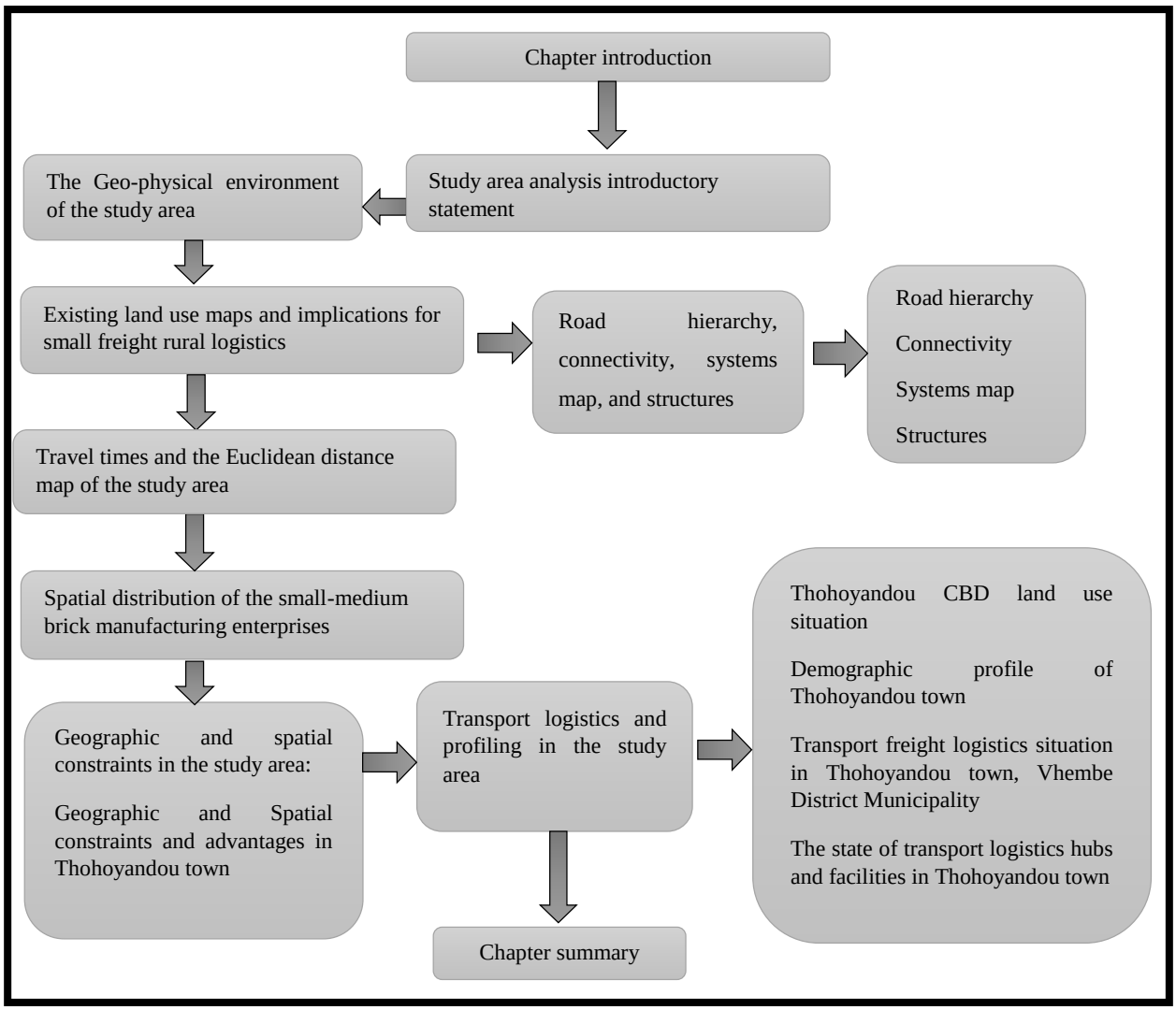
The methodology chapter described the methods of data collection and data collection. The research design of the study is the Research Framework Matrix. The data sources selected are primary data and secondary data sources. The chapter highlighted the choice of research approach which is Exploratory/Formulative using both qualitative and quantitative research methodologies.

CHAPTER SIX: STUDY AREA ANALYSIS

6.1. Chapter Introduction

Chapter five on study area analysis seeks to present the focus of map work analysis, spatial analysis, and configuration of the land use compatibility. Therefore, the contents of the chapter is comprised of a chapter outline; introduction; the geophysical environment of the study area; existing land use maps and implications for small freight rural logistics; road hierarchy, connectivity, systems maps, and structures; travel times, and Euclidean distances of the study area; spatial distribution of the small-medium brick manufacturing enterprises; geographic and spatial constraints in the study area; transport logistics and profiling in the study area; and lastly chapter summary. Figure 6.1 below is outlined as follows:

Figure 6. 1: The chapter six outline



Source: Author's construct, (2022)

Figure 6.1. above indicates the construct of the chapter six structure layout, which constitutes of ten components namely chapter introduction; introduction; the geophysical environment of the study area; existing land use maps and implications for small freight rural logistics; road hierarchy, connectivity, systems maps, and structures; travel times and distances from the Thohoyandou central business district to the SMBEs; spatial distribution of the small-medium brick manufacturing enterprises; geographic and spatial constraints in the study area; transport logistics and profiling in the study area; and lastly chapter summary.

6.2. Study area analysis introductory statement

The study area selected for the data collection and analysis purposes is Thohoyandou town, a small town within the Vhembe region under the authority of the Thulamela Local Municipality. The study is an Exploratory/ Formulative research approach based on a phenomenon that has not been studied and analyzed before. The area's synthesis of analysis approach is based on locating the physical siting, transportation network, construction management, and socio-economic impacts of the small-medium brick manufacturing enterprises on the host community of Thohoyandou town. The study area analysis is also based on spatial mapping and land use compatibility analysis in ensuring how customers will access the services offered by SMBEs. The area will be analyzed based on Map-Work Analysis, and Geo-Spatial and Locational Analysis. This will be done to address and understand the nature of value chain logistics issues and impacts on the host community (Thohoyandou town), and whether to reject, accept or justify the observations highlighted in the study area. The physical location, siting, and environmental conditions of the small-medium brick enterprises is the analysis that is to be conducted in terms of looking at the road hierarchy, this is to show the different classes of road and transport access points and mobility that enables the truck drivers to deliver and transport brick products to the customers. Socio-economic conditions are based on the gender balance and the population of the SMBEs and highlight them as the economic drivers of the town of Thohoyandou. The existing road connectivity land use mapping is an essential part of the situational analysis because it shows the connectivity of other linking road networks and neighbouring places and how they are linked to the road network of the SMBEs. The last task of the situational analysis is to highlight the geographic and spatial constraints in the study area as well as transport logistics and profiling in the study area.

The introduction indicated, in brief, the contents of the chapter and what each content contributes to the finalising of the chapter, in the case of the introduction having elaborated on what to expect in the chapter, the following section will seek to describe the geophysical environment of the study area.

6.3. The Geo-physical environment of the study area

Thohoyandou town is located in Thulamela local municipality, under the Vhembe district municipality, in Limpopo province of South Africa. It is surrounded by Sibasa, Shayandima, Makwarela, Muledane, Ngovhela, and as far as Tshisahulu areas. The municipalities surrounding Thohoyandou, under Thulamela local municipality, are Collins Chabane local municipality, Makhado local municipality, and Musina local municipality. The transport routes that are connecting Thohoyandou town and its surrounding areas are the R524 route which is along the Punda maria road network and the R523 route which starts from the cross junction (traffic circle) of Thohoyandou at Ha-Thidiela Sasol garage integrating the Thohoyandou CBD and the Sibasa CBD, (VDM Draft 2020/21 IDP REVIEW: p. 126-139).

THE GEO-PHYSICAL ENVIRONMENT OF THE STUDY AREA

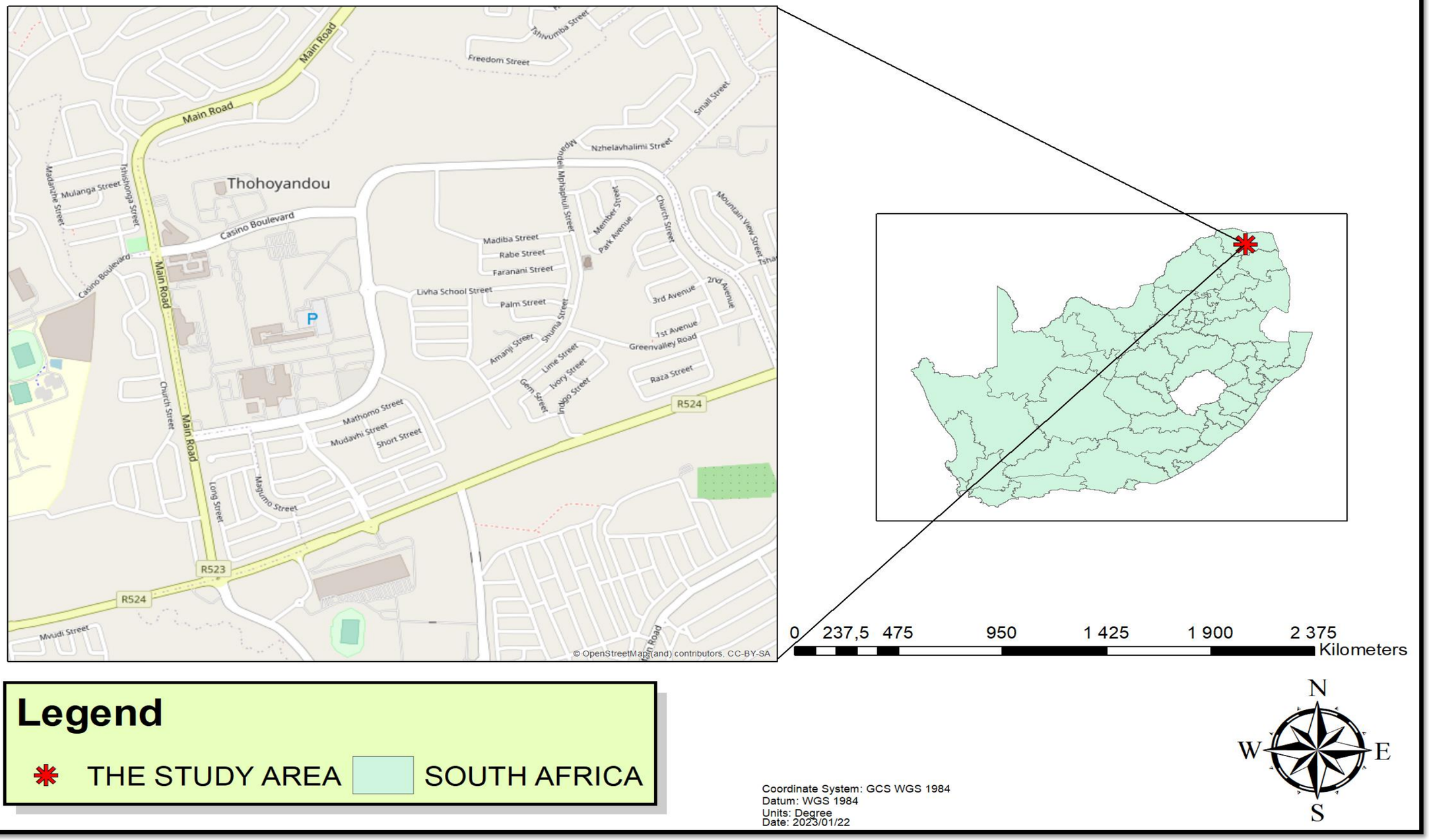


Figure 6. 2: The Geo-Physical Environment of the Study Area

Source: (Derived from ArcMap 10.8 version, 2022)

The above Figure 6.2: A geo-physical map of the study area, shows the map of South Africa, with an indication of the location of the study area within the Vhembe District Municipal boundary. The study has been projected to a much clearer geographic environment which is the Peri-urban area of the study area (Thohoyandou).

The geophysical environment of the study area has been well described and indicated in brief, on the geo-location and the spatial environment of the Thohoyandou town. In the following section what will be discussed will highlight the existing land use maps and their implications for small freight rural logistics.

6.4. Existing land use map and implications for small freight rural logistics

Transportation planning for land use development has an impact on the implications for small freight rural logistics. This is motivated by the lack of freight-forwarding business enterprises that deal with logistics and the distribution of manufactured products. Therefore, transportation planning has a long-lasting impact on the existing land uses and their compatibilities, (Litman, 2017: p 5). The integration of mixed-land use development indicates how the location of business establishments in terms of small-medium enterprises development can be determined by showing where people will live and conduct their newly established businesses and other activities. The claiming of land use rights and title deeds ownership for acquiring property ownership can be promoted to make freight transport more effective and efficient within the Peri-urban area of Thohoyandou town.

Figure 6.3 below shows the land use map drawing no.1 which is highlighting the road layout network along the concentration of densities. The areas are mostly covered by the residential land use zone and more open space followed by the institutional land use and the commercial zone. This informs the local authority to invest in more business ventures and establish collaboration with SMBEs. It will also present the SMBEs with an opportunity to operate as service areas providing locally manufactured brick products to the community of the study area and other surrounding neighbourhoods.

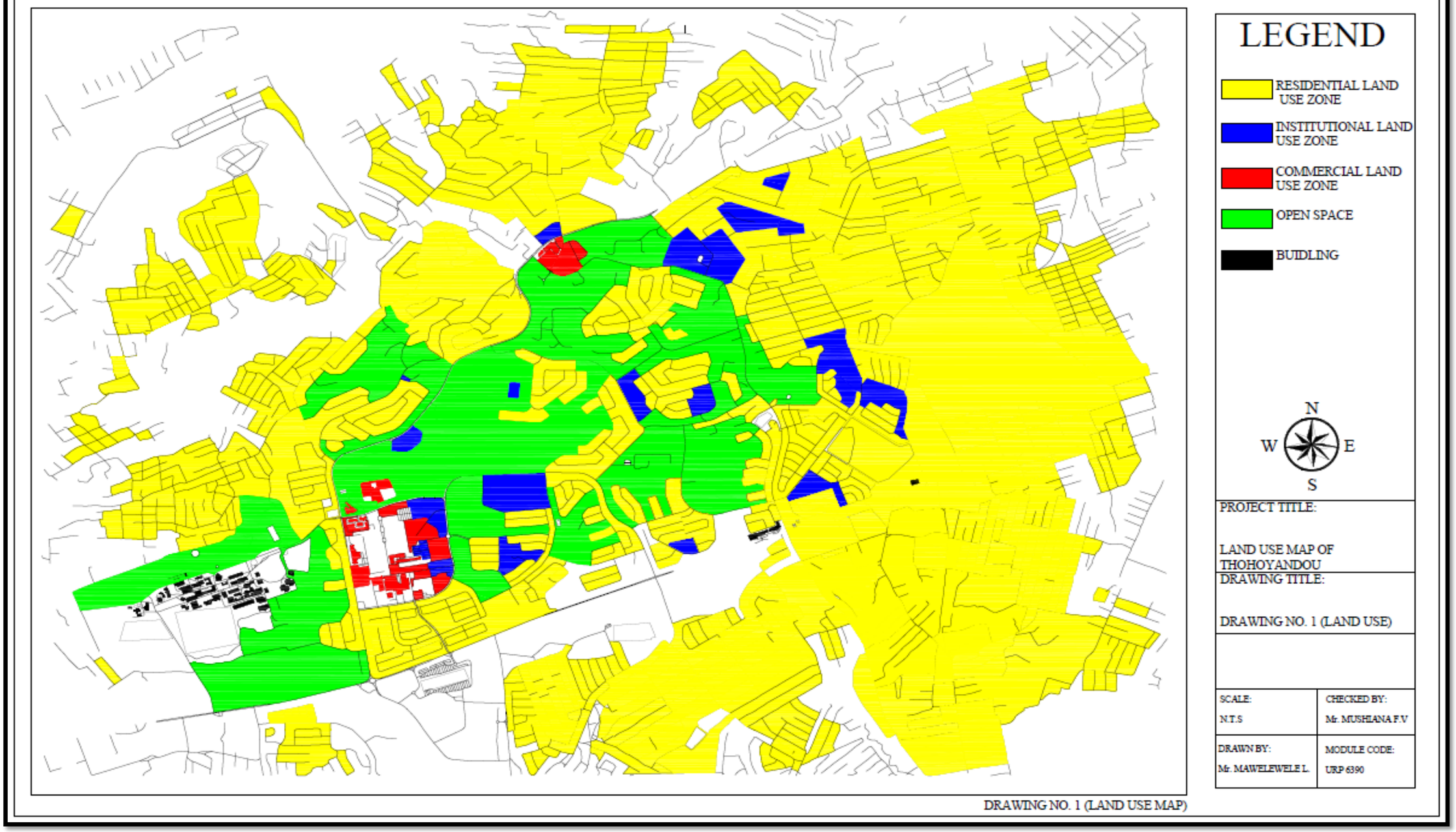


Figure 6. 3: The Land Use map of Thohoyandou town, Drawing no. 1

Source: (Author's construct, 2022)

The discussion under existing land use maps and implications for small freight rural logistics indicated the land use compatibilities and land use zones in the Peri-urban area of the study. It highlighted the dominating and less dominating land uses that exist in the area of the study, together with emphasising the implications for small freight rural linkages. The following section will dwell on identifying the road hierarchy, connectivity, systems maps, and structures that exist within the study area of SMBEs sites.

6.5. Road hierarchy, connectivity, systems map, and structures

6.5.1. Road hierarchy

The Thohoyandou town road network hierarchy is characterised by different interlinked routes. These include the primary road, the primary road A, the district distributor road, the local distributor, the access collectors (with no bus lanes), and lastly access roads. This road network hierarchy is mainly used by the Thohoyandou residents and other commuters traveling around the Thohoyandou CBD and Sibasa CBD to get access to the services provided by the local authority. The hierarchy is distinguished by different classes of roads with their unique widths at a metered distance.

6.5.2. Connectivity

The concept of connectivity or permeability refers to the directedness of road linkages and the densities of connections in a transport network system, (TDM Encyclopaedia, 2009: p.1). The connectivity conceptualisation is an important emphasis to be highlighted and understood so that it can be interpreted for the small rural freight logistics and smart transportation planning, and design for the provision of planning for communities. And to promote sustainability, particularly focusing on strategies in designing new truck inns, logistics hubs, and trans-shipment hubs. In the SMBE perspective, the access and mobility capacity in transport planning for freight corridors carriageway capacity is to highlight how the connectivity concept is in relation to the elements of (vacant space, open space, and the built fabric) in the context of a given settlement, at different physical scales, (Hilty et al, 2006: p.1).

6.5.3. Systems map and structures

The mapping techniques applied in the diagram are the design of the existing road network system, in its hierarchical structure. It shows the service points, the structures, Primary Road A, and Access collector roads.

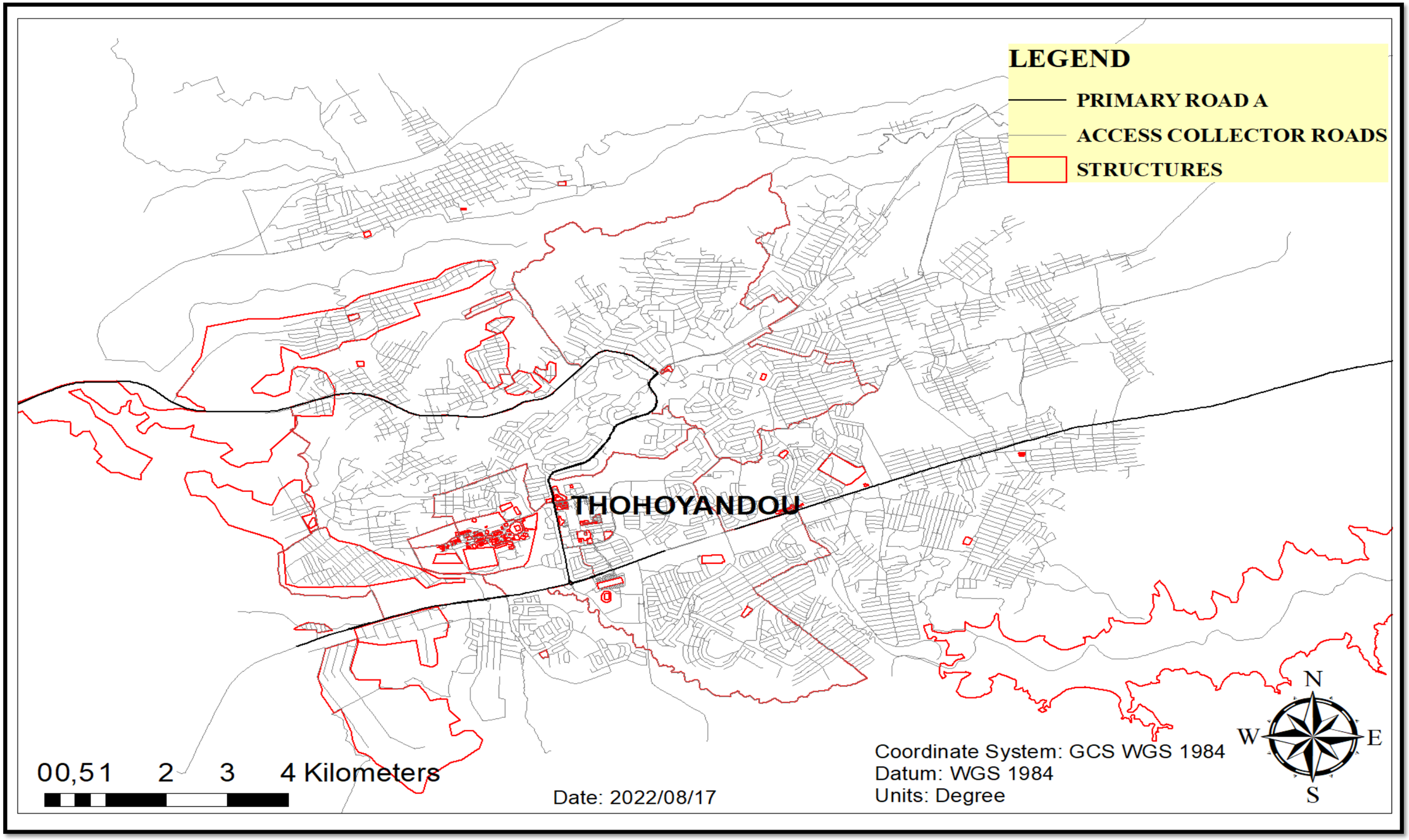


Figure 6. 4: The road hierarchy, connectivity, and structures map

Source: (Derived from the ArcMap 10.8 version, 2022)

The road hierarchy, connectivity, and structures map indicated the primary road A as the major road for the study area. The road is mainly utilised by the commuters, followed by the road classes ranging from access roads to access collector roads. The structures are highlighted in red polygons including the water body of Nandoni dam. The following section focuses on the travel times and the determination of the Euclidean distance indicating the distance between points of the SMBEs and the point of the Thohoyandou CBD post office.

6.6 Travel times and the Euclidean distance map of the study area

According to Biliyamin and Absode (2012: p.19), "traffic congestion increases travel time and trip delays, thus contributing towards high logistics costs, travel expenses and costly distances". In respect to the previous statement, a travel time impact study analysis determines the amount of time required to travel from one point to another on a given route. The Euclidean distance gives the closest proximity of the SMBEs in (km) as the destination to the Thohoyandou CBD (post office) as the origin. In conducting such an analysis study, information may also be collected on the locations, durations, and causes of delays.

Figure 6.5: below indicates the Euclidean distance analysis map under the spatial analyst tool application for the determination of the closest proximities of the distances between each SMBE and the CBD post office. What was analysed was the travel time that it took when traveling from the CBD origin to the SMBEs locations. Also, the Euclidean distance was also calculated using the ArcMap 10.8 version to determine the distance it took to arrive at the SMBEs site when traveling from the CBD post office.

Table 6.1: Shows the travel time in minutes and travel distance in kilometres when driving from the SMBEs site to the CBD post office.

Table 6. 1: Travel time in minutes and travel distance in kilometres

Small-medium brick manufacturing enterprises	Travel time in (minutes) from the SMBE site to the CBD	Distance in (km) from the SMBE site to the CBD
The Lufule 1 brick makers enterprise	17 (min)	8.8 (km)
Gokolo bricks enterprise	17 (min)	9.4 (km)
The corner sand and brick supply enterprise	14 (min)	7 (km)
Young Xing brick yard enterprise	7 (min)	3.3 (km)
Vhavenda bricks enterprise	9 (min)	4.3 (km)
Mami group enterprise	12 (min)	5.9 (km)

Dithuse brick yard enterprise	7 (min)	3.9 (km)

Source: (Author's construct, 2022)

Table 6.1: above indicated each SMBE's travel times and distances which they share with the Thohoyandou CBD.

A MAP SHOWING THE EUCLIDEAN DISTANCE PROXIMITY OF THE SMBEs NEAR THE CBD CENTRAL POINT

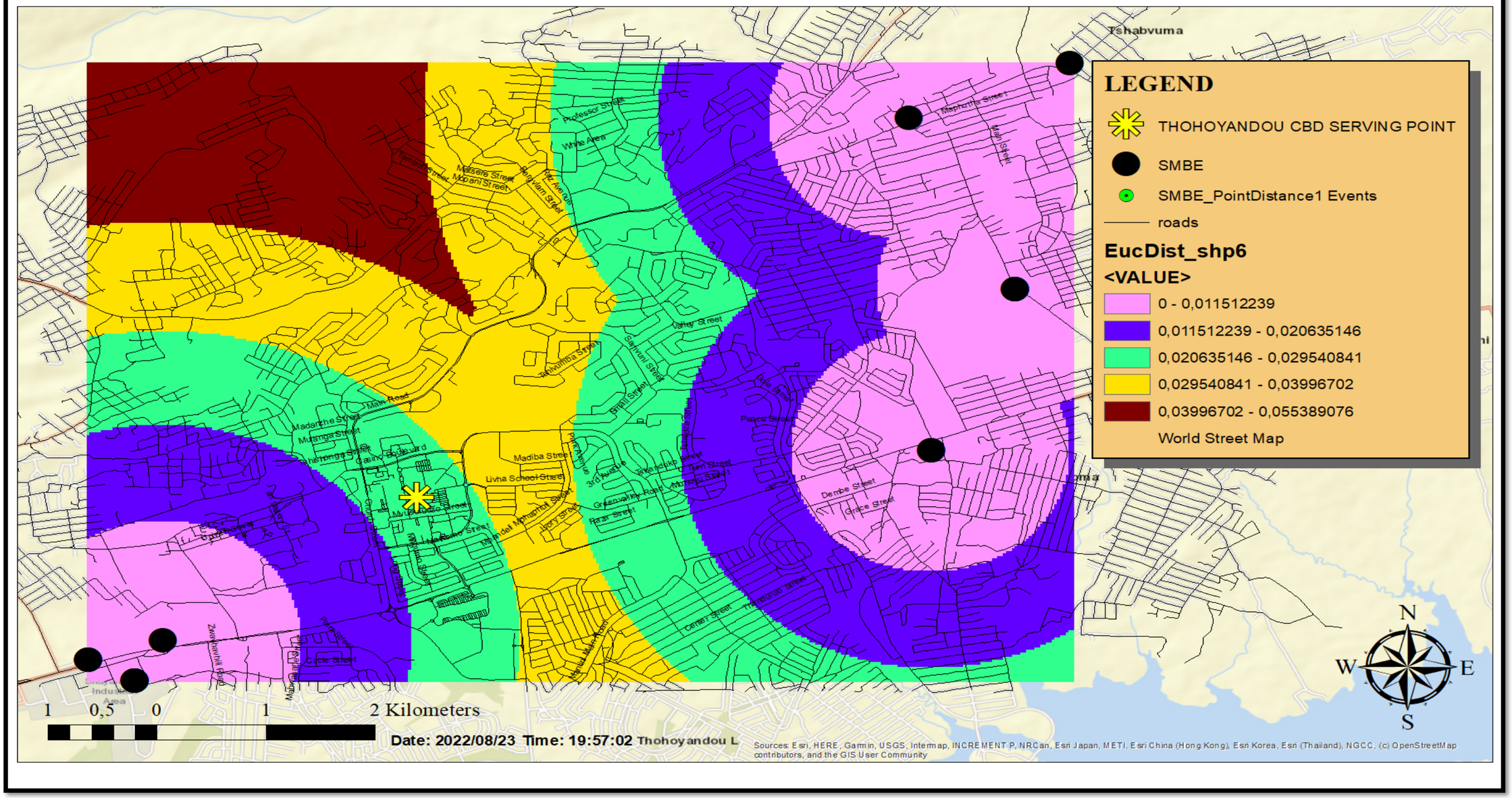


Figure 6. 5: The Euclidean distance analyst map.

Source: (Author's construct, using ArcMap 10.8 version, 2022)

The above Map representation showed that the Euclidean distance between the point of SMBEs and the point of the CBD post office can be determined to measure the distance between similar points of origin to the point of destination. The following section will focus on the determination of the spatial distribution analysis of the SMBEs and their locations in the 12 km radius within the study area.

6.7 Spatial distribution of the small-medium brick manufacturing enterprises

The establishment and development of small businesses is one of the strategies that local governments should consider in various rural and urban areas of South Africa and other countries. In this strategy, the employer is responsible for initiation in the new company's own environment, using the existing premises and creating jobs for themselves and sometimes for others, so that the complex tasks of the owner are easily controlled and facilitated (Simeon, 2009: p. 1453-1464). From an economic perspective, small and medium-sized enterprises are a means of economic and social growth and can effectively reduce unemployment by creating new job opportunities (Sa 'di, 2013: p. 1-58). Small and medium-sized brick-making companies belong mainly to the private sector and industry, some are regulated by law, some are not at all. The definition of small and medium is variable and depends on the type of activity or the country considered.

Small-medium-sized brick manufacturing companies are the main actors in the global construction industry. Figure 6.6: below presents the study analyses through spatial analysis application for the geographic representation of the small-medium brick enterprises in the Peri-urban area of Thohoyandou town. That is studied with an emphasis on strengthening the competitive advantage and increasing the opportunities for other local authorities to invest in these enterprises and help grow their value chains performance through collaboration and opening opportunities for more businesses to be established which are similar to the SMBEs. The map below shows the systematic cluster distribution analysis of the spatial location of the SMBEs. In which the spatial cluster distribution development approach of the enterprises especially in the physical planning and construction sector as a driver of socio-economic impact, has been based on two foundations of the enrichment and sustainability of the stakeholder participation approach and the public participation approach which yield (people-based decision-making outcomes).

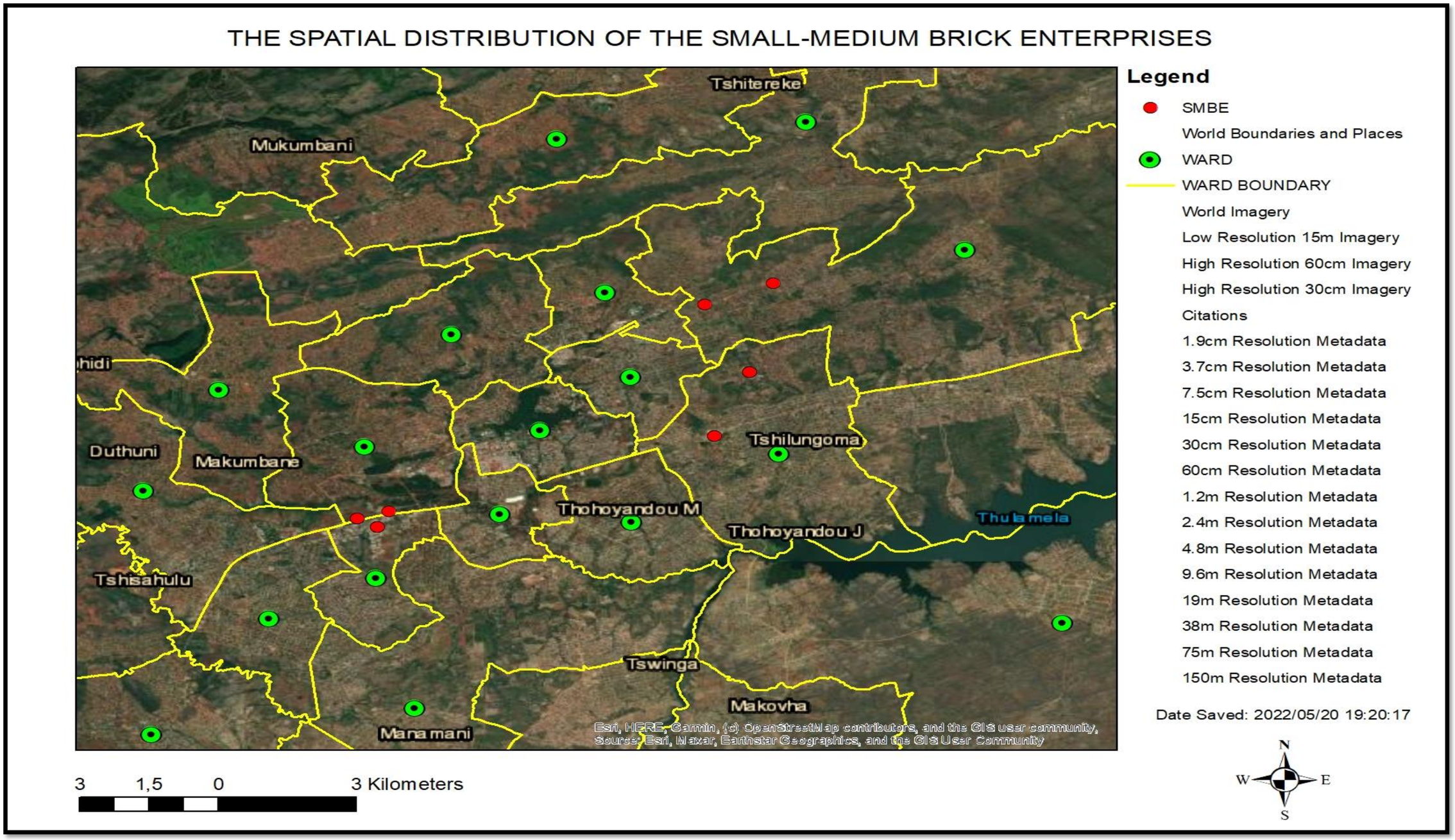


Figure 6. 6: The Spatial Distribution of the Small-Medium Brick Enterprises

Source: (Derived from ArcMap 10.8 version, 2022)

The preceding section elaborated on the notion and relevance of the spatial distribution of the SMBEs, in this case, the distribution map showed the point of location for each of the seven SMBEs. This then gives the local authority to open more opportunities and collaboration with the SMBEs to become more competitive and strategic. The following section will involve the study area's geographic and spatial constraints, highlighting the challenges for future development expansion in the Peri-urban area of Thohoyandou town.

6.8 Geographic and spatial constraints in the study area

6.8.1. Geographic-Spatial constraints and advantages in Thohoyandou town

There is a lack of land for Peri-urban development or Peri-urban expansion within the Thulamela Local Municipality (Thohoyandou town) which can cater to business development within the proclaimed areas of the municipality. This is an issue, when we look in terms of developing our logistics enterprises and their facilities, where they handle, load, off-load, store, and distribute their locally produced and manufactured products and goods. Even some enterprises, especially small-medium brick manufacturing enterprises, are poorly situated and located. For example, you might normally find a brick manufacturing enterprise adjacent to the major distributor road, where it is not supposed to be located. The lack of land for logistics enterprise development in proclaimed areas will hinder the growth and development of logistics infrastructure and hubs or facilities for future development within Thohoyandou town, (Thulamela Municipality IDP 2020/21 – 2022/23: p. 315-317).

Despite the lack of land for further development expansion within and around the Thohoyandou Peri-urban region, there are opportunities that it presents in terms of locating local manufacturing enterprises, industrial sites for food processing, service delivery opportunities, for rezoning purposes, and processing of change of land use zones. The spatial advantage of the study area (Thohoyandou) presents the planning for infrastructure development within the study area in which, the road can be prioritized for maintenance for logistical purposes, freight movement, and mobility within the transport logistics perspective, (Thulamela Municipality IDP 2020/21 – 2022/23: p. 315-317).

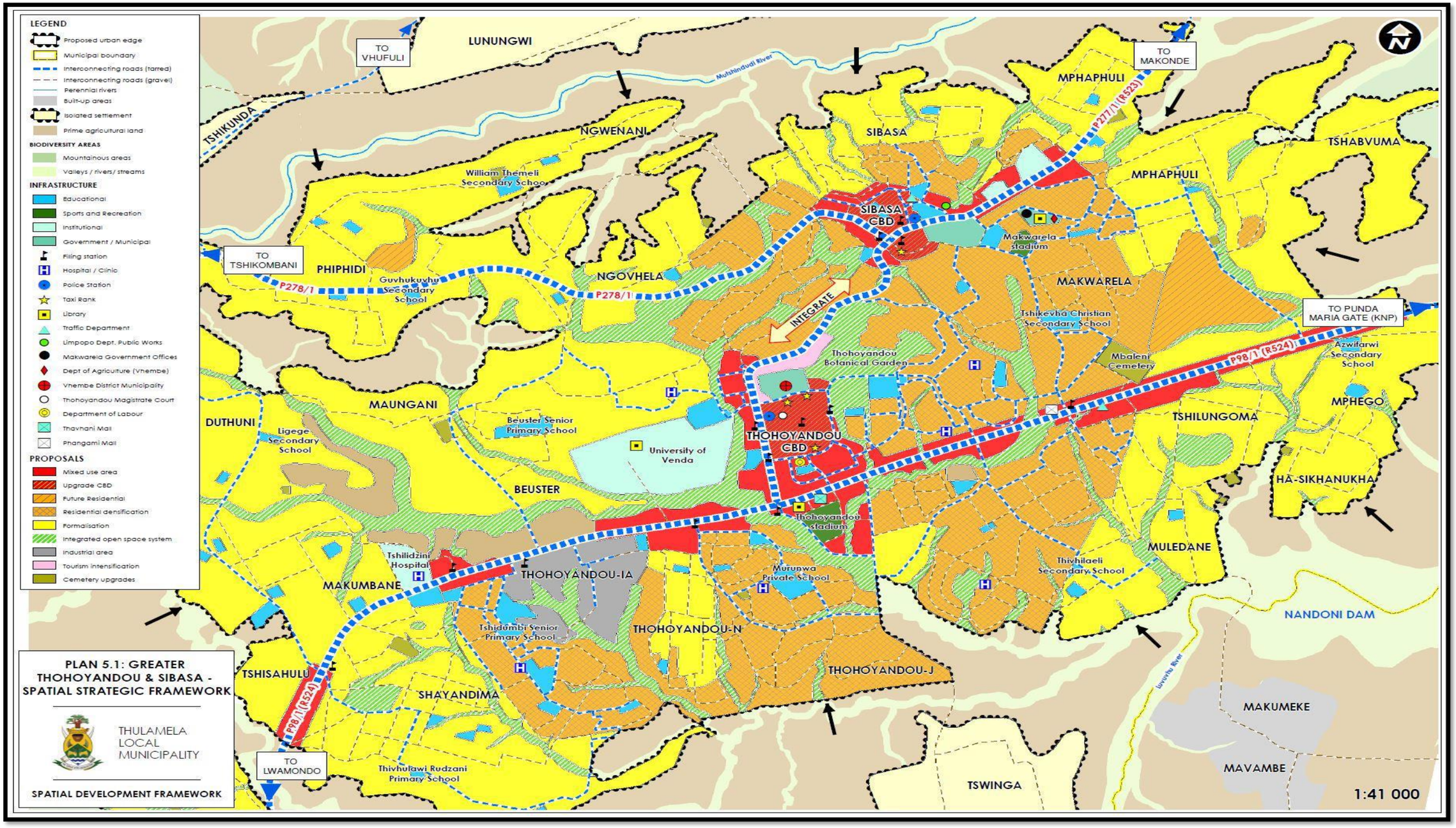


Figure 6. 7: Greater Thohoyandou and Sibasa Spatial Strategic Framework

Source: (Derived from Thulamela Local Municipality DRAFT20IDP.20BUDGET202020.2120–202022.23/SDF)

The preceding section involved a discussion and a map of the spatial challenges of the study area's geographic and spatial arrangements, highlighting the challenges for future development expansion in the peri-urban area of Thohoyandou town. The following section will focus on the transport logistics and profiling in the study area indicating the demographic profile of Thohoyandou town, the transport freight logistics situation in Thohoyandou town in the Vhembe District Municipality, the state of transport logistics hubs and facilities in Thohoyandou town and the Thohoyandou CBD land use situation.

6.9 Transport logistics and profiling in the study area

6.9.1. Demographic profile of Thohoyandou town

The study being conducted is covering the geographical area of Thohoyandou, a small town within the boundary of the Thulamela Local Municipality. In this study, Thohoyandou town was the former capital of the Bantustan of Venda. It was built in the late 1970s; it was proclaimed the capital of the Venda nation when Venda was established in 1979. The name Thohoyandou means “head of the elephant”, and is taken from the name of king Thohoyandou, who ruled the Vhavenda kingdom in the early 1700s. The GPS coordinates of Thohoyandou are L 22.9758 5, L 30.4717 6, its population is estimated to be 69453, with a household number of 17345 (406.94 per km^2). Thohoyandou area covers (1629.48 km^2). It has a 52% of females and 48% of males, the first language is Tshivenda at 84.7%, and other languages at 9.4%, (Census 2011, GIS DVD).

Table 6.2 below is showing the demographic profile of Thohoyandou town distinguishing the percentages in racial makeup and different ethnic groups found within Thohoyandou.

Table 6. 2: The demographic profile of Thohoyandou town

Racial makeup (2011 Census)		**First languages**	
Black African	95.5%	Venda	84.7%
Coloured	0.2%	Tsonga	2.6%
Indian/Asian	4.2%	English	2.1%
White	0.2%	Northern Sotho	1.2%
Other	0.1%	Other	9.4%
Total	100.2%		100%

Source: (Census 2011, GIS DVD)

The table above showed the profiling of Thohoyandou town highlighting the racial makeup and different ethnic groups distinguished by their percentages within Thohoyandou town.

6.9.2. Transport freight logistics situation in Thohoyandou town, Vhembe District Municipality

Several authors e.g. (Mashiri & Naude, 2006; Chakwizira et al., 2008; Chakwizira & Mashiri, 2009; 2012) argued that "The purpose of the Freight Logistics Strategy is to inform the Vhembe District Municipality (VDM) of the transport logistics situation occurring within Thohoyandou town, and other towns such as Musina and Makhado in terms of type, origin, and destination of freight products such as brick products, condition and capacity of key corridors, and intervention measures required to address any bottlenecks that might be there". The Freight Logistics Strategy considers the complete supply and value chain processes involved in freight logistics of brick products movement from, intra, inter, and through the district. Vhembe District Municipality is faced with the following freight logistics challenges wherein some challenges are affecting the transport logistics state of Thohoyandou town due to the low capacity of corridor development that is used to carry truckloads, namely:

Extensive freight congestion contributes little to the district's economic growth; the intrusion of trucks into the district's road network has a significant negative impact on the condition and lifespan of the road network and poses a major threat to the transport logistics sector existing in Thohoyandou town; the widespread use of head loading, backloading for freight transport; the lack of limited trucking companies and systems; poor monitoring and evaluation, fragmented responsibility for freight planning and lack of logistics infrastructure; a formal and informal economy leading to a dualistic logistical divide; Poor access to markets resulting in high freight transportation and logistics costs; underdeveloped rural freight markets; and the lack of appropriate institutional cargo structures, among other challenges (Chakwizira et al., 2008; Chakwizira & Mashiri, 2009; 2012).

6.9.3. The state of transport logistics hubs and facilities in Thohoyandou town

One of the main reasons for provincial concern in dealing with the impact of large numbers of cargo vehicles on provincial roads is the lack of parking facilities, fuel stations, driver rest, toilets and sanitation facilities and the impact these have on the environment (The informal Truck stops in Thohoyandou are inadequate for the level of truck traffic, (National Department of Transport, 2011; NATMAP 2050). There are limited logistics hubs for the storage of manufactured brick products even on the site of the SMBEs, there is limited space for occupying the products. The logistical facilities such as truck inns, distribution centres, and

warehouses are still not adequately provided for the brick manufacturing logistics enterprises in Thohoyandou town. The Buying point Trans-shipment hub needs to be allocated as development proposals. A local market trans-shipment hub also needs to be proposed. The District Market Trans-shipment hub for the Vhembe District Municipality is still not developed nor rather proposed to cater for the logistics transportation of brick products in Thohoyandou town, (Department of Transport, 2007; Sieber, 2011).

6.9.4. Thohoyandou CBD land use situation

Below is a scheme map that has been derived from the Umsebe Development Planner's Database of 2020 under the Thulamela Local Municipality land use scheme, indicating the existing land uses within the Thohoyandou (CBD) and the surrounding neighbourhoods. It shows the land use connectivity, compatibility, and situation existing in the land use zones. And the spatial situation of the road network.

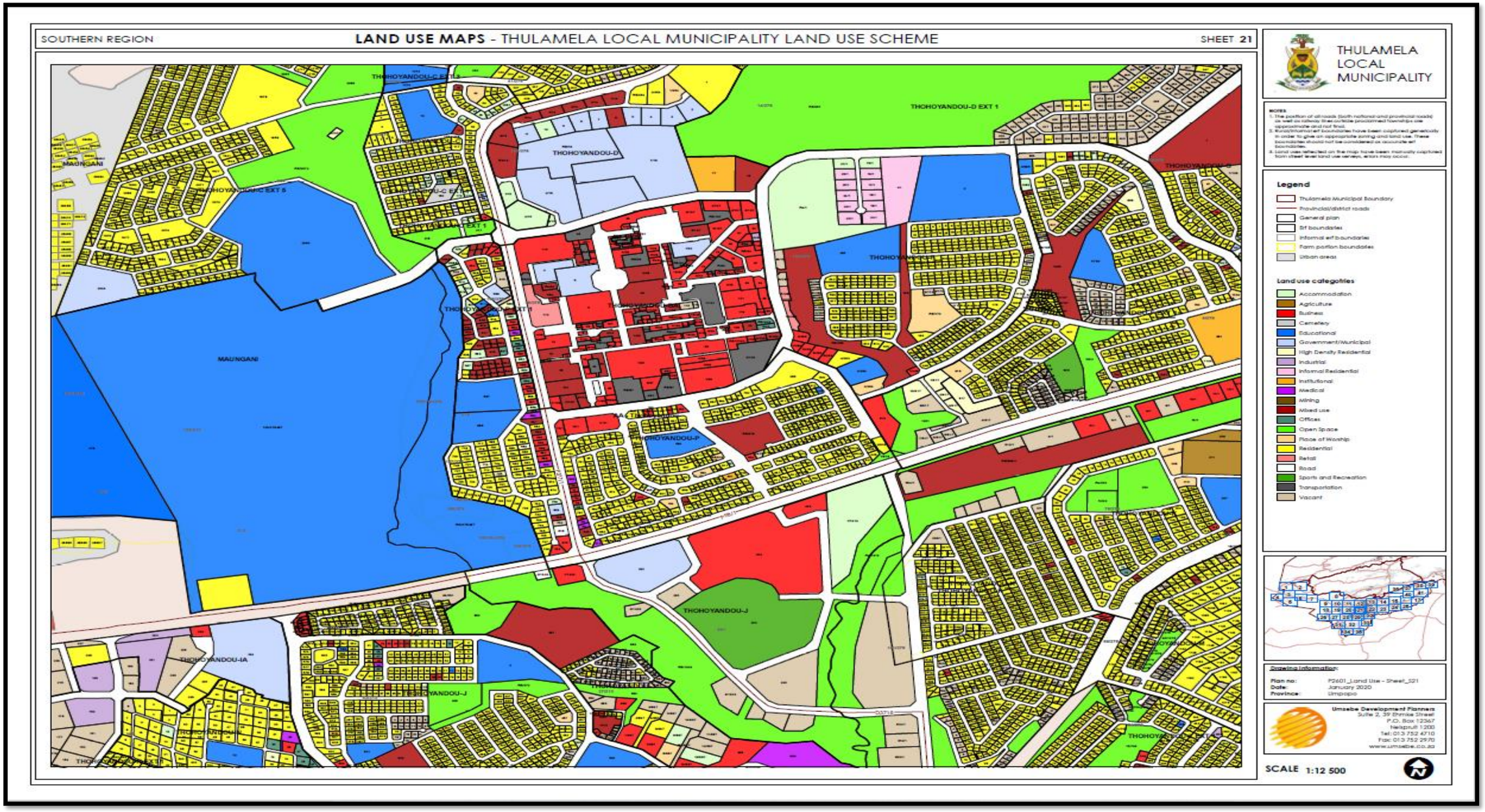


Figure 6. 8: Land use map of the study area– Thulamela Local Municipality Land Use Scheme

Source: (Derived from Umsebe Development Planners Database, 2020)

The land use scheme map above shows the agricultural site, educational use, government/municipal properties, industrial 1 to 2, institutional, protected areas, open space, quarrying and mining, residential 1 to 3, road, rural residential, rural settlement, tourism, and accommodation and lastly utilities and services.

The previous section involved a discussion and a map of the spatial challenges of the geographic and spatial arrangements in the study area highlighting the challenges for future development expansion in the Peri-urban area of Thohoyandou town. The following section will focus on the overall chapter summary.

6.10 Chapter summary

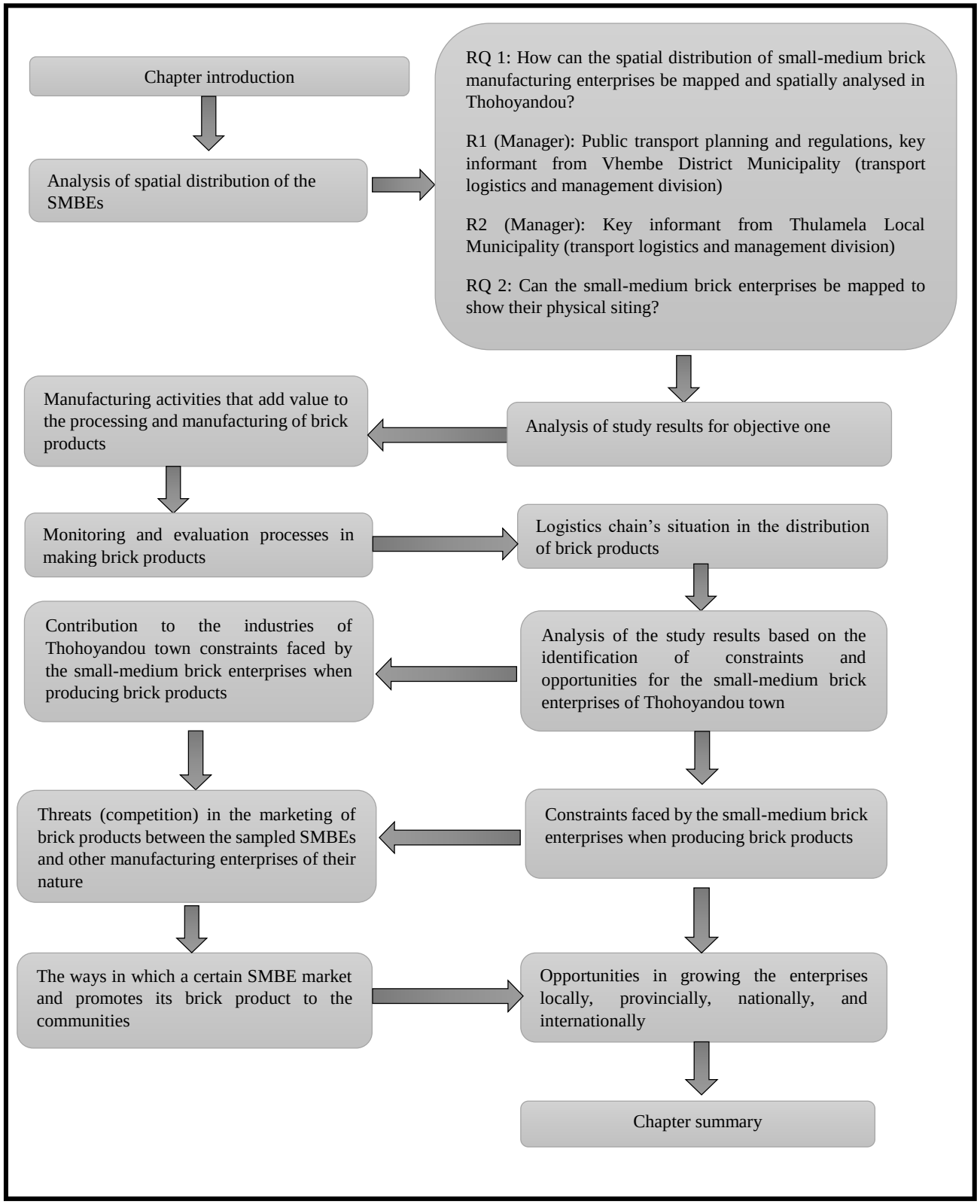
Chapter 6 detailed analysis of the study area, it presented the focus of map work analysis, spatial analysis, and configuration of the land use compatibility. It features, the contents of the chapter which are comprised of a chapter outline, an introduction, the geo-physical environment of the study area, an analysis of the existing land use maps, and implications for small freight rural logistics, the study chapter has also shown road hierarchy, connectivity, systems maps, and structures, together with the travel times and distances from the Thohoyandou central business district to the SMBEs, spatial distribution of the small-medium brick manufacturing enterprises, the geographic and spatial constraints in the study area, transport logistics and profiling in the study area, and lastly chapter summary.

CHAPTER SEVEN: EXPLORING THE SPATIAL LOGISTICS OF SMALL-MEDIUM BRICK ENTERPRISES - CONSTRAINTS AND OPPORTUNITIES

7.1. Chapter Introduction

Chapter seven is dedicated to an analysis of objective one (exploring and mapping) the spatial logistics of small-medium brick enterprises in Thohoyandou town in respect of constraints and opportunities making use of 12 km from Thohoyandou CBD's post-office. The contents of the chapter is comprised of a chapter introduction; an analysis of spatial distribution of the SMBEs; analysis of study results for objective one. As well as manufacturing activities that add value to the processing and manufacturing of brick products; monitoring and evaluation processes in making brick products; logistics chains situation in the distribution of brick products; contribution to the industries of Thohoyandou town constraints faced by the small-medium brick enterprises when producing brick products. The analysis of the study results based on the identification of constraints and opportunities for the small-medium brick enterprises of Thohoyandou town will also be discussed. Then the constraints faced by the small-medium brick enterprises when producing brick products; threats (competition) in the marketing of brick products between the sampled SMBEs and other manufacturing enterprises of their nature; the ways in which a certain SMBE market and promotes its brick product to the communities; opportunities in growing the enterprises locally, provincially, nationally, and internationally and lastly chapter summary will also be discussed and interpreted. These will be highlighted in the respect to data findings. Figure 7.1 below outlines the structure of chapter seven.

Figure 7. 1: The structure layout of chapter seven



Source: Author's construct, (2022)

Figure 7.1. above indicates the construct of chapter six structure layout. Chapter seven comprises of thirteen components namely: a chapter introduction; an analysis of spatial

distribution of the SMBEs; analysis of study results for objective one; manufacturing activities that add value to the processing and manufacturing of brick products; monitoring and evaluation processes in making brick products; logistics chains situation in the distribution of brick products; contribution to the industries of Thohoyandou town constraints faced by the small-medium brick enterprises when producing brick products; analysis of the study results based on the identification of constraints and opportunities for the small-medium brick enterprises of Thohoyandou town; constraints faced by the small-medium brick enterprises when producing brick products; threats (competition) in the marketing of brick products between the sampled SMBEs and other manufacturing enterprises of their nature; the ways in which a certain SMBE market and promotes its brick product to the communities; opportunities in growing the enterprises locally, provincially, nationally, and internationally and lastly chapter summary

The analysis of objective one informs the research study in terms of mapping the spatial distribution of small-medium brick enterprises and an analysis of the existing value chain logistics, to identify constraints and opportunities impacting and impacted within the small-medium brick enterprises in Thohoyandou town. It emphasises and iterates the application of spatial analytical tools as well as the mapping, and the locational analytics perspective in a manner to which how and where the researcher will be able to understand the locational areas of the logistics enterprises. The manner in which the objective seeks to be achieved is based on the fundamentals and significance of the constructive key informant questionnaires that were administered by the researcher to the key informants. These key informants who were identified were from the Thulamela local municipal departments, which is the department of Local Economic Development, planning development, Road, and water services, and lastly housing and electricity. Concerning the Vhembe district municipality, the departments sampled were the Local Economic Development and Transport. In which all key respondents responded and advised where possible based on which matter the research should focus on, the most. The chapter on the analysis of objective one focused on the data collection information gathered from the key informants based on the spatial distribution of SMBEs mapping and spatial analysis applications. The chapter also highlighted the findings of the questionnaire administered, to aid the researcher in making justifications and applying mapping skills, to address the responses provided. The respondents responded on the main variables which gave a certain level of reliability and valid data for analysis purposes. And the variables were formulated as statements in the following manner: constraints faced by the SMBEs in making

brick products; competition with other brick enterprises; the ways in which brick products reach the public; and lastly growing the enterprise locally, provincially, nationally, and internationally. The study results showcase the mean average from the highest to the lowest average.

The introduction indicated, in brief, the contents of the chapter and what each content contributes to the finalising of the chapter, in the case of the introduction having elaborated on what to expect in the chapter, the following section will seek to describe an analysis of objective one.

7.2. Analysis of the spatial distribution of SMBEs

The analysis of objective one informed the researcher on the application of mapping and addressed the need for the application of other GIS components such as QGIS, ArcMap pro, Remote Sensing, and Satellite Navigation Systems as they are used to create maps and enable the researcher to make justifications as well as drawing conclusions, thereafter, based on the data analysis. As well to as evaluate the application of smart logistics for the distribution of the brick products from the point of origin to the point of destination.

7.2.1. RQ 1: How can the spatial distribution of small-medium brick manufacturing enterprises be mapped and spatially analysed in Thohoyandou?

The table below shows and emphasizes the administrative protocols and mandates of conducting proper interviews with specific emphasis on the date and time, number of respondents, and also a place of interview for the KIIs in Vhembe district municipality.

Table 7. 1: The administrative information from the Vhembe district municipality KIIs

DATE:	TIME OF INTERVIEW:	RESPONDENT NUMBER:	PLACE OF INTERVIEW:
04/10/2022	10:45 am-11:05 am	1	Public transport planning and regulations office of Vhembe district municipality
06/10/2022	11:00 am-11:10 am	1	LED office of Vhembe district municipality

Source: fieldwork report, 2022

N=5

7.2.1.1. R1 (Manager): Public transport planning and regulations, key informant from Vhembe District Municipality (transport logistics and management division)

1- (SA) Spatial analysis: the spatial analysis tool is the application of GIS technology and spatial environmental mapping that enabled the researcher to identify it as one of the ways in which the spatial distribution of small-medium brick enterprises can be mapped and spatially configured on a radius of 12 km in Thohoyandou town. According to R1 (Manager within the public transport planning and regulations office in the Vhembe District Municipality fieldwork, 2022), "the spatial analysis tool has been selected as the best way of analysing the spatial conditions and locational areas where the researcher can identify the physical attributes of the SMBEs".

2- (M) Mapping: in terms of R1 (Manager within the public transport planning and regulations office in the Vhembe District Municipality fieldwork, 2022), "mapping was highlighted as the only easy way and most usable approach in geo-referencing the physical environment and mapping the features and also the site characteristics on a geographic representation perspective for the SMBEs in Thohoyandou".

5- (LA) Locational analysis: according to R1 (Manager within the public transport planning and regulations office in the Vhembe District Municipality fieldwork, 2022), "the locational analysis enables the researcher to create a service areas map and network analysis using the network analysist tool to depict the exact locations and geographic positioning of the SMBEs and their distribution spatially".

Below is the map showing the spatial and directional distribution of the Small-Medium Brick Manufacturing Enterprises.

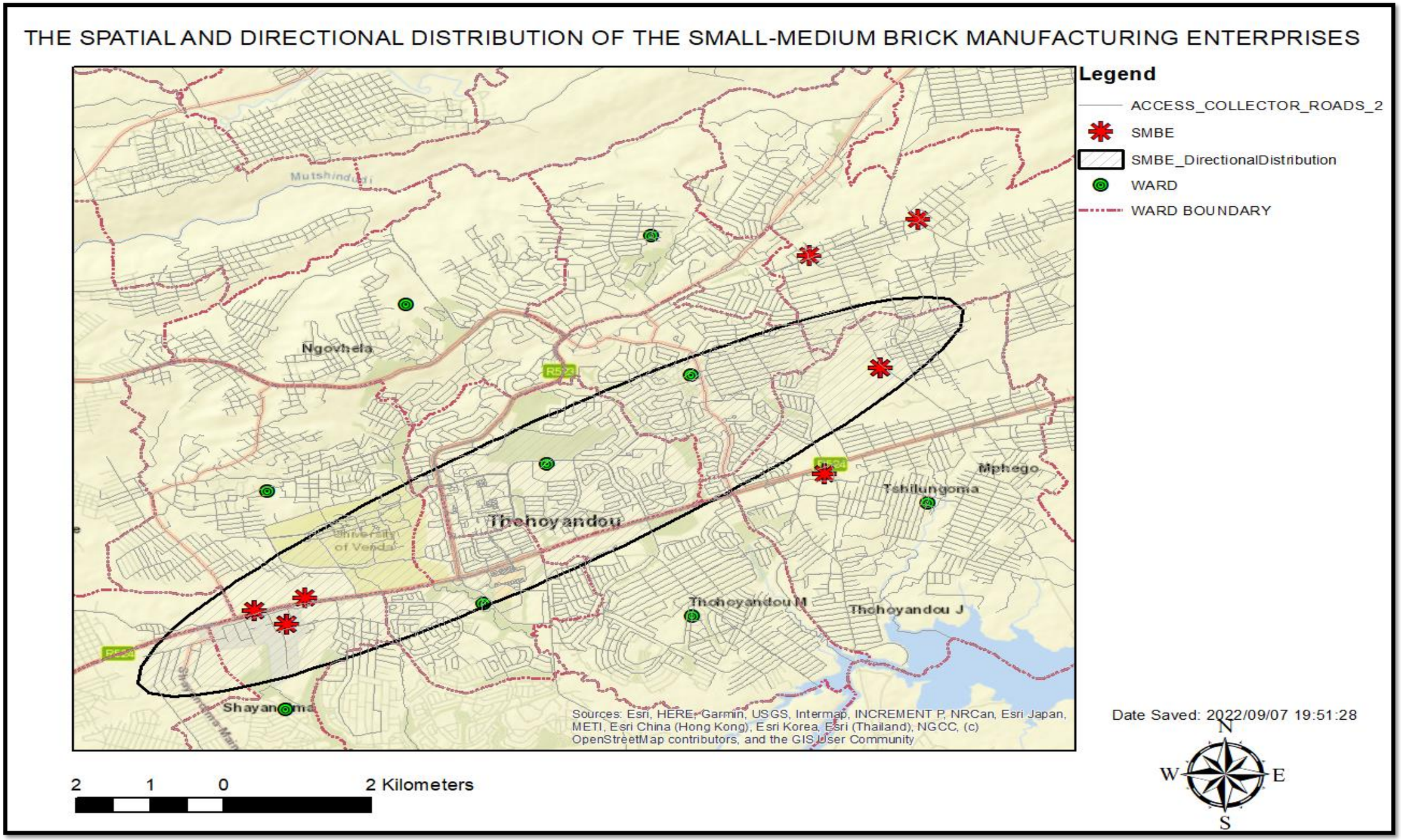


Figure 7. 2: The spatial and directional distribution map of the Small-Medium Brick Manufacturing Enterprises

Source: Authors construct (ArcMap 10.8 version), 2022

Table 7.2. below emphasises the administrative protocols and mandates of conducting proper interviews with specific emphasis on the date and time, number of respondents, and the interview place for the KIIs in Thulamela local municipality.

Table 7. 2: Administrative information from Thulamela local municipality KIIs

DATE:	TIME OF INTERVIEW:	RESPONDENT NUMBER:	PLACE OF INTERVIEW:
15/09/2022	11:28 am-11:00 am	1	Thulamela local municipality office no. 120 housing
16/09/2022	10:45 am-11:07 am	1	LED department at Thulamela local municipality
16/09/2022	12:15 pm-12:23 pm	1	Technical services surface roads department at Thulamela local municipality

Source: fieldwork report, 2022

N=5

7.2.1.2 RQ2 (Manager): Key informant from Thulamela Local Municipality (transport logistics and management division)

1- (SA) Spatial analysis: the spatial data which was analysed was from the key informant from the Thulamela local municipality. R2 emphasized the matters of looking into the main routes of the corridors along the Punda maria road, which are the R524 and R523 routes. The distance from the location of the SMBEs and the service areas was found to be spatially representative of locating the brick manufacturing enterprises in a 2 km radius. The spatial analysis aided in understanding the demographics of the population density and the need to consolidate the new development opportunities for new brick manufacturing enterprises' establishment purposes in the transport logistics industry of Thohoyandou town. The spatial analysis aided in identifying routes that serve the enterprises and the service areas within a metered distance of a 2 km radius.

2- (M) Mapping: mapping was selected as the main and default mechanism for identifying the geographic advantages and locations of the SMBEs within the Thohoyandou town region.

5- (LA) Locational analysis: locating the areas of the SMBEs and where there are possibilities for future investments and new business establishments, is the most advanced way of providing the local authorities with the need for accessing services offered by the SMBEs.

Below is the spatial location of the SMBEs and their measured service areas in a 2 km radius.

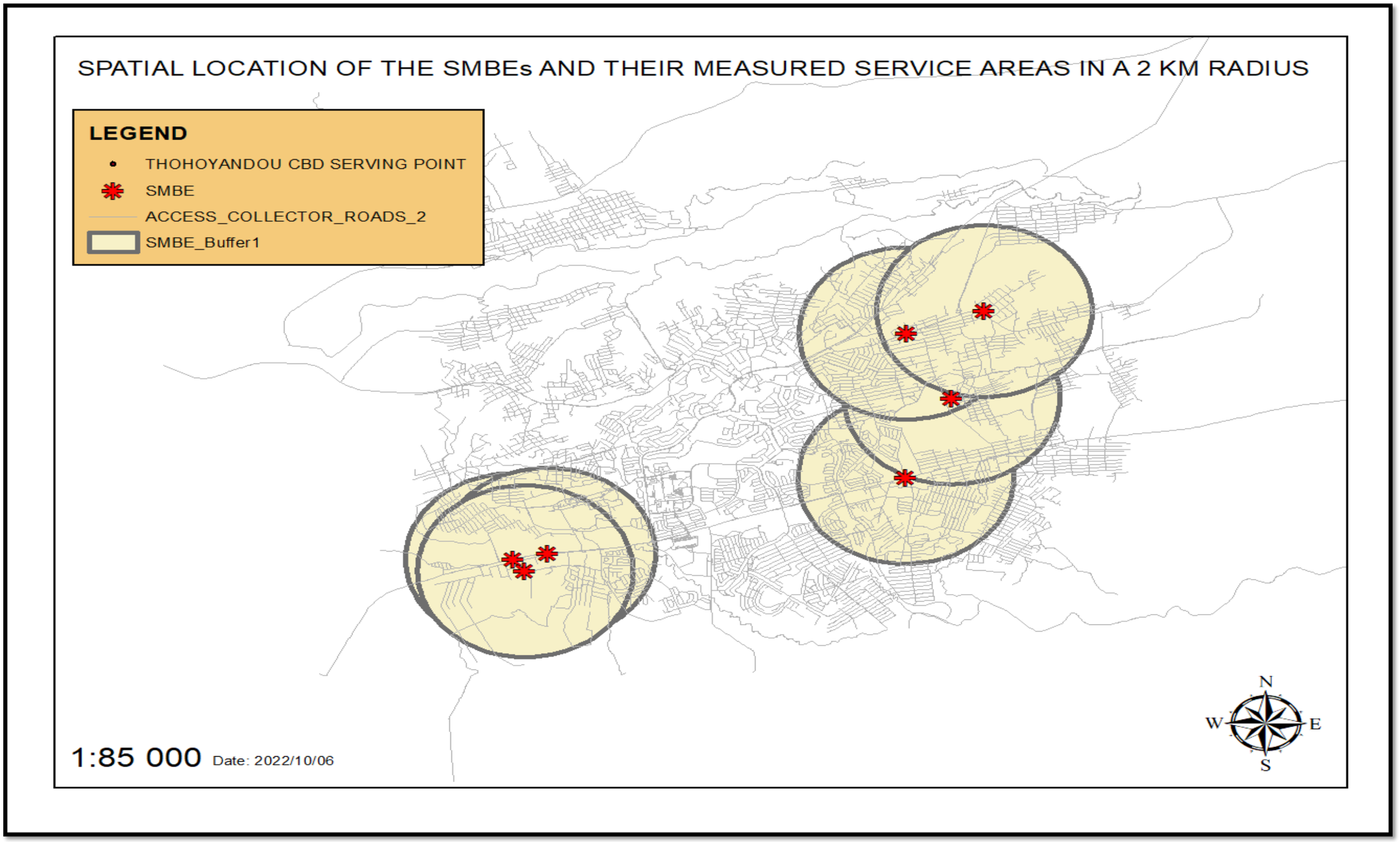


Figure 7. 3: The spatial location of the SMBEs and their measured service areas on 2 km radius

Source: Author's Own Construct (ArcMap 10.8 version), 2022

7.2.1.3 RQ 2: Can the small-medium brick enterprises be mapped to show their physical siting?

Yes, this can be done through locational analysis mapping and spatial configuration mapping on a radius of 12 km covering all sampled populations of the small-medium brick enterprises.

The table below highlights the variables of objective one analysis: spatial analysis, mapping, and locational analysis as well as the corresponding respondents, and the percentages in total for each respondent.

Table 7. 3: The Spatial configuration analysis on a radius of 12 km

		Number of respondents	Percentage of respondents	Valid Percent	Cumulative Percent
Variables	**Spatial analysis**	2	33.3	33.3	33.3
	Mapping	2	33.3	33.3	66.7
	Locational analysis	2	33.3	33.3	100.0
	Total	6	100.0	100.0	

Source: author's fieldwork, 2022

Sample: N=6

The locational analysis and spatial configuration map were done within a 12 km radius, showing the location of the SMBEs and the Thohoyandou post office as the central point of the configured radius. The spatial configuration map also shows how to navigate along the routes and find the geographic locations of the SMBEs. The 12 km radius has significantly covered areas ranging from long to short-distance travel to the SMBEs premises. These areas are, (Thohoyandou M, Tshilungoma, Thohoyandou J, Tswinga, Vhufuli, Makovha, Manamani, Mathule, Tshisaulu, Duthuni, Mapate, Phiphidi, Mukumbani, Sibasa, and lastly Tshitereke). These areas are potential drivers of the economic growth point of the Thulamela local region when it authorises the development of small-medium brick manufacturing enterprises through the application of smart value chain logistics. Below is a locational analysis and spatial configuration map on a radius of 12 km from the post office as the central point.

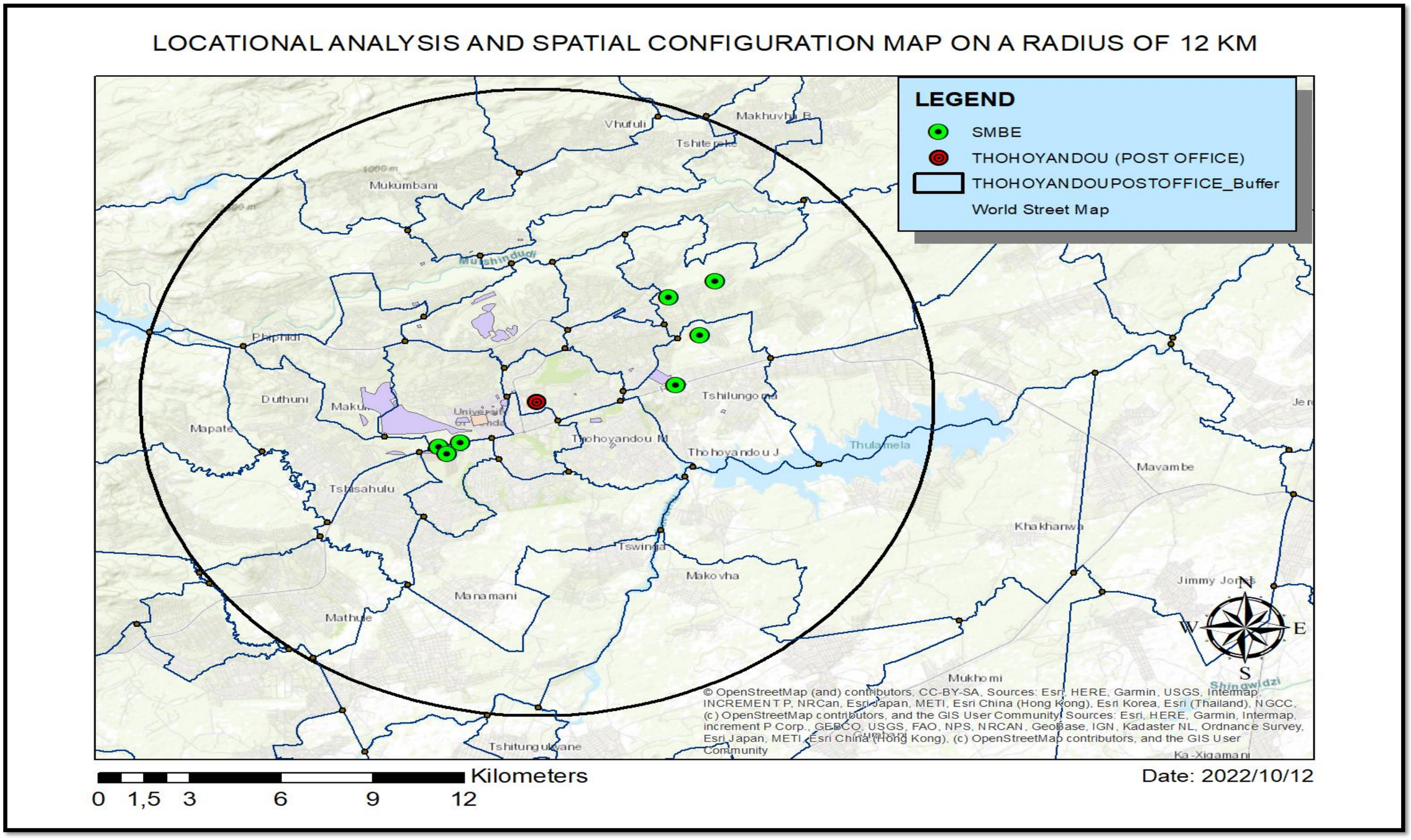


Figure 7. 4: The locational analysis and spatial configuration map on a radius of 12 km.

Source: Author's construct (ArcMap 10.8 version), 2022

The previous section involved a discussion on the responses from R1 (Manager): Public transport planning and regulations, a key informant from Vhembe District Municipality (transport logistics and management division), and responses from R2 (Manager): Key informant from Thulamela Local Municipality (transport logistics and management division**)** in the analysis of objective one. The following section will focus on the overall chapter summary.

7.3. Analysis of study results for objective one

The analysis is key in validating the respondents' responses regarding activities that add value to the brick products, monitoring and evaluation processes in making brick products, logistics chains' situation in the distribution of brick products, and contribution to the industries of Thohoyandou town. The study results showcase the mean average from the highest to the lowest average. What will be discussed in this section will be the existing value chain logistics used by the small-medium brick manufacturing enterprises in Thohoyandou town.

Table 7.4 below depicts the analysis of objective one which highlights the analysis of the existing value chain logistics as applied by the small-medium brick manufacturing enterprises in Thohoyandou town.

Table 7. 4: Analysis of objective one variables

Variables		Activities that add value to the brick product	Monitoring and Evaluation processes in making brick products	Logistics chain's situation in the distribution of brick products	Contribution to the industries of Thohoyandou town
	Valid	7	7	7	7
	Missing	0	0	0	0
Mean		4.57	1.14	3.71	1.43
Std. Error of Mean		.719	.143	.474	.297
Mode		3[a]	1	4	1
Std. Deviation		1.902	.378	1.254	.787
Variance		3.619	.143	1.571	.619
Skewness		-.154	2.646	-.682	1.760
Std. Error of Skewness		.794	.794	.794	.794
Range		5	1	3	2
Maximum		7	2	5	3

a. Multiple modes exist. The smallest value is shown

Source: author's field data, (2022)
Sample: N=7

The table 7.4 above shows that there are 7 valid responses, zero missing responses, average mean, standard deviation, mode, variance, skewness, standard error of skewness, range, and maximum values. In this tabulated analysis, the average mean which is the highest is 4.57 on activities that add value to the processing and manufacturing of brick products. This means that the activities that add value to the product are fundamental and essential in the making of brick products, they add significant value from processing of raw materials to finished brick products.

The above section was on the introduction to analysis of objective two which reflected on the analysis of the existing value chain logistics used by the small-medium brick manufacturing enterprises. The following section identifies the main activities involved in adding value to the processing and manufacturing of brick products within the SMBEs.

7.4. Manufacturing activities that add value to the processing and manufacturing of brick products

The analysis of this section is to identify the main activities or activity that engage in adding value to the processing and manufacturing of brick products within the SMBEs. Out of cost-benefit analysis, investment, pricing strategies, logistics activities, value chain activities, and lastly (all of the above), the majority of value chain activities were (all of the above) and (pricing strategies) that add value to the processing of raw materials into manufactured brick products.

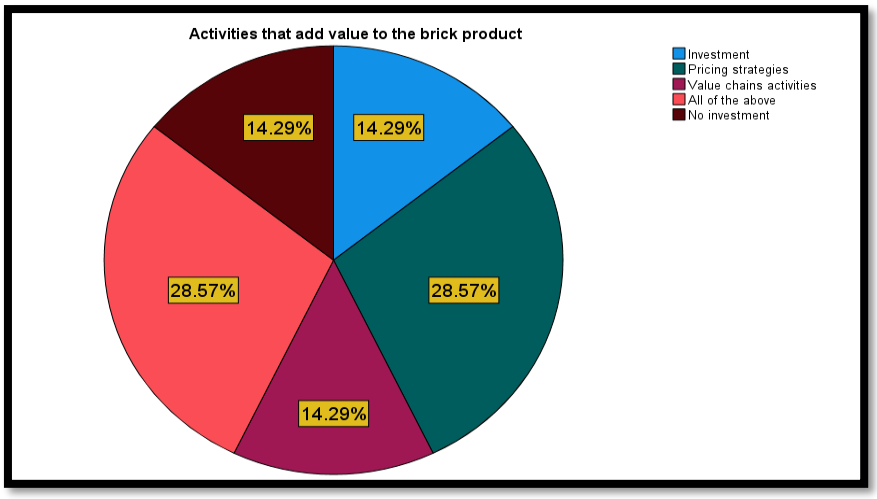


Figure 7. 5: Activities that add value to the brick product

Source: Author's field data, (2022)

Sample: N=7

Figure 7.5. above shows that (28.57%) were all of the above-mentioned activities and (28.57%) were for pricing strategies, where both of them add a significant value when processing and manufacturing brick products. Only (14.29%) were "no investments", (14.29%) of value chain activities, and (14.29%) of investments that add little value to the processing and manufacturing of brick products to most brick-making enterprises.

The above section identified the main activities that are involved in adding value to the processing and manufacturing of brick products within the SMBEs. The following section will be based on the performance of monitoring and evaluation processes of manufacturing brick products.

7.5. Monitoring and evaluation processes in making brick products

The analysis of this section is based on the performance of monitoring and evaluating processes of manufacturing brick products. A key informant questionnaire was administered to the attention of the key respondents from the seven SMBEs in regard to identifying if whether they do monitor and evaluate the process of manufacturing brick products. The respondents responded on the 'yes' or 'no' options. The study results of the data has shown that, the majority of the SMBEs do actually monitor and evaluate the process of manufacturing brick products. Figure 7.6 on the monitoring and evaluation processes in making brick products, is as follows:

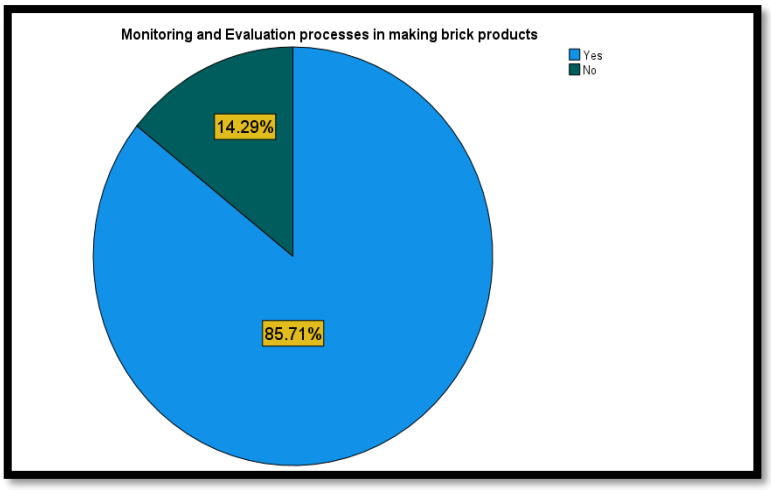


Figure 7. 6: Monitoring and evaluation processes in making brick products

Source: Author's field data, (2022)

Sample: N=7

Figure 7.6. above shows the majority of respondents validating that they do monitor and evaluate processes in making brick products at (85.71%) and others responding that they are not responsible for monitoring and evaluating the processing of inputs into finished brick products at (14.29%).

The above section was based on the performance of monitoring and evaluation processes of manufacturing brick products, where the majority of respondents validated that they do monitor and evaluate processes in making brick products. The following section will be based on identifying the types of existing logistics chains as applied in the delivery and distribution of brick products.

7.6. Logistics chain's situation in the distribution of brick products

The analysis of this section is to identify, the types of existing logistics chains as applied in the delivery and distribution of brick products for the local communities by SMBEs. From the value-added chains, supply chains, value chains, transport network and to all of the above, only supply chains, transport network and all of the above were key responses which were identified by the respondents. Figure 7.7 below on the logistics chains situation in the distribution of brick products is as follows:

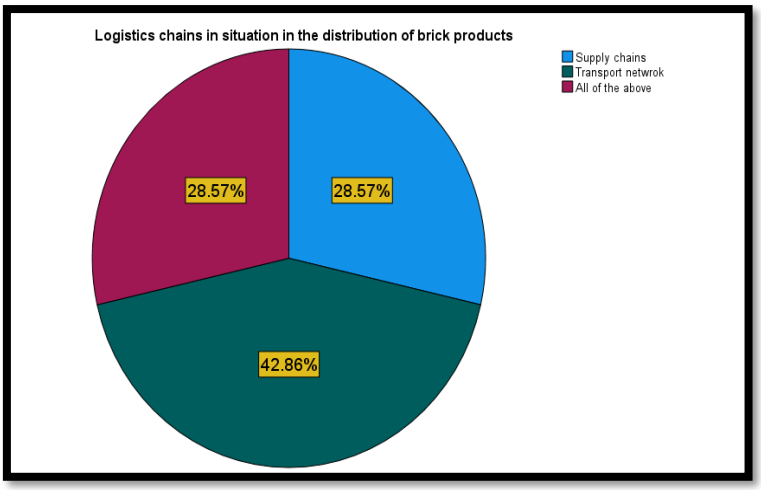


Figure 7. 7: Logistics chain's situation in the distribution of brick products

Source: Author's field data, (2022)

Sample: N=7

Figure 7.7 above shows that the major logistics chain is the transport network. This means that the majority of enterprises utilize transportation as a means of distributing brick products to customers from point of origin to point of destination. In this case (42.86%) is for the transport network, whilst (28.57%) is for both supply chains and all of the above.

The previous section focussed on identifying the types of existing logistics chains as applied in the delivery and distribution of brick products. The following section will be based on the contribution made by the brick-making enterprises to the construction and physical infrastructure industries of Thohoyandou town.

7.7. Contribution to the industries of Thohoyandou town

The analysis of the section is based on the contribution made by the brick-making enterprises to the construction and the physical infrastructure industries of Thohoyandou town. Figure 7.8 below on the respondents opinionated responses is as follows:

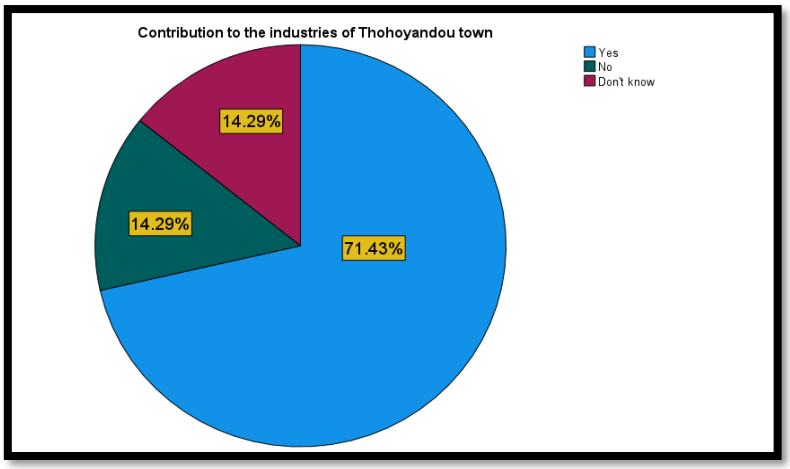


Figure 7. 8: Contribution to the industries of Thohoyandou town

Source: Author's field data, (2022)

Sample: N=7

Figure 7.8 above shows that (71.43%) responded that their brick-making enterprise contributes to the construction and the physical infrastructure industries of Thohoyandou town. Whereas (14.29%) responded that their enterprise does not contribute and as well as (14.29%) responded that they are not sure, or they don't know whether their enterprise contributes to the construction and physical infrastructure industries or not.

The previous section was based on the contribution made by the brick-making enterprises to the construction and physical infrastructure industries of Thohoyandou town. The following section will focus on the identification of constraints and opportunities for the small-medium brick enterprises of Thohoyandou town.

7.8. Analysis of the study results based on the identification of constraints and opportunities for the small-medium brick enterprises of Thohoyandou town

Table 7.5 below depicts the analysis of objective three which reflects on the identification of constraints and opportunities impacting and impacted on the manufacturing and distribution of small-medium brick enterprises (SMBEs) and products in Thohoyandou town. It shows the results based on the results findings under constraints faced by the SMBEs in making brick products, competition with other brick enterprises, the ways in which brick products reach the

public and lastly growing the enterprise locally, nationally, provincially, and internationally.

Table 7. 5: Analysis of study results based on constraints faced by the SMBEs, competition with other enterprises, ways in which brick products reach the public and growing the enterprises from local to international opportunities.

Variables		Constraints faced by the SMBEs in making brick products	Competition with other brick enterprises	The ways in which brick products reach the public	Growing the enterprise locally, nationally, provincially, and internationally
N	Valid	7	7	7	7
	Missing	0	0	0	0
Mean		1.57	1.14	4.14	2.00
Std. Error of Mean		.369	.143	.705	.309
Median		1.00	1.00	5.00	2.00
Mode		1	1	3[a]	2
Std. Deviation		.976	.378	1.864	.816
Variance		.952	.143	3.476	.667
Minimum		1	1	1	1
Maximum		3	2	6	3

a. Multiple modes exist. The smallest value is shown

Source: Author's fieldwork, (2022)

Sample: N=7

The Table 7.5 above shows that there are 7 valid responses, zero missing responses, average mean, standard deviation, mode, variance, skewness, standard error of skewness, range, and maximum values. In this tabulated analysis, the average mean, which is the highest, is 4.14, reflecting on how brick products reach the public. This means that the way in which brick products are produced and manufactured makes the enterprises more competitive and increases more opportunities for local communities and the rural market. When the product reaches the public, this gives an enterprise a certain profit gain and more trust from the consumers. The lowest mean average is at 1.14, this means that majority of the enterprises that manufacture brick products have less competition and for others the competition exists as compared to other enterprises of their nature.

The above section was on the introduction to analysis of objective three, which reflected on the identification of constraints and opportunities that impacted on the manufacturing of the brick product in Thohoyandou town. The table emphasised on the average mean which had the highest average of 4.14 meaning that the brick products manufactured in the process reached the public on time. The following section will focus on identifying the challenges faced by SMBEs, when they manufacture and produce brick products.

7.9. Constraints faced by small-medium brick enterprises when producing brick products

The analysis of this section is to identify the challenges that small-medium brick manufacturing enterprises face, when manufacturing and producing brick products. The main criterion was choosing the appropriate variable that resonates with the nature of the enterprises' challenges. And these were (Maintenance, Logistics Costs, Buying of materials, Transportation Costs, and All of the above). The majority of the responses went to the maintenance challenges that enterprises face in their daily activities and schedules. The least was buying of materials.

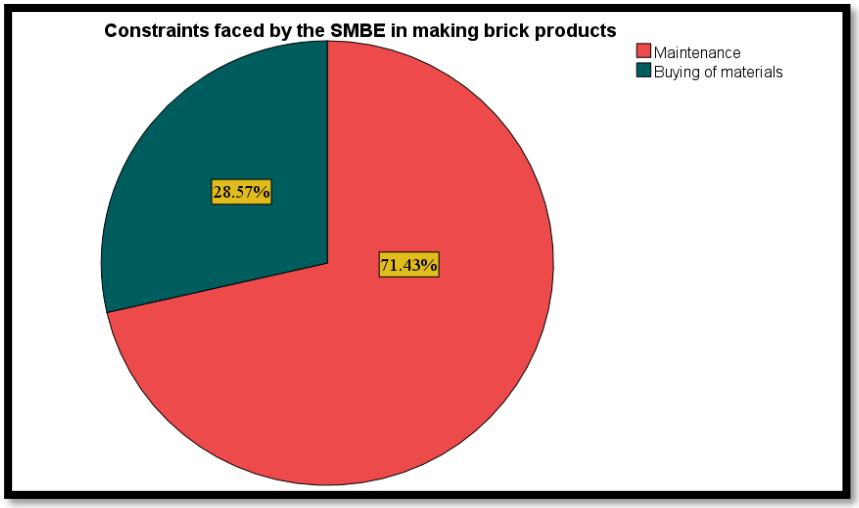


Figure 7. 9: Constraints faced by the SMBEs in making brick products

Source: Author's fieldwork, (2022)

Sample: N=7

Figure 7.9. above, shows that (71,43%) was maintenance which has been reflected as the major challenge that most of the enterprises (SMBEs) face. This means that more machinery, equipment, and electricity maintenance must be managed at all costs. The enterprise must find ways in which the maintenance costs can be reduced and at the same time make an attainable

profit. In this study what happens is that the value chain system if applied with caution can increase the competitive advantage of the enterprises. (28.57%) was buying of materials, these are raw materials that are inbound, means that they are materials transported within the enterprises to increase efficiency in the production of manufacturing. The (28.57%) means that a few of the enterprises have less challenges on buying of inbound raw materials.

The previous section was based on the constraints faced by small-medium brick enterprises when producing brick products. The main criterion was choosing the appropriate variable that resonates with the nature of the enterprises' challenges. And these were (Maintenance, Logistics Costs, Buying of materials, Transportation Costs, and All of the above). The following section will be based on the threats (competition) in the marketing of brick products between the sampled SMBEs and other manufacturing enterprises of their nature.

7.10. Threats (competition) in the marketing of brick products between the sampled SMBEs and other manufacturing enterprises of their nature

The analysis of this section is to determine if whether there are any threats (competition) in the marketing of brick products by the SMBEs within Thohoyandou town and other communities.

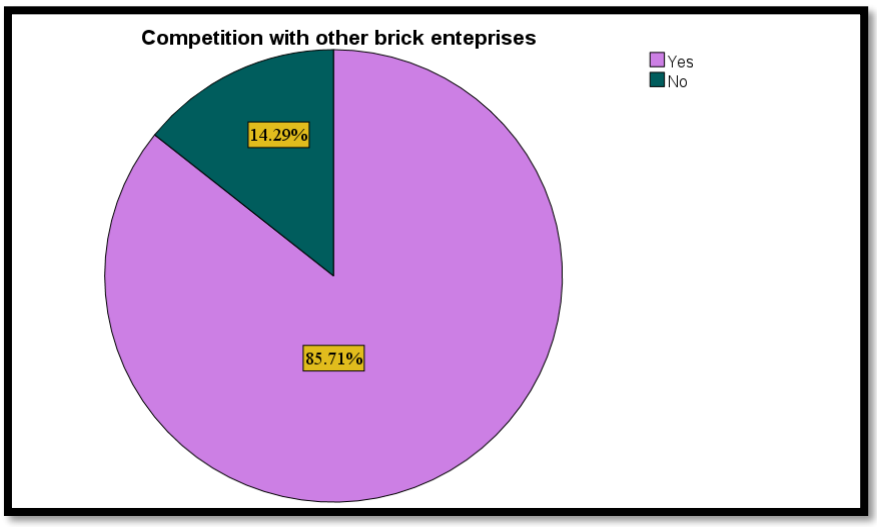


Figure 7. 10: Competition with other brick enterprises

Source: Author's fieldwork, (2022)

Sample: N=7

Figure 7.10 above shows that the majority of enterprises found that there is (85.71%) more competition and threats with other brick enterprises and manufacturing enterprises within and

around Thohoyandou town. And there is (14.29%) of less competition in the marketing of brick products between the seven sampled SMBEs with other similar enterprises.

The previous section focussed on the threats (competition) in the marketing of brick products The analysis of this section is to determine if whether there are any threats (competition) in the marketing of brick products by the SMBEs within Thohoyandou town and other communities. In the following section, the marketing strategies will be discussed that are applied by SMBEs.

7.11. The ways in which a certain SMBE market and promotes its brick product to the communities

The analysis of this section was to identify the main marketing strategy or strategies that are applied by SMBEs when they market, promote, and sell their brick products to the public. This is how brick products are consumed and reach the public attention. How the marketing of brick products is realised was determined through the following options, Advertising, Promotion, Sales, Social Media correspondence, and lastly all of the above.

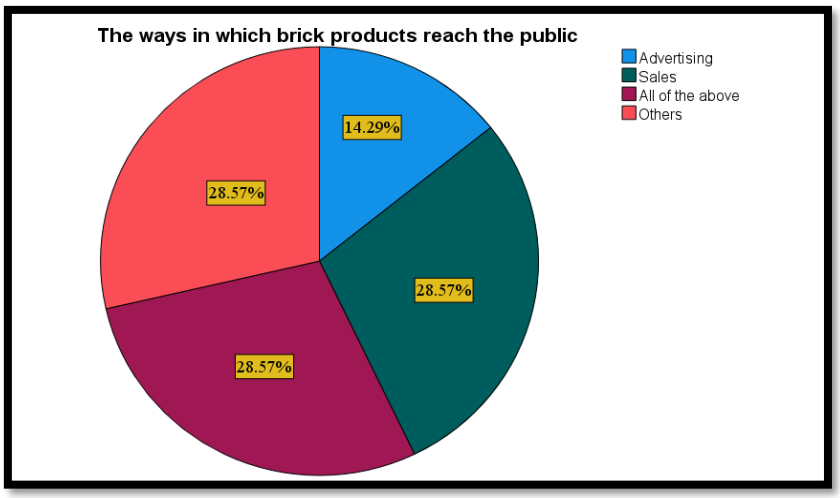


Figure 7. 11: The ways in which brick products reach the public

Source: Author's fieldwork, (2022)

Sample: N=7

Figure 7.11 above shows that the study results determined that, (28.57%) of advertising, (28.57%) of sales, and (28.57%) of all of the above were the major ways in which the brick enterprises produce, market, and sell their products to the general public. This means that all of the above-mentioned marketing strategies can be adopted by any brick-making enterprise. When it needs to increase its competitive advantage in the market and into the sector. Only

(14.29%) was on advertising, this shows that the minority of the enterprises were not utilising much of the advertisement strategy to promote their brick products.

The analysis of the previous section has shown that there are ways in which brick products can reach the public, and these are Advertising, Promotion, Sales, Social Media correspondence, and lastly all of the above. The following section will discuss the opportunities that enable an enterprise to grow locally, provincially, nationally, and internationally.

7.12. Opportunities in growing the enterprises locally, provincially, nationally, and internationally

The analysis of this section was to identify the opportunities and strengths of the enterprises that will enable them to grow locally, provincially, nationally, and internationally. The main purpose was to determine whether the sampled SMBEs can grow from local beginnings into high-rated and internationally competitive enterprises. That will deal with trade, exporting as well as importing their products to other countries.

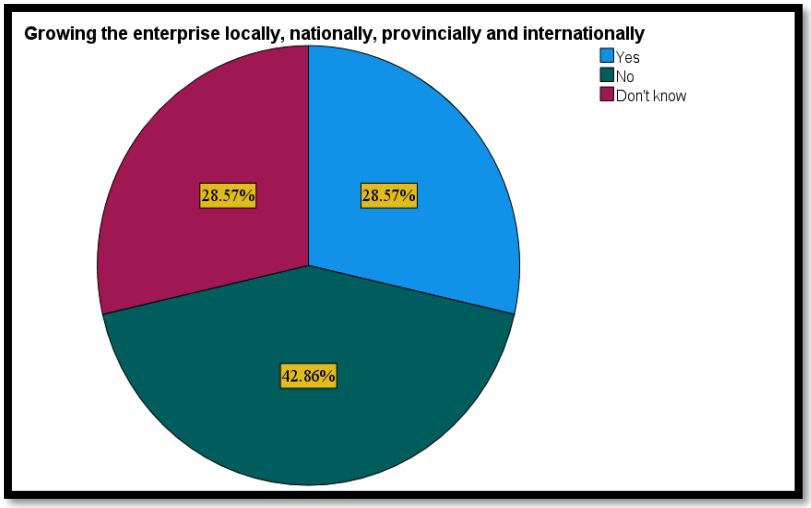


Figure 7. 12: Growing the enterprise locally, provincially, nationally, and internationally

Source: Author's fieldwork, (2022)
Sample: N=7

Figure 7.12 above shows the study results of the determined options as indicated in the figure, in which (42.86%) selected no or rather disagree that indeed their enterprises won't get an opportunity to grow their business locally, provincially, nationally, and internationally. This means that the majority of SMBEs don't see their enterprises growing from local to

internationally competitive enterprises. A few of the SMBEs interviewed constitute only (28.57%) which says that indeed they can see an opportunity in growing their enterprises locally to being internationally recognised manufacturing logistics companies. While only (28.57%) responded that they don't know whether their enterprise can grow and develop locally, provincially, nationally, or internationally.

The previous section was based on the identification of opportunities in growing the enterprises locally, provincially, nationally, and internationally. The following section will dwell on the chapter summary.

7.13. Chapter summary

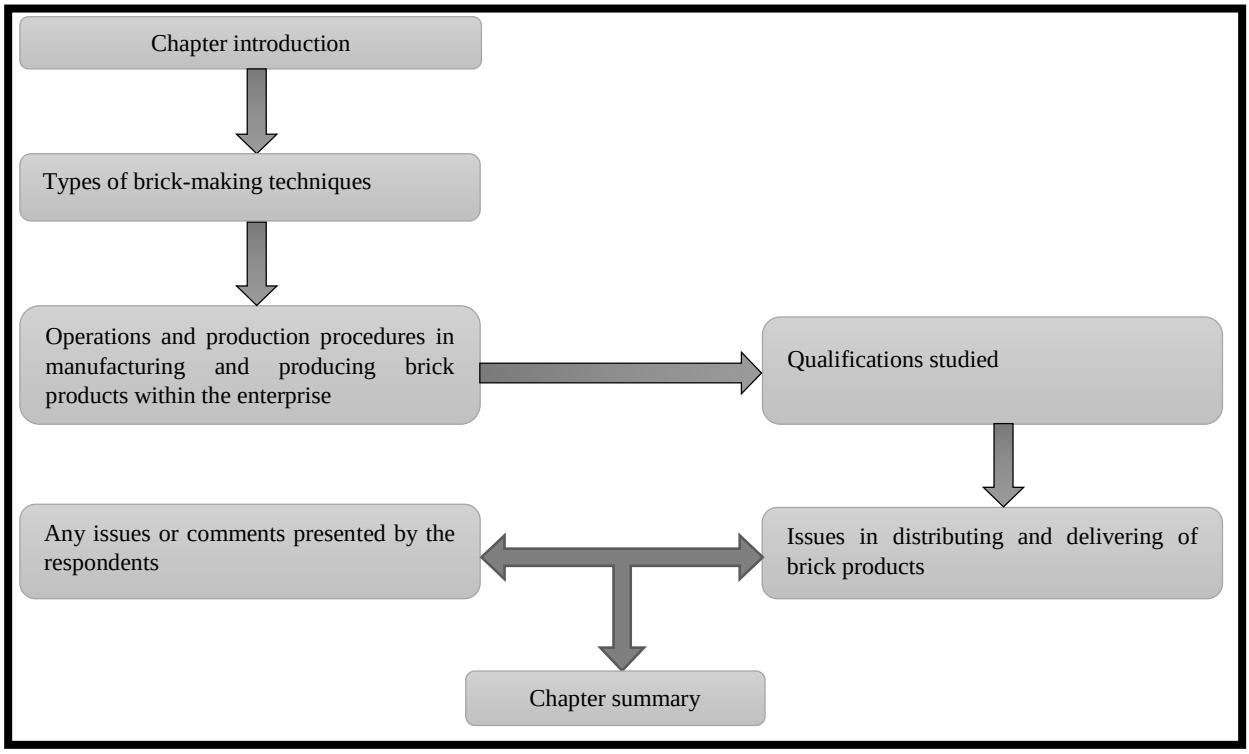
Chapter six detailed an analysis of objective one which sought to map the spatial distribution of small-medium brick enterprises in Thohoyandou town. It presented the focus of map work analysis, spatial analysis, and configuration of the land covered in a 12 km radius. It featured, the contents of the chapter which are comprised of a chapter outline, an analysis of objective one; manufacturing activities that add value to the processing and manufacturing of brick products; monitoring and evaluation processes in making brick products; logistics chains situation in the distribution of brick products; contribution to the industries of Thohoyandou town; constraints faced by the small-medium brick enterprises when producing brick products; threats (competition) in the marketing of brick products between the sampled SMBEs and other manufacturing enterprises of their nature; the ways in which a certain SMBE market and promotes its brick product to the communities; opportunities in growing the enterprises locally, provincially, nationally, and internationally and lastly chapter summary which was highlighted concerning data findings.

CHAPTER EIGHT: EXAMINING THE SMALL-MEDIUM BRICK ENTERPRISES OPERATIONAL MODE, LAND USE, TRANSPORTATION, AND SOCIO-ECONOMIC IMPACTS

8.1. Chapter Introduction

The chapter introduces the analysis of objective two, examining the small-medium brick enterprises operational mode, land use, transportation, and socio-economic impacts on the host community (Thohoyandou)). The chapter features the contents of chapter introduction; types of brick-making techniques; operations and production procedures in manufacturing and producing brick products within the enterprises; qualifications studied; issues in distributing and delivering of brick products; any issues or comments presented by the respondents; and lastly chapter summary. Figure 8.1 below shows the structure layout of chapter eight, which is outlined as follows:

Figure 8. 1: The structure layout of chapter eight presented as follows



Source: Author's construct, (2022)

The analysis of objective two reflects on the analysis of examining the small-medium brick manufacturing enterprises operational mode, land use, transportation, and socio-economic impacts on the host community (Thohoyandou).

The table below shows the tabulated analysis which is based on the types of brick-making techniques; operations and production procedures, education status; issues in distribution and delivering of brick products, and general comments for any inputs into the study.

Table 8. 1: Analysis of study results based on types of brick-making techniques, operations and production procedures, education status, issues in distributing and delivering brick products and lastly general comments for further input into the study.

Variables		Types of brick-making techniques	Operations and Production procedures	Education status	Issues in distributing and delivering brick products	General comments for any inputs into the study
N	Valid	7	7	7	7	7
	Missing	0	0	0	0	0
Mean		3.00	3.57	3.14	3.00	1.14
Std. Error of Mean		.436	.528	.670	.436	.143
Mode		3	5	2[a]	2	1
Std. Deviation		1.155	1.397	1.773	1.155	.378
Variance		1.333	1.952	3.143	1.333	.143
Skewness		.000	.052	.205	.909	2.646
Std. Error of Skewness		.794	.794	.794	.794	.794
Kurtosis		3.000	-2.351	-2.476	-.150	7.000
Std. Error of Kurtosis		1.587	1.587	1.587	1.587	1.587
Range		4	3	4	3	1
Maximum		5	5	5	5	2

a. Multiple modes exist. The smallest value is shown

Source: author's fieldwork, (2022)

Sample: N=7

Table 8.1 above shows that there are 7 valid responses, zero missing responses, average mean, standard deviation, mode, variance, skewness, standard error of skewness, range, and maximum values. In this tabulated analysis, the average mean which is the highest is 3.57 on the operations and production procedures. This means that most of the operating enterprises

produce and manufacture brick product as a means of increasing their competitive advantage of the enterprise performance. Whereas the lowest average mean is 1.14 on the general comments for any inputs into the study.

The previous section was based on introducing the analysis of the objective two which reflects on the examining of the seven SMBEs brick products physical operational mode, production procedures, land use, transportation, and socio-economic impacts in Thohoyandou town. The next section will focus on the discussion of the fieldwork results that reflects on the types of brick-making techniques.

8.2. Types of brick-making techniques

The analysis of this section is based on the discussion of the fieldwork results, which reflects on the types of brick-making techniques. A criterion for choosing the appropriate technique used and applied in manufacturing brick products, was based on traditional, machinery, modern, handcraft, and all of the above techniques. In which the key respondents responded 100% successfully.

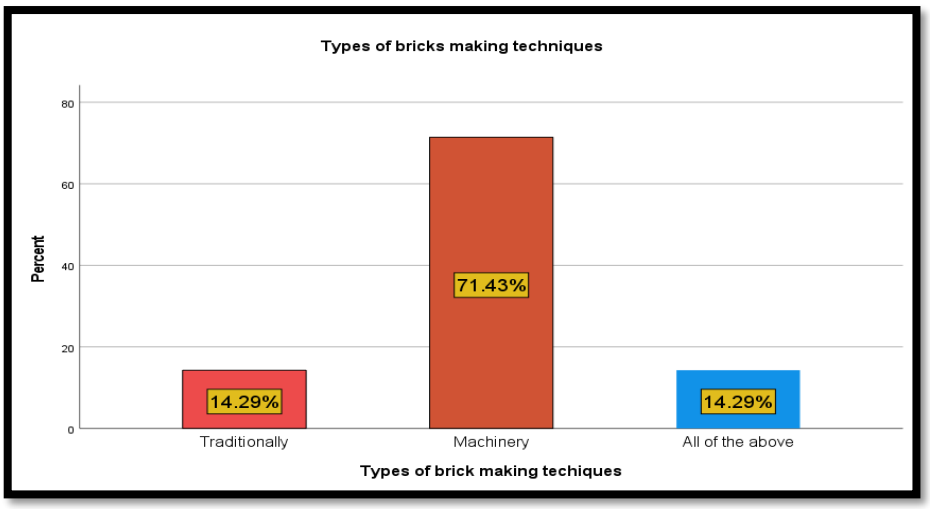


Figure 8. 2: Types of brick-making techniques

Source: Author's fieldwork, (2022)

Sample: N=7

Figure 8.2: above shows that (71.43%) of the SMBEs manufacture and produce brick products using machinery. Only (14.29%) of the seven SMBEs brick-making techniques were found to be utilising the traditional way of manufacturing and all of the above mentioned techniques.

The section on the discussion of the fieldwork results that reflected on the types of brick-making techniques, was analysed to show that machinery was the only technique which was being used and applied by majority of the SMBEs. The next section will be based on the identification of the staff personnel who performs the operations and production procedures in manufacturing and producing brick products within the enterprises.

8.3. Operations and production procedures in manufacturing and producing brick products within the enterprise

The analysis of the section was to identify the staff personnel who performs the operations and production procedures in manufacturing and producing brick products within the enterprises. The criterion was on choosing the operators and producers, supervisors, manufacturers, managers, and (all of the above).

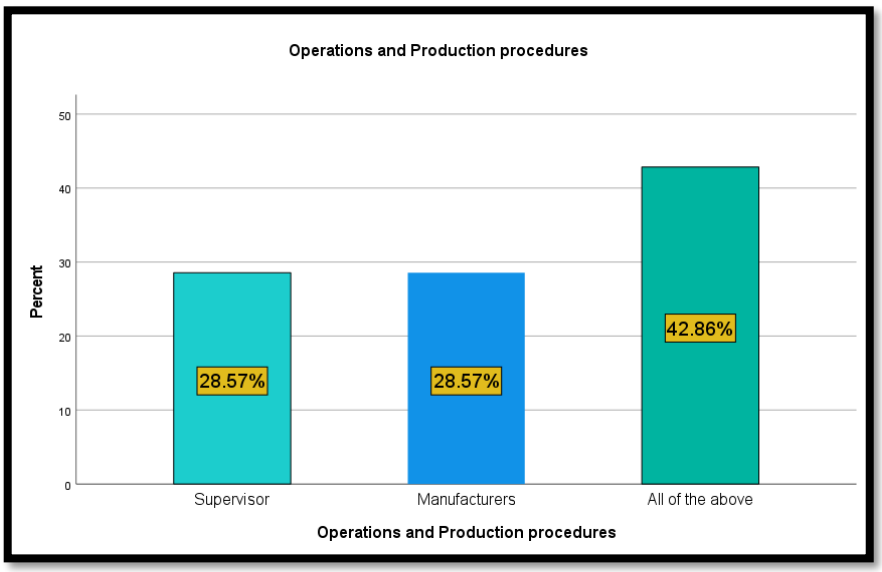


Figure 8. 3: Operations and production procedures

Source: Author's fieldwork, (2022)

Sample: N=7

Figure 8.3. above shows that majority of the respondents from the seven SMBEs responded to all of the above at (42.86%), which means that all of the above personnel staff mentioned in

this analysis were found to be eligible for operating and producing brick products. Whereas only (28.57%) was both supervisors and manufacturers, which means that (28.57%) of the enterprises don't fully operate and produce the brick products, when all of the above staff personnel are not available.

The previous section was based on the identification of the staff personnel who performs the operations and production procedures in manufacturing and producing brick products within the enterprises. Wherein they were defined as supervisors, manufacturers, managers, producers and (all of the above), where all of the above mentioned personnel were dominating. The following section will focus on the qualifications studied by the staff personnel of the SMBEs.

8.4. Qualifications studied

The analysis of this section is based on the types of qualifications studied which is the education status of the operators and producers of the seven SMBEs. The main educational background options which were identified were primary education, matric, graduate (not in transport and logistics), graduate (transport and logistics/related) and lastly others.

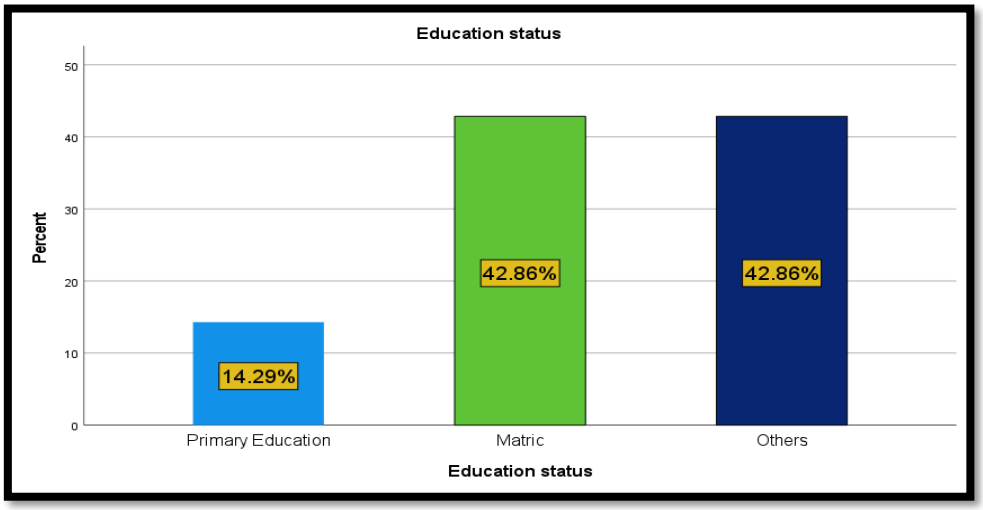


Figure 8. 4: Education status

Source: Author's fieldwork, (2022)

Sample: N=7

Figure 8.4. above shows the study results obtained from the field to the seven SMBEs. In which matric and others constituted (42.86%), meaning that majority of the staff members and office personnel of the seven SMBEs were having matric as their educational background and others, then (14.29%) of primary educational individuals. This means that there is low experiential training from the industry, based on the manufacturing and production of making brick products.

The previous section was based on the discussion of the qualifications studied by the staff personnel of the SMBEs, to identify which qualifications were they holding and educational status. In respect to this only those with matric and others were constituting 42.86%. the following section however will focus on the issues in the distribution and delivery of brick products from the SMBEs premises to the market.

8.5. Issues in distributing and delivering of brick products

The analysis of this section reflected on the options of either agreeing, strongly agreeing, disagreeing, strongly disagreeing, and others. To respond to the statement of issues in distributing and delivering of brick products.

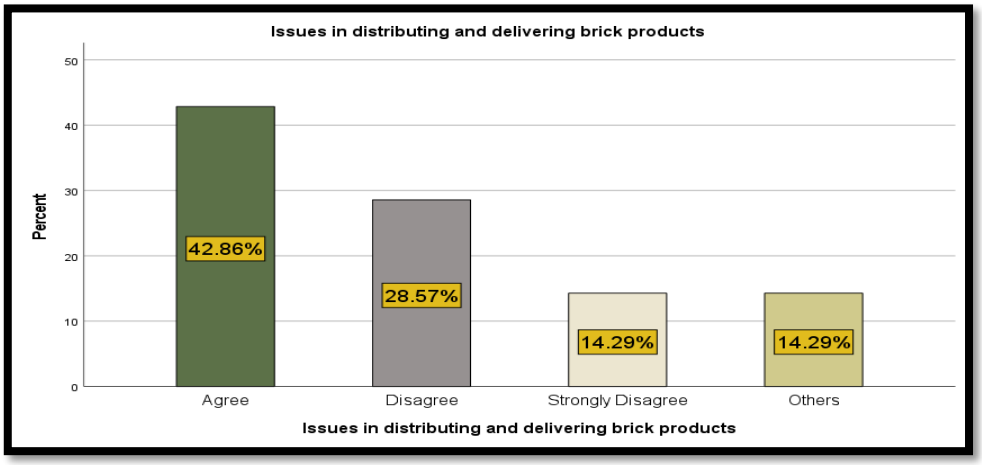


Figure 8. 5: Issues in distributing and delivering brick products

Source: Author's fieldwork, (2022)

Sample: N=7

Figure 8.5. above shows that the majority of the enterprises actually agree to the issue of negative impacts on the production of finished brick products having the impacts on the transportation and construction industries of Thohoyandou town with a percentage of

(42.86%). while only (28.57%) responded that they disagree to the statement. Furthermore a (14.29%) alone constituted of both strongly disagreeing and others to the statement of issues in distributing and delivering of the brick products.

The section on the issues of distribution and delivery of brick products impact on the construction and transportation industries has been discussed with a study result showing that majority of the enterprises agree to the to the statement in question. That indeed the negative impacts imposed by the distribution and delivery of brick products actually exists. The following section will dwell on the comments made by the respondents to the understanding of the scope of study.

8.6. Any issues or comments presented by the respondents

The comments were based on the response of the respondents and their contribution to the study, any comment was opened for the respondent to comment on the study based on their understanding of the scope of the study. Only two options were identified to either comment or not comment at all.

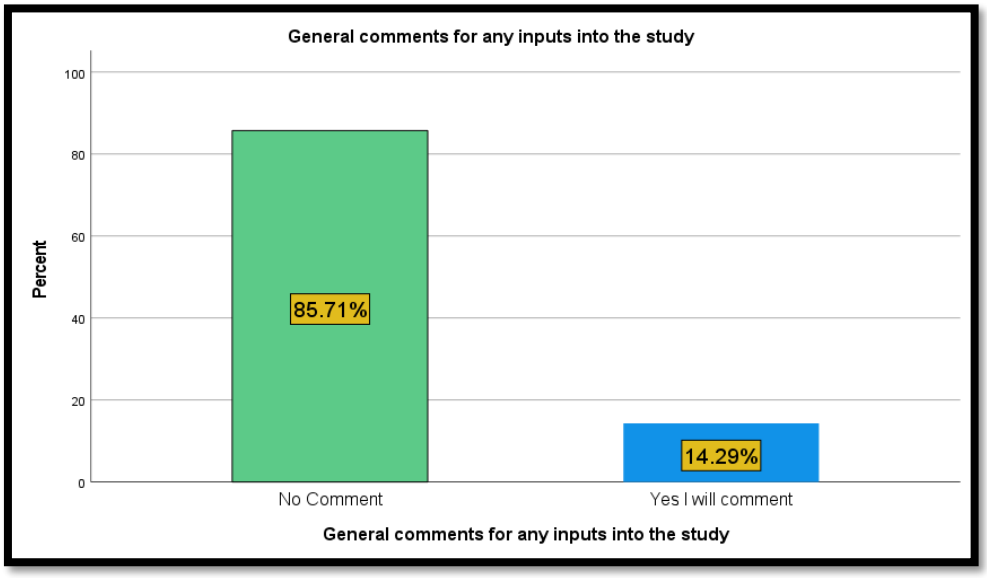


Figure 8. 6: General comments for any inputs into the study

Source: Author's fieldwork, (2022)

Sample: N=7

Figure 8.6. shows that (85.71%) of a sample of the respondents had not commented on anything with regard to the study. Only (14.29%) commented on the study in which the respondent answered that "there are challenges in small business when they start to be established, if there

is profit being made and generated then there will progress within the business and there is also the issue of investment".

Table 8. 2: The data gathered from the key informants of the seven SMBEs. Indicating distances and places for suppliers of the SMBEs.

SMBEs	Distance of the brick enterprises from the Thohoyandou CBD	Distance of the enterprises to the centres	Areas where the enterprises supply brick products	Suppliers of the materials, machinery and trucks for transportation and manufacturing operations	Km in distance between the agencies identified and the SMBE trade premises	The distance from the CBD to the markets where the enterprise distributes brick products
Young Xing Trading (Bricks)	0-5 km	Sibasa: 3 km Malamulele: 30 km Elim: 50 km Louis Trichardt: 80 km Vuwani: 40 km	Sibasa	Transport agencies	180 km	0-5 km
Vhavenda bricks (PTY) LTD	+21 km	Sibasa: 0-20 km Malamulele: 41-69 km Elim: 71-90 km Louis Trichardt: 75 km Vuwani: 21-69 km	Sibasa Malamulele Elim Louis Trichardt Vuwani	Others	+41 km	6-10 km
Mami Group Brick House	6-10 km	Sibasa: 11-15 km Malamulele: +21 km Louis Trichardt: 0-90 km	Sibasa Malamulele Elim Louis Trichardt Vuwani	Mami Construction and Transport Crusher-Mathombo supplies Machinery-Hydratomi Batho Pele	11-20 km	6-10 km
Gokolo Bricks	11-15 km	Sibasa: 5 km Malamulele: 20-25 km	Sibasa	Transport agencies	0-10 km	11-15 km
Dithuse Brick Yard	No response	No response	No response	Transport agencies	No response	No response
Corner Sand and Brick Supply	No response	No response	No response	Transport agencies	No response	No response
Lufule 1 Brick Makers	No response	No response	No response	Transport agencies	No response	No response

Source: Author's field data, (2022)

Table 8.2 above indicated the seven SMBEs, distance of the brick enterprises from the Thohoyandou CBD, distance of the enterprises to the centres, areas where the enterprises supply brick products, suppliers of the materials, machinery, and trucks for transportation and

manufacturing operations, distance in km between the agencies identified and the SMBEs trade premises and lastly the distance from the CBD to the markets where the enterprise distributes brick products. Four of the SMBEs namely Young Xing Trading (Bricks), Vhavenda bricks (PTY) LTD, Mami Group Brick House and Gokolo bricks managed to respond during key informant interviews. Only three SMBEs did not manage to respond fully to the questions during interviews and these are Dithuse brick yard, corner sand and brick supply and Lufule 1 brick makers. Only Lufule 1 brick makers was not visited, as the key informant was able to communicate through online contact, the questionnaire was distributed through google forms and was sent to the key informant of the enterprise.

The previous section focussed on the discussion of any issues or comments that the respondents may want to respond to in terms of their understanding of the research scope of study. The following section will be based on the summary of the chapter.

8.7. Chapter summary

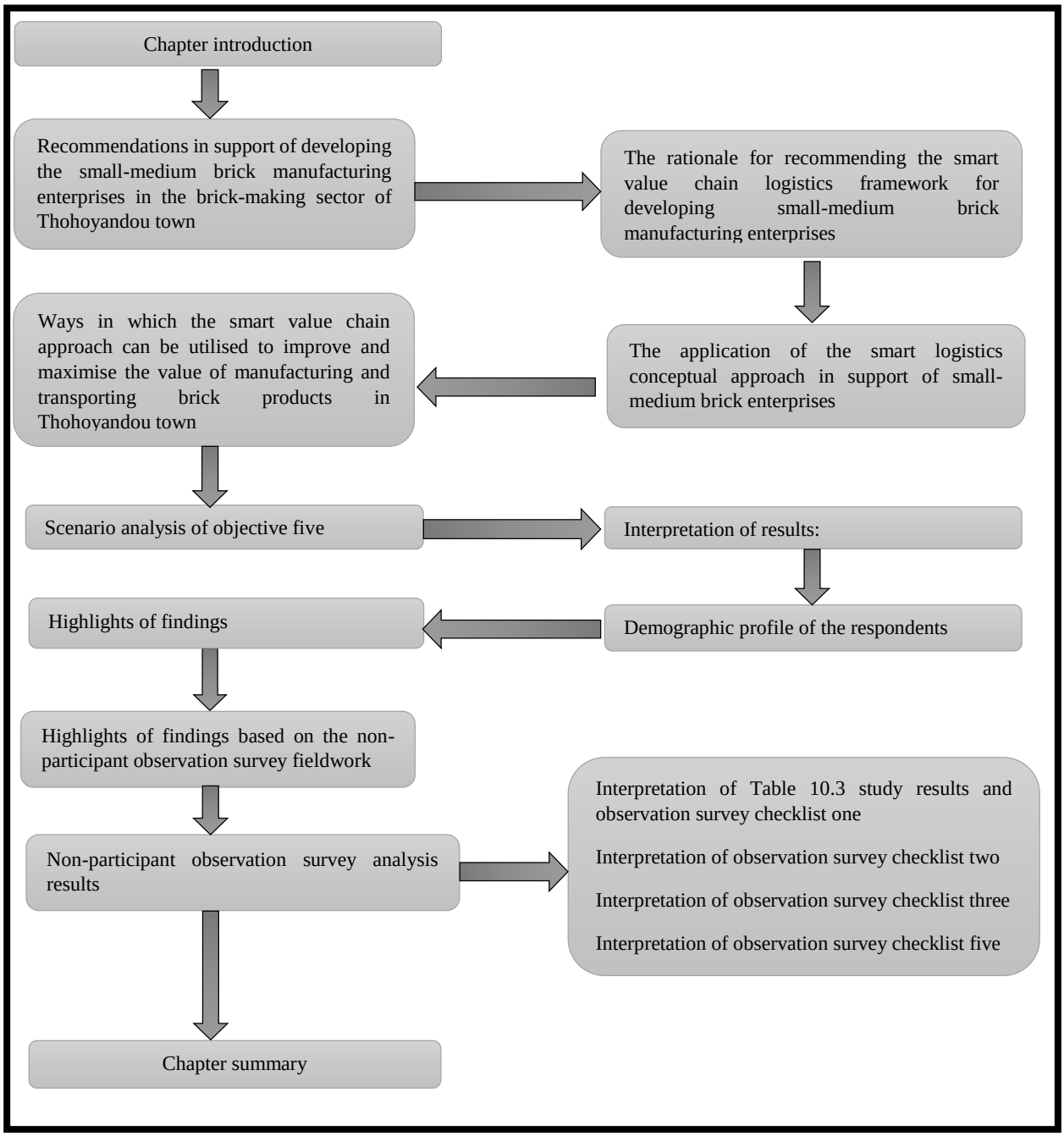
Chapter eight detailed an analysis of objective two on examining the brick products operational mode, land use, transportation, and socio-economic impacts on the host community of Thohoyandou town. It featured the contents of chapter introduction; introduction; types of brick-making techniques; operations and production procedures in manufacturing and producing brick products within the enterprises; qualifications studied by the staff personnel; issues in distributing and delivering of brick products; any issues or comments presented by the respondents; and lastly chapter summary.

CHAPTER NINE: A SMART VALUE CHAIN LOGISTICS FRAMEWORK FOR SMALL-MEDIUM BRICK MANUFACTURING ENTERPRISES IN THE BRICK-MAKING SECTOR

9.1. Chapter Introduction

This chapter presents the analysis of objective three. It seeks to highlight the relevance of recommending the Smart Value Chain Logistics Framework that seeks to support the small-medium brick manufacturing enterprises development in the brick-making sector of Thohoyandou town. The chapter comprises a chapter introduction, Recommendations in support of developing the small-medium brick manufacturing enterprises in the brick-making sector of Thohoyandou town, The rationale for recommending the smart value chain logistics framework for developing small-medium brick manufacturing enterprises, The application of the smart logistics conceptual approach in support of small-medium brick enterprises, Ways in which the smart value chain approach can be utilised to improve and maximise the value of manufacturing and transporting brick products in Thohoyandou town, Scenario analysis of objective three interpretation of results, highlights of findings, highlights of findings based on the non-participant observation survey fieldwork, non-participant observation survey analysis results, and lastly chapter summary. Figure 9.1 below represents the structure outline of chapter nine.

Figure 9. 1: The structure layout of chapter nine



Source: Author's construct, (2022)

Figure 9.1. above indicates the construct of chapter nine which is the analysis of objective three structure layout, constituting of eight components namely; chapter introduction, Recommendations in support of developing the small-medium brick manufacturing enterprises in the brick-making sector of Thohoyandou town, The rationale for recommending the smart value chain logistics framework for developing small-medium brick manufacturing enterprises,

The application of the smart logistics conceptual approach in support of small-medium brick enterprises, the Ways in which the smart value chain approach can be utilised to improve and maximise the value of manufacturing and transporting brick products in Thohoyandou town, Scenario analysis of objective three the interpretation of results and highlights of findings constituting seven components namely, chapter introduction, introduction, interpretation of results, highlights of findings, highlights of findings based on the non-participant observation survey fieldwork, non-participant observation survey analysis results and lastly chapter summary.

The section on the chapter introduction presented the outline of the main components that are discussed under chapter nine It also showed the figure 9.1 representing the components in an outline of a structure layout. The following section will introduce the chapter.

The analysis of objective three is based on the Smart Value Chain Logistics Framework recommendation that aim to support the development of small-medium brick manufacturing enterprises in the brick-making sector of Thohoyandou town. The framework is based on the notion of increasing the competitive advantage of the seven SMBEs and other manufacturing enterprises that are similar to the SMBEs operations. The chapter's main aim is the presentation of data and interpretation of the results, followed by a discussion of the research findings. The study's aim is to interrogate the application of smart value chain logistics in support of the SMBEs within the land use, transportation logistics, manufacturing operations and production procedures in making and distributing brick products. The interpretation of demographic profiling of the respondents was conducted in relation to the research key informant's questionnaires. The data collection was conducted to identify, interpret, present, and analyse the findings of the demographic profile of the respondents, the non-participant observations survey and its findings, and address the study's problem statement. A total of six questionnaires were administered as the demographic profiling of the study. The following contents will be discussed in this chapter; chapter introduction, introduction, interpretation of results, highlights of findings, highlights of findings based on the non-participant observations survey fieldwork and the non-participant observations of each analysis results. The analysis of objective three is also based on the scenario analysis methodology comprising the Smart Value Chain Logistics critical paths, conceptual approach, theoretical approach, model approach, and strategic

approach. What has been discussed under this chapter are the recommendations that aim to support the development of the SMBEs, and lastly the chapter summary.

The preceding section introduced chapter three highlighting on components to be discussed later on this chapter. The following section will focus much on discussing in detail the recommendations that must be adopted to support the development and growth of the SMBEs of Thohoyandou town.

9.2. Recommendations in support of developing the small-medium brick manufacturing enterprises in the brick-making sector of Thohoyandou town

9.3.1. To recommend the Smart Logistics Value Chain Management strategy (SLVCM) for the SMBEs operational performance competitiveness.

The Smart Logistics Value Chain Management (SLVCM) in this recommendation becomes part of the operational planning process to control the efficiency of product and service flow, from raw materials procurement, warehouse management, transport cost management, and value chain to the point of use or the consumers, (Uckelmann, 2008: p 204). It also helps to minimize the activities' impacts on a given area, be it socio-economic and transport process impacts on the host communities (in this case Thohoyandou town), (Kijewska, *et al*, 2016).

9.3.2. To recommend the application of Smart Value Chain Logistics Framework guideline which aims to guide the development of the SMBEs.

The study recommends a Smart Value Chain Logistics Framework guideline that will enable the enterprises to develop their own guidelines and frameworks based on the recommended framework of the study. It will enable the enterprises to create cost benefit analysis spreadsheets and digitised logbook scheduling and also enable them to think smart about the operations they are performing. They will adopt the smart and strategic implementation plans for the future development and growth of the enterprises value chain management system and the supply chain of bricks that are logistically managed in terms of the smart logistics.

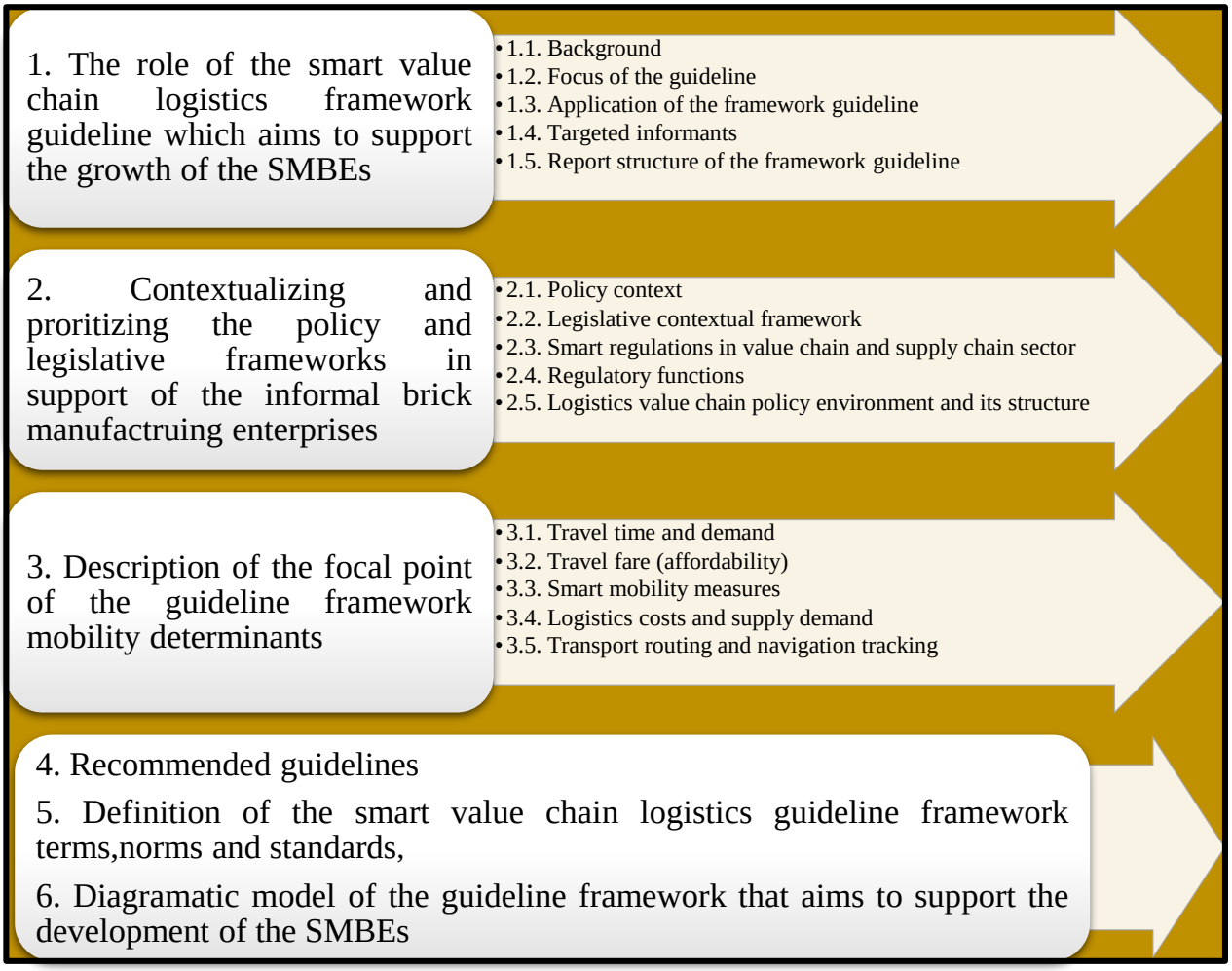


Figure 9. 2: The Smart Value Chain Logistics framework guideline

Source: Author's construct, (2022)

Figure 9.2 shows that the framework guideline is comprised of six components namely; the roles of the smart value chain logistics framework guideline which aims to support the growth of the SMBEs, contextualising and prioritising the policy and legislative frameworks in support of the informal brick manufacturing enterprises of Thohoyandou town; description of the focal point of the guideline framework mobility determinants; recommended guidelines; definition of the smart value chain logistics guideline framework terms and lastly diagrammatic model of the guideline framework that aims to support the development of the SMBEs.

10.3.3. To prioritize the implementation of the creation and development of the satellite centres, truck inns, trans-shipment hubs, warehouses, and storage facilities for the manufacturing sector of Thohoyandou town.

Table 9. 1: Key priority issues in Transport Logistics functions and proposed centres for Small-Medium Brick Manufacturing Enterprises sector of Thohoyandou town

Proposed Central Location	Function	Facilities for Traditional Supply Chains	Facilities for Modern Supply Chains	Communication facilities	Timeframe and estimated budget	Sponsor
Proposed Satellite Centre	Buying point Trans-shipment hub	Short storage facilities Loading facilities Truck inns	Pre-facilities safe conditions for storing products	Telephone Fax Fleet	Short term R800 000.00	Municipal infrastructure grant
Proposed Multi-purpose rural town service centre	Local market trans-shipment hub	Storage facilities Loading facilities services Logistics procurement agency	Packaging houses Unloading facilities Ablutions	Telephone Fax Internet Fleet	Medium term R1 million	Municipal infrastructure grant
Proposed Major Rural Service Centre	District Market Transhipment hub	Additional to the above: Transport brokering service			Short term R950 000.00	District municipal infrastructure grant

Source: (Department of Transport, 2007; Sieber, 2011).

The above implementation plan mechanism has been adopted as a priority plan which seeks to highlight the proposed central location and their activities that ensure to resolve the issue of lack of logistics facilities, truck inns and trans-shipment hubs for the local manufacturing enterprises of Thohoyandou town and responsible authority satisfaction. The planning of a cost-effective project is subject to a complex mission of coordinating a wide range of activities, sponsors, timeframes and assigning tasks to project champions. The above proposal seeks to meet those aspirations.

The section on the recommendations of the smart value chain logistics framework guideline, discussed the main research recommendations of the study which were applicable in supporting the SMBEs growth and development in Thohoyandou town, from the local to the international perspective. The following section focusses on the rational for recommending the smart value chain framework.

9.3. The rationale for recommending the Smart Value Chain Logistics Framework for developing small-medium brick manufacturing enterprises

The aim of recommending the Smart Value Chain Logistics Framework (SVCLF) is to develop a guideline that seeks to support the growth and development of (SMBEs). The notion is to apply the value chain analysis to the study of the brick enterprises (SMBEs) to justify or reject any observations of the constraints and the opportunities for (SMBEs). The application of the framework is adopted through scenario analysis, which has been characterised by phases of a series of scenarios in the support of smart application modelling of the framework. The rationale again was to enhance and improve the location and physical siting of brick manufacturing activities, production, and inventory control that required Smart Logistics services innovations and smart supply chain strategies. The framework aims at improving the implications of maintenance costs due to manufacturing activities and high transportation logistics costs. The application of smart transportation is also vital in making the process of delivery to be efficient and effective, through the use of (ICT) platforms, Geographic positioning system (GPS) tracker instalments, truck camera, and video recorder monitors installed on trucks.

The section on the previous discussions was based on the description of the rationality for recommending and adopting the strategic approach of the effective smart value chain logistics framework guideline. On the next section what will be discussed will be the basis for applying the smart logistics conceptual approach in support of the Small-medium brick enterprises.

9.4. The application of the smart logistics conceptual approach in support of small-medium brick enterprises

The Smart Logistics approach can be applied to support the development of (SMBEs) in the following ways: it is recognised as a more intelligent and efficient way to plan, manage, and control logistic activities with intelligent technologies applications. The study results have shown that majority of the (SMBEs) were not familiar or were not using the Smart Logistics approach to its best capabilities, based on the observations drawn from the (SMBEs) manufacturing environment. Therefore, the application of logistics 4.0 can be defined as an enabling intelligent management of processes. Wherein, the key components of the concept are

automatic identification, real-time location, automatic data collection, connectivity and integration, data processing and analysis, and business services. These components when integrated support the daily activities of an improved and more advanced operation and production of manufacturing, and distribution of finished brick products.

The previous section focused on the discussion around the application of the smart logistics concept approach that will support the small-medium brick enterprises and to manage them logistically. The following will seek to highlight the ways in which the smart value chain logistics approach can be used to improve and maximise the value of manufacturing and transportation of brick products.

9.5. Ways in which the smart value chain logistics approach can be utilised to improve and maximise the value of manufacturing and transporting brick products in Thohoyandou town

9.6.1. The approach can be used by improving the enterprise's main activities through inbound logistics, manufacturing operations, outbound logistics, market and sales, service, and support activities. By incorporating these mentioned activities, the enterprise can increase its competitive advantage to a greater extent.

9.6.2. Is to improve the rural freight logistics by adopting the freight logistics strategy that informs the Thulamela local municipality of the transport logistics situation occurring in Thohoyandou town.

9.6.3. In transporting brick products, the ways are to provide network routing options for distributing brick products from point a to point b. This can be done by either applying one of the following strategies: Point-to-Point Strategy, Fixed Routing, Corridor planning, Flexible Routing, and Hub-and-Spoke.

The section on the previous discussion was based on the ways in which the smart value chain logistics approach can be used to improve and maximise the value of manufacturing and transportation of brick products. The following section will focus on the discussion of the scenario analysis of objective three wherein four scenarios were formulated for the synthesis of the analysis.

9.6. Scenario analysis of objective three

The section on the scenario analysis main aim was to address objective three for the generated and anticipated future of the key drivers that stimulate the growth and development of the SMBEs. This is to enable SMBEs to create their own frameworks and implementation plans for their business franchise and improve the marketing and sales of their products that they are manufacturing.

9.6.1. Scenario 1: Smart value chains critical paths of the SMBEs

Table 9.2 shows the scenario of the smart value chain critical paths overview of the seven SMBEs.

Table 9. 2: Scenario of the smart value chains critical paths of the SMBEs

SMBEs	**Inbound Logistics:** Receiving, warehousing, and transport inventory control	**Operations:** Value-creating activities that transform inputs into products	**Outbound Logistics:** Activities required to get a finished product to a customer	**Marketing and Sales:** Activities associated with getting a buyer to purchase a product	**"Service:** Activities that maintain and enhance a product's value, such as customer support"
1. Young Xing Trading (Bricks)	The enterprise receives raw materials from agencies and trucks and also receives investment from other interested companies	The operators and supervisors create value-adding activities for the manufacturing of brick products	The activities are to get the raw materials, buy fuel, and machinery, and also distribute products to the customer	The enterprise utilizes the pay-and-go delivery system. And they do not market nor promote or advertise their products meaning it is not yet improved	It is customer support satisfaction, delivery on the same day, and feedback afterward
2. Vhavenda bricks (PTY) LTD	There are bricks that the enterprise receives, that they don't manufacture. Receives wrappers, and pallets. Receives fuel for transport and machinery	Is to buy sand (in rocks) into concrete and buy cement products to create and manufacture bricks (pavers which are durable)	Crushing plant (it crushes rocks) 9ml rock into crusher stones. It is the machinery to make cement bricks, through river sand	Advertising and the use of the internet	Plastic wraps that look attractive and help the brick pallets to be stronger to hold a ton of bricks. After-last-service. They show the customers what they need and what is suitable for them
3. Mami Group Brick House	Not receiving any products	To produce quality products	Purchasing and deliver on time	Marketing strategy and promotions	Good materials and transporting on time
4. Gokolo Bricks	Receives cement and sand	Four wheelbarrows 1-aggregate cement, sand (bou sand), and river sand	Customers hire their own transport, or the product is delivered to them by the enterprise outside of the enterprise	Paying through cash and also through EFT	To make delivering time to be efficient
5. Dithuse Brick Yard	Nothing is being received, there is	Manufacturing and marketing of	Bricks are distributed to	This is done through cash	Manufacturing and production

	poor transport inventory control	bricks are the only activities that transform inputs into products	various markets and sectors	payments as an assumption	procedures that are sustainable
6. Corner Sand and Brick Supply	The enterprise receives raw materials such as sand, cement, water, and equipment for making bricks	The activities are brick-making operations through traditional handcraft methods of manufacturing brick products	This is through transporting and distributing brick products out of the enterprise to be delivered to the customers	This is either to promote the product through reasonable sales and pricing of the brick products	The enterprise doesn't perform a lot of activities on services, but provides a service of just buying and selling brick products to the customers this is the only way of maintaining customer satisfaction
7. Lufule 1 Brick Makers	Concrete	There are none	Manufacturing and raw materials	Top quality	Following up on clients

Source: Author's construct, (2022)

Table 9.1 above shows the main smart value chain critical paths for the seven SMBEs as they are applied in the daily activities of the operations and manufacturing performances. And these were, Inbound Logistics: Receiving, warehousing, and transport inventory control; Operations: Value-creating activities that transform inputs into products; Outbound Logistics: Activities required to get a finished product to a customer; Marketing and Sales: Activities associated with getting a buyer to purchase a product; Service: Activities that maintain and enhance a product's value, such as customer support.

9.6.2. Scenario 2: Smart concepts application

The expected outcomes of Scenario 2 imply an application of the reviewed literature on smart concepts that are within the domain of logistics value chains. Literature findings have led to the scenario of anticipating the future of smart SMBE operations and their competitive strategies. This scenario applies the concept of a Smart Supply Chain, in which the goal or aim is to have the right item, in the right quantity at the right time, at the right place for the right price in the right condition to the right customer, (Wu, et al, 2016: p395-417). This scenario also applies the concept of Telematics, which enables the use of computer-related activities which are used to control and monitor remote devices and systems, installed to freight trucks, which has found wide application in the road freight sector, (European shippers' council, 2007, p 653-654). The scenario also applies the smart logistics concept to the system of operating

brick manufacturing enterprises. The application aims to efficiently align logistics planning and scheduling of ICT infrastructure, people, and policy implementation. The future of the enterprise rests on the application of Logistics 4.0, which is all about the application of the Internet of Things, cloud computing, big data, block chain, robotics, automation and wireless sensor network, drones, and automatic guided vehicle, (Radiovojevicg, 2014; p 1-50). These applications will increase growth and develop the enterprise's competitive advantage in the market sector and the manufacturing sector with innovative capabilities.

9.6.3. Scenario 3: Theoretical framework application

This scenario is based on the application of the theoretical applications that are centered around the theory of value configuration, which builds on extending and transforming porters value chain framework for the analysis and development of an enterprise or manufacturing organization's value-adding activities, (Porter, 1985; p 11). This scenario applies the theory of Resource-Based View (RBV) theory, of the firm which indicates the firm behavior that interprets the competitive gain of the enterprise in the market. It also shows how a company's human capital management, technology control, and innovation can be the alternatives for competitive advantage, (Mitra et al, 2017; p 1-26). Introducing a transaction cost of managing logistics of the operation, the logistics theory application implies that its key central focus is on transport demand and research, which resonates with the concepts of supply chain management. In which the logistics review can be described in terms of the management of upstream and downstream relationships with suppliers, distributors, and customers in a way that greater customer value is achieved at less total costs, (Karen, et al, 2007; p 1-30).

9.6.4. Scenario 4: Strategic model application

Figure 9.3 below seeks to introduce a scenario approach of the strategic application of the various activities and the logistics activities of an enterprise. The strategic model is based on the notion of the transportation distribution of brick products through the value chain system and the supply chain demand of an enterprise that manufactures bricks. The packaging of the brick products by plastic wrappers on pallets, the distribution process, loading/unloading handling, information (ICT and digitized logistics platforms) and lastly the physical location, siting, and warehousing.

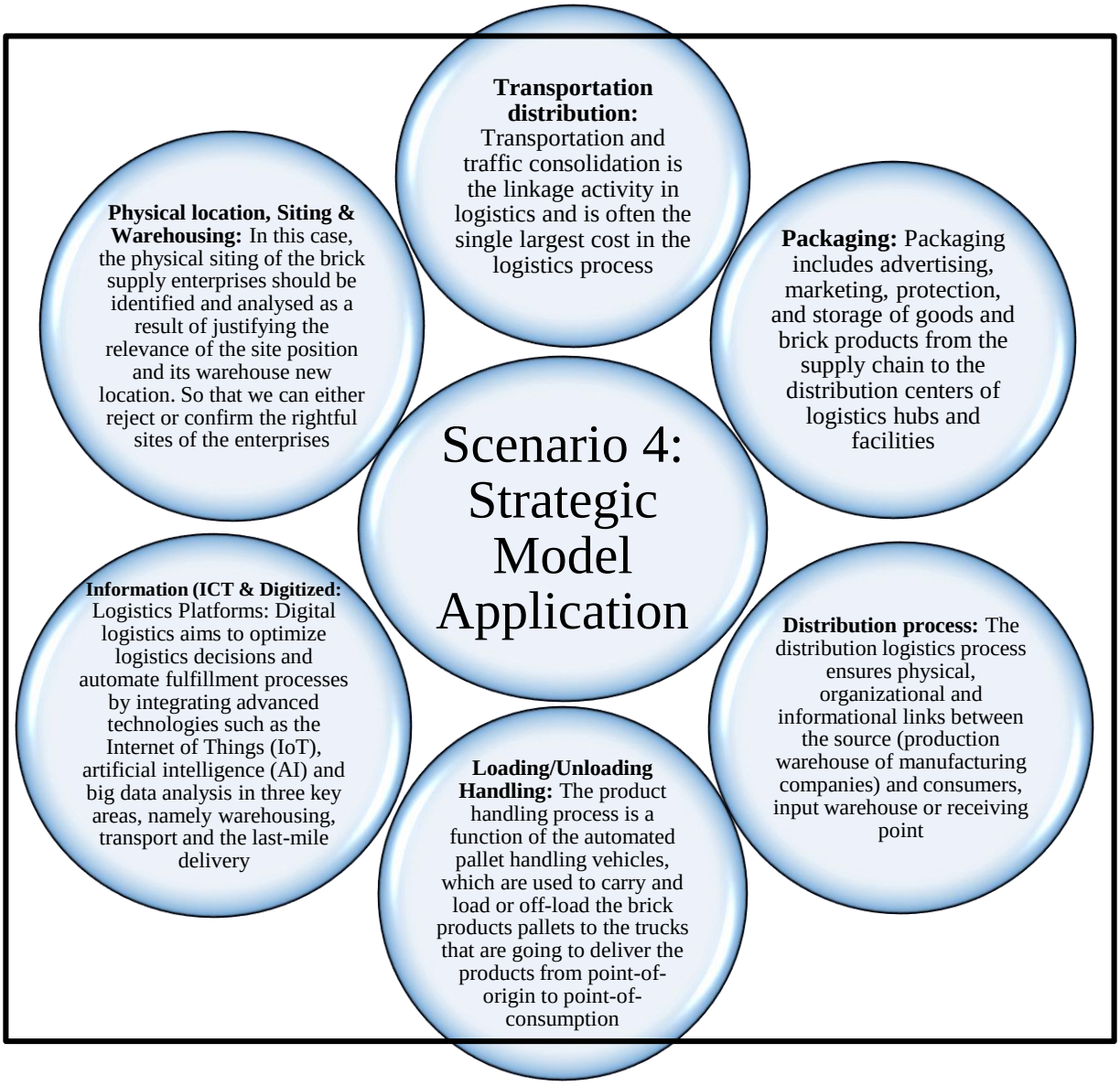


Figure 9. 3: Scenario 4 (Strategic Model Application)

Source: Author's construct, (2022)

Figure 9.3 Gives an emphasis on the strategic application of the logistics theory and model in transport logistics of the selected small-medium brick manufacturing enterprises of South Africa in Thohoyandou town.

The previous section introduced the chapter in highlighting the main purpose of the chapter and the sub-sections that will be discussed later from the chapter. The following section however will focus on the interpretation of results.

9.7. Interpretation of results

The section introduces the results based on the demographic profiling of all the key respondents who were interviewed in this study. The main purpose was to gain more insight into the respondent's majority group which dominates the brick manufacturing sector of Thohoyandou town. Wherein the major socio-economic profile variables identified were gender, age, race, language, years of experience in the field and ranking in the profession.

9.7.1. Demographic profile of the respondents

This section presents the socio-economic profile of the key informants, from the Thulamela local municipality, Vhembe district municipality, and the seven small-medium brick manufacturing enterprises. The socio-economic profile variables of the key respondents to be discussed are as follows:

- Gender
- Age
- Race
- Language
- Years of experience in the field
- Ranking in the profession

Table 9.3 below shows the tabulated analysis of the demographic profiling of the key respondents, representing the gender, years, race colour, language spoken years of service, and position held.

Table 9. 3: Analysis of demographic profiling of the key respondents

Variables		Gender	Years	Race colour	Language spoken	Years of service	Position held
N-values	Valid	13	13	13	13	13	13
	Missing	0	0	0	0	0	0
Mean		1.08	3.15	1.15	2.92	2.08	3.00
Mode		1	3	1	3	3	2
Std. Deviation		.277	.689	.555	.277	.862	1.633
Variance		.077	.474	.308	.077	.744	2.667
Skewness		3.606	-.203	3.606	-3.606	-.164	.543

Std. Error of Skewness	**.616**	**.616**	**.616**	**.616**	**.616**	**.616**
Range	**1**	**2**	**2**	**1**	**2**	**5**
Maximum	**2**	**4**	**3**	**3**	**3**	**6**

Table 9.3 above shows that there are 13 valid responses, zero missing responses, average mean, standard deviation, mode, variance, skewness, standard error of skewness, range, and maximum values. In this tabulated analysis, the average mean which is the highest is 3.15 on years of respondents. This means that age signifies the importance of middle-aged workers who operate SMBEs. The least mean average is 1.08 under gender preferences.

9.7.1.1. Gender

The majority of key respondents (92.31%) are male, whereas female respondents constitute (7.69%). The figure below presents the gender of the study respondents.

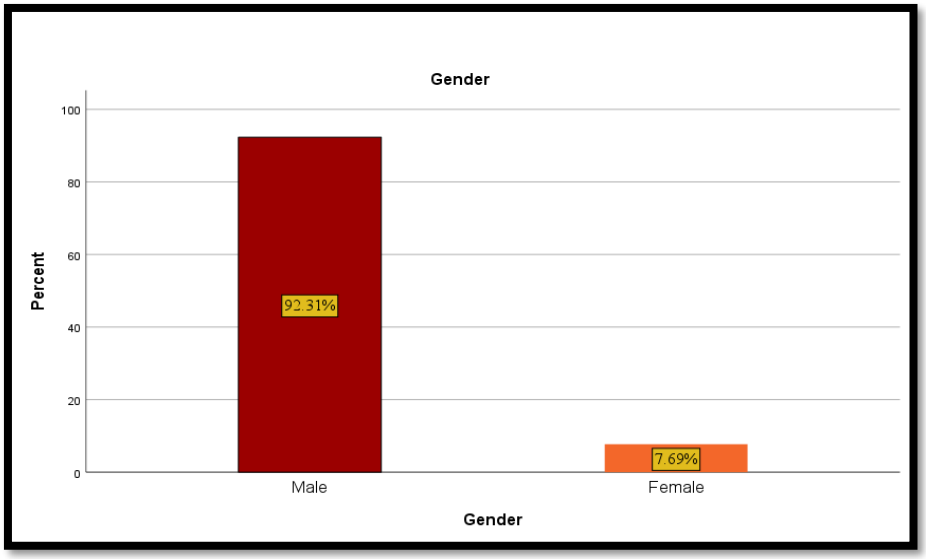


Figure 9. 4: Gender of survey respondents

Source: Author's field work, (2022)

Sample: N=13

Figure 9.4 above shows a high percentage of male respondents, this indicates that within the seven SMBEs, Thulamela local municipality and Vhembe district municipality, males are more dominating than females. This further justifies the fact that most males are the ones who dominate the field of transport logistics and owns most of the brick manufacturing enterprises.

9.7.1.2. Age

The data regarding the age of the respondents were collected from the survey. The data findings are in the figure as follows:

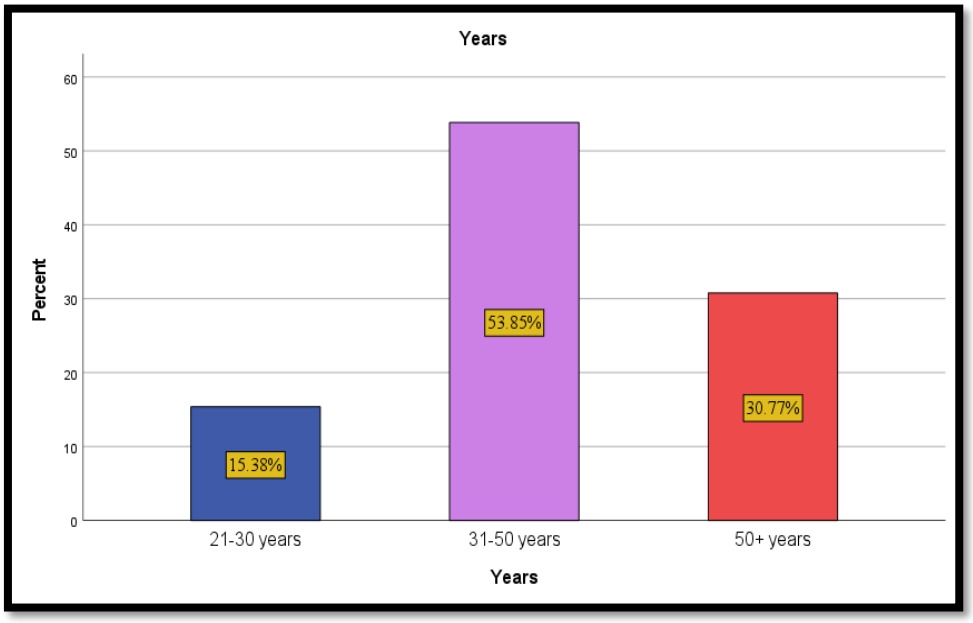


Figure 9. 5: Age of respondents

Source: Author's fieldwork, (2022)

Sample: N=13

Figure 9.5 above shows that the majority of respondents are (53.85%) that are between the ages of 31-50 years. This is followed by (30.77%) of 50+ years of age and above. The smallest age of respondents of (15.38%) are between the ages of 21-30 years. This study result shows that key respondents that are between the ages of 31-50 years are the ones operating most of the brick manufacturing enterprises.

9.7.1.3. Race

The data regarding the race colour of the key respondents were collected from the survey. Wherein the distinguished race colour of Black constituted (92.31%) and the whites constituted (7.69%). The result means that the Black majority are the ones dominating the seven SMBEs compared to whites within Thohoyandou town, South Africa.

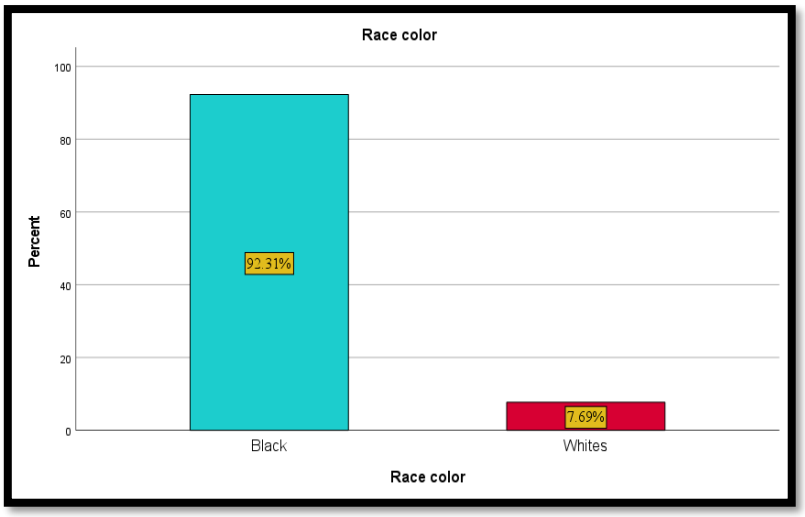


Figure 9. 6: Race of respondents

Source: Author's fieldwork, (2022)

Sample: N=13

Figure 9.6 above shows that the majority race dominating within the seven SMBEs, Thulamela local municipality and Vhembe district municipality are Black people at (92.31%) than whites at (7.69%).

9.7.1.4. Language

The key respondents were interviewed based on their home language preferences. The data relating to the language status was essential. In this study result, it has been found that (92.31%) of the majority language spoken was Venda than Afrikaans at (7.69%). this result justifies that Venda people are the ones who mostly operate within the brick-making sector of Thohoyandou town. Figure 9.7 below depicts the respondent's language profile:

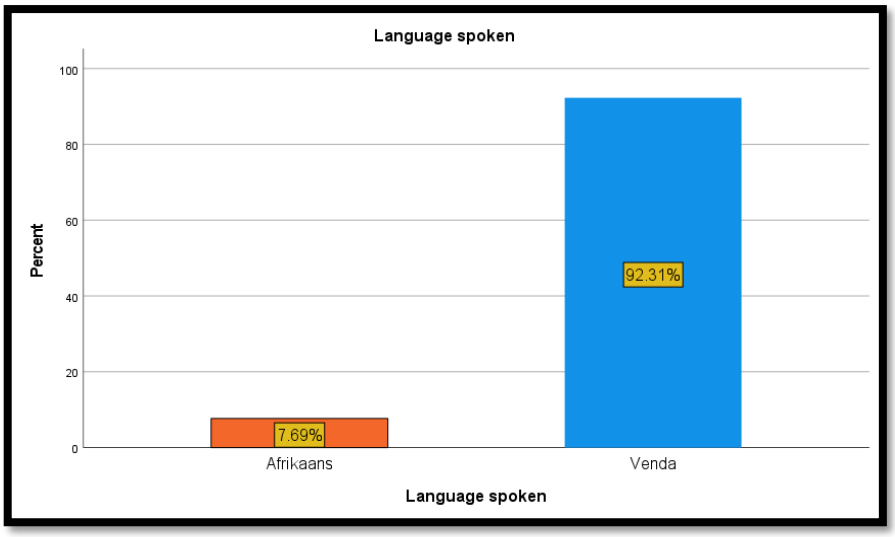


Figure 9. 7: Language of respondents

Source: Author's fieldwork, (2022)

Sample: N=13

Figure 9.7 above shows that the majority of respondents (92.31%) speak Venda, while the minority of respondents speak Afrikaans (7.69%).

9.7.1.5. Years of experience in the field

The years of experience data which was collected constituted of (38.46%) for more than 10 years of experience within the occupation of each respondent. For the years of experience between 1-5 years, (30.77%) was found to be the minority, together with the (30.77%) between 6-10 years.

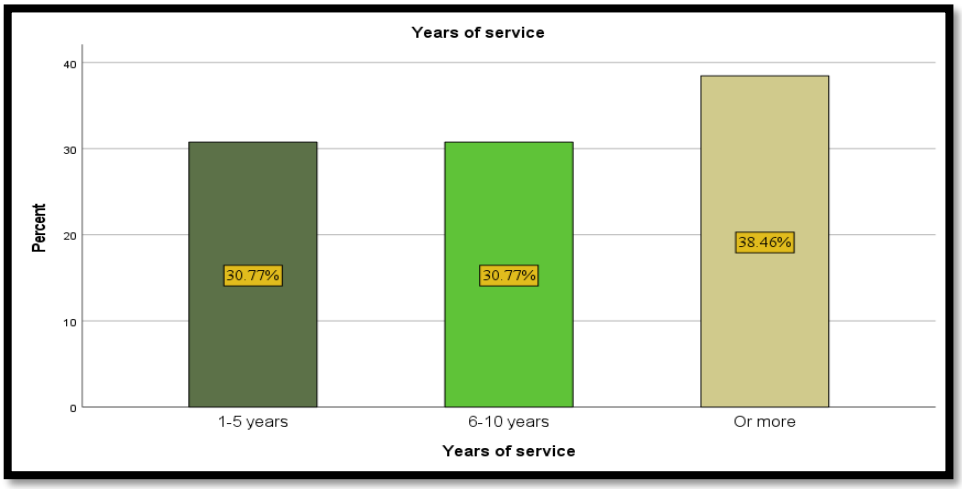


Figure 9. 8: Respondent's years of experience in the field

Source: Author's fieldwork, (2022)

Sample: N=13

Figure 9.8 above shows that the majority of years of experience from 10 years or more experienced are (38.46%) than 1-5 years and 6-10 years at (30.77%).

9.7.1.6. Ranking in the profession

The data regarding position and ranking within the enterprises were collected to identify the majority of positions held within the enterprises, Thulamela local municipality and Vhembe district municipality and the minority from the highest ranking to the lowest ranking.

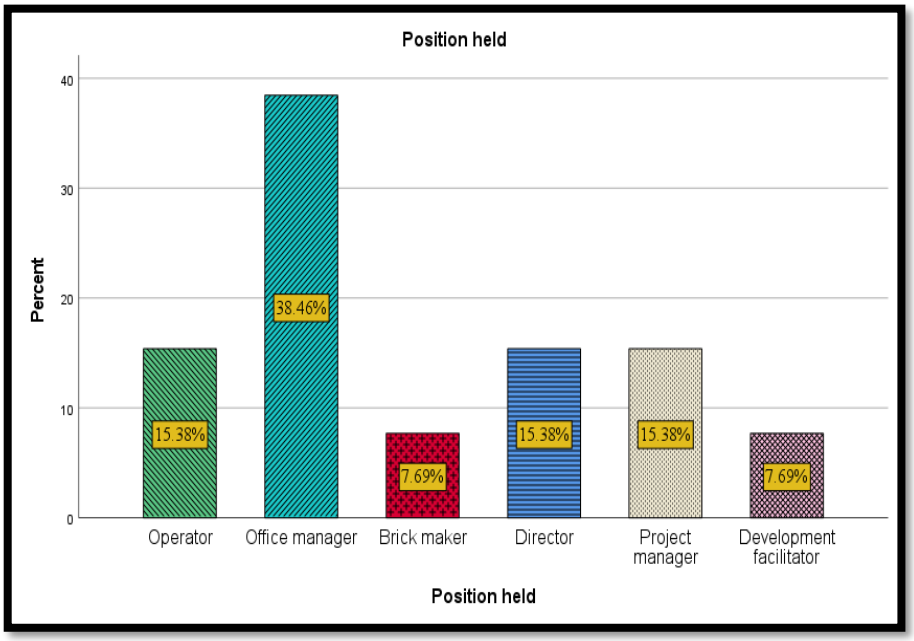


Figure 9. 9: Ranking of the respondents

Source: Author's fieldwork. (2022)

Sample: N=13

Figure 9.9 above shows the ranking of professions of the key respondents within their respective workplaces. The data collected in this study showed that (38.46%) were office managers, (15.38%) were operators, (15.38%) were directors, (15.38%) were project managers and a minority being (7.69%) of brick makers as well as (7.69%) of development facilitators.

The previous section on the interpretation of the study results focused on the discussion of the demographic profiling of the respondents. The following section will focus on the highlights of findings based on the findings of the locational distribution of the SMBEs.

9.8. Highlights of findings

The section is based on the findings of the location distributions of the SMBEs sampled from a radius of 12 km, below is a highlight of the location of the seven SMBEs that are located in Thohoyandou town. The findings show where the SMBEs are located on the layout of the geographic map. Plate 1: shows Vhavenda Bricks (Pty) Ltd enterprise, Plate 2: shows Lufule 1 brick makers enterprise, Plate 3: shows Gokolo bricks enterprise, Plate 4: shows the Corner Sand and Brick Supply enterprise, Plate 5: shows Mami Group Brick House enterprise, Plate 6: shows Dithuse Brick Yard enterprise, and lastly Plate 7: shows the Young Xing Brick Trading enterprise.

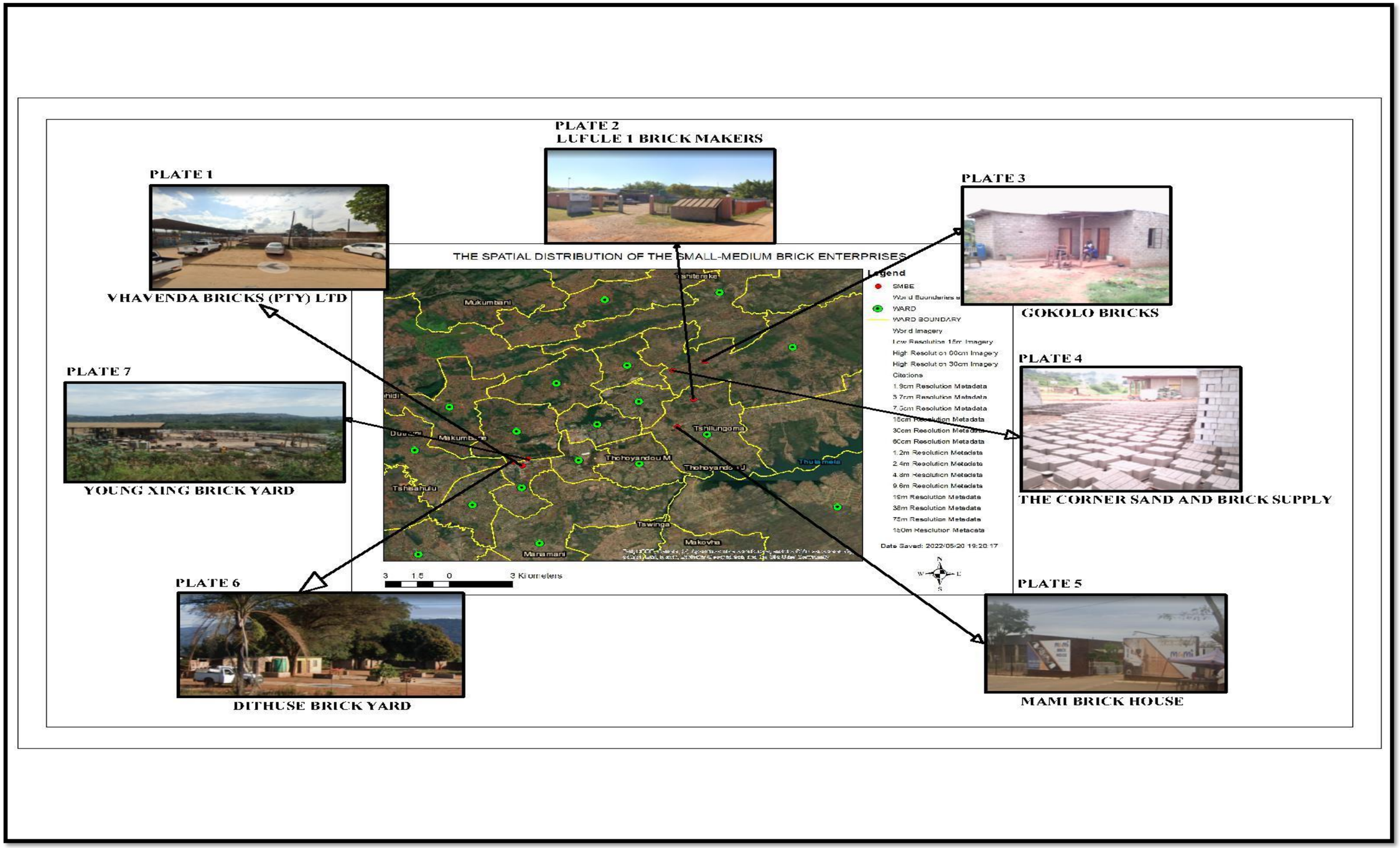


Figure 9. 10: Locational distribution of the seven Small-Medium Brick Manufacturing Enterprises

Source: Author's field work, (2022)

The above figure shows the spatial location and distribution of the seven SMBEs that are located and configured on a radius of 12 km.

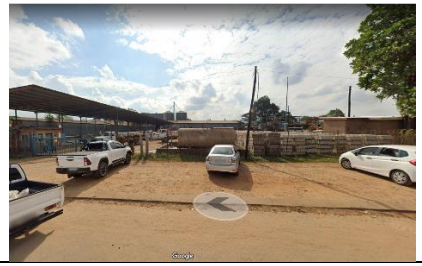
9.9. Highlights of findings based on the non-participant observation survey fieldwork

The section introduces the findings from the survey conducted at the selected SMBEs of Thohoyandou town that was configured on a radius of 12 km. The main aim was to observe the operations of the brick-manufacturing enterprises which were visited. This was done to find out the main constraints, physical siting, the planning of the built site, aesthetic appeal, transport logistics, and conditions of the site to name a few. So as to justify or reject the findings based on analysis results.

Table 9.4 shows the highlights of findings that are based on the non-participant observation reconnaissance survey (fieldwork) conducted at the six SMBEs selected for study field visits. It shows the observation checklists, the variables studied, photographic evidence of the variables studied and a description of the key findings.

Table 9. 4: Highlights of findings based on the non-participant observation survey

Observation checklists	**Variables studied**	**Photographic evidence of variables studied**	**Description of the key findings**
Observation checklist one		**Plate 9.8: Effectiveness**	
a). Public and private buildings use and function	(VAR1) Effectiveness (VAR2) Efficiency (VAR3) Optimization		The use of public buildings is effective and efficient
b). Aesthetic appeal/ appearance of built infrastructure	(VAR1) Good (VAR2) Fair (VAR3) Not-pleasing	**Plate 9.9: Not pleasing**	The appearance of the structures and built form is not pleasing to some of the enterprises

			
c). Building elevations and design of façade	(VAR1) Good quality (VAR2) Building orientation (VAR3) Culturally diverse	**Plate 9.10: Building orientation** 	There is good quality building orientation of building elevations and façade
Observation checklist two			
a). Conditions of the site (public and private spaces)	(VAR1) Convenient (VAR2) Accessible (VAR3) Inconvenient (VAR4) Not accessible	**Plate 9.11: Accessible site** 	The site is convenient and accessible by vehicles and by walking
b). Existing features on the site of the enterprises	(VAR1) Natural vegetation (VAR2) Topsoil (VAR3) Structures	**Plate 9.12: Topsoil and vegetation cover**	There is existence of topsoil and natural vegetation cover

			
c). Spatial form of the site	(VAR1) Organic (VAR2) Inorganic (VAR3) Planned	**Plate 9.13: Organic and planned** 	The SMBEs are well planned and organic
Observation checklist three			
a). Operational performance	(VAR1) Effectiveness (VAR2) Sustainability (VAR3) Ineffectiveness (VAR4) Not Sustainable	**Plate 9.14: Sustainable operations** 	The operational performance is sustainable and effective
b). Operational value chain activities	(VAR1) Active (VAR2) Not active (VAR3) Operational efficiency	**No evidence**	
c). Operational mode	(VAR1) Smart		

	(VAR2) Not smart (VAR3) Sustainability (VAR4) Not Sustainable	**Plate 9.15: Sustainable operational mode** 	Some of the enterprise's operational modes are sustainable and smart
Observation checklist four			
a). Production procedures	(VAR1) Followed (VAR2) Not followed (VAR3) Strategic approach (VAR4) Not strategic	**No evidence**	
b). Manufacturing process	(VAR1) Sustainable (VAR2) Not Sustainable (VAR3) Strategic approach (VAR4) Not strategic	**Plate 9.16: Strategic and sustainable processes** 	The manufacturing processes are strategic and sustainable
c). Production and manufacturing impacts	(VAR1) Good (VAR2) Fair (VAR3) Bad	**No evidence**	
Observation checklist five			
a). Transport and distribution of brick products	(VAR1) Smart transportation (VAR2) Logistically managed (VAR3) Not logistically managed	**Plate 9.17: Logistically managed**	The transport and distribution of brick products are not smart although the enterprises are logistically managed

			
b). Smart logistics application within the enterprises	(VAR1) Applied (VAR2) Not applied (VAR3) Smart (VAR4) Not smart	**No evidence**	
c). Transport logistics of brick products	(VAR1) Sustainable enough (VAR2) Not sustainable enough (VAR3) Integrated (VAR4) Fragmented	**Plate 9.18: Sustainable enough and integrated** 	Some of the enterprises are sustainable enough and integrated and while some are fragmented and not sustainable enough

Source: Author's fieldwork, (2022)

Table 9.2. above emphasised the findings of the selected and visited SMBEs of study. The findings were justified and evidenced based on the observation made during the reconnaissance survey activity.

The previous section focused on highlighting the findings based on the non-participant observation survey fieldwork. The findings have shown that the SMBEs are mostly in need of improving their operations and manufacturing activities that will reduce the costs of productivity. The following section will focus on the non-participant observation survey analysis results that will be discussed.

9.10. Non-participant observation survey analysis results

This section seeks to provide an observation insight gained from the visits conducted at the selected SMBEs under the research study. The main purpose was to survey the sites of the SMBEs and the operational performances during manufacturing activities. Which was guided by the scales of measurements, which were inclined to five observation survey checklists, to analyse the conditions and value chains logistics state of the SMBEs.

Table 9.5 below shows the tabulated analysis of the non-participant observation survey, depicting the scale of measurements with the corresponding mean average statistic, standard deviation, variance, and skewness

Table 9. 5: non-participant observation survey analysis results

Variables	N	Minimum	Maximum	Mean		Std. Deviation	Variance	Skewness	
	SMBEs	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std. Error
a). Public and private buildings use and function									
(VAR1) Effectiveness	6	1	4	2,83	,477	1,169	1,367	-,668	,845
(VAR2) Efficiency	6	2	4	2,83	,307	,753	,567	,313	,845
(VAR3) Optimization	6	1	4	2,67	,422	1,033	1,067	-,666	,845
b). Aesthetic appeal/ appearance of built infrastructure									
(VAR1) Good	6	1	3	1,83	,401	,983	,967	,456	,845
(VAR2) Fair	6	1	5	2,83	,543	1,329	1,767	,440	,845
(VAR3) Not-pleasing	6	1	5	2,67	,667	1,633	2,667	,383	,845
c). Building elevations and design of façade									
(VAR1) Good quality	6	1	3	2,17	,307	,753	,567	-,313	,845
(VAR2) Building orientation	6	1	4	2,83	,477	1,169	1,367	-,668	,845
(VAR3) Culturally diverse	6	1	3	2,33	,333	,816	,667	-,857	,845
a). Conditions of the site (public and private spaces)									

(VAR1) Convenient	6	3	5	3,83	,401	,983	,967	,456	,845
(VAR2) Accessible	6	1	1	1,00	,000	,000	,000	.	.
(VAR3) Inconvenient	6	3	4	3,17	,167	,408	,167	2,449	,845
(VAR4) Not accessible	6	1	2	1,50	,224	,548	,300	,000	,845
b). Existing features on the site of the enterprises									
(VAR1) Natural vegetation	6	1	5	3,00	,730	1,789	3,200	,000	,845
(VAR2) Topsoil	6	1	1	1,00	,000	,000	,000	.	.
(VAR3) Structures	6	2	5	3,17	,477	1,169	1,367	,668	,845
c). Spatial form of the site									
(VAR1) Organic	6	3	5	4,17	,401	,983	,967	-,456	,845
(VAR2) Inorganic	6	1	5	3,50	,563	1,378	1,900	-1,375	,845
(VAR3) Planned	6	1	4	3,00	,447	1,095	1,200	-1,369	,845
a). Operational performance									
(VAR1) Effectiveness	6	2	4	3,67	,333	,816	,667	-2,449	,845
(VAR2) Sustainability	6	1	3	2,50	,342	,837	,700	-1,537	,845
(VAR3) Ineffectiveness	6	2	5	3,17	,401	,983	,967	1,438	,845
(VAR4) Not Sustainable	6	1	2	1,50	,224	,548	,300	,000	,845
b). Operational value chain activities									
(VAR1) Active	6	2	3	2,33	,211	,516	,267	,968	,845
(VAR2) Not active	6	1	5	2,17	,654	1,602	2,567	1,354	,845
(VAR3) Operational efficiency	6	2	5	4,00	,447	1,095	1,200	-1,369	,845
c). Operational mode									
(VAR1) Smart	6	1	5	3,50	,563	1,378	1,900	-1,375	,845
(VAR2) Not smart	6	1	5	3,00	,775	1,897	3,600	,000	,845
(VAR3) Sustainable	6	1	5	3,50	,619	1,517	2,300	-,774	,845
(VAR4) Not Sustainable	6	1	4	2,83	,601	1,472	2,167	-,711	,845
a). Production procedures									
(VAR1) Followed	6	1	5	4,00	,632	1,549	2,400	-1,936	,845
(VAR2) Not Followed	6	1	3	1,67	,333	,816	,667	,857	,845
(VAR3) Strategic approach	6	1	4	3,00	,516	1,265	1,600	-,889	,845
(VAR4) Not Strategic	6	2	4	2,50	,342	,837	,700	1,537	,845
b). Manufacturing process									
(VAR1) Sustainable	6	3	5	4,17	,307	,753	,567	-,313	,845
(VAR2) Not Sustainable	6	1	5	3,33	,760	1,862	3,467	-,723	,845
(VAR3) Strategic approach	6	1	4	3,17	,477	1,169	1,367	-1,586	,845
(VAR4) Not Strategic	6	1	5	2,67	,615	1,506	2,267	,840	,845
c). Production and manufacturing impacts									
(VAR1) Good	6	2	5	4,50	,500	1,225	1,500	-2,449	,845

(VAR2) Fair	6	1	5	2,33	,615	1,506	2,267	1,270	,845
(VAR3) Bad	6	1	2	1,33	,211	,516	,267	,968	,845
a). Transport and distribution of brick products									
(VAR1) Smart transportation	6	2	3	2,83	,167	,408	,167	-2,449	,845
(VAR2) Logistically managed	6	1	4	3,00	,447	1,095	1,200	-1,369	,845
(VAR3) Not logistically managed	6	2	2	2,00	,000	,000	,000	.	.
b). Smart logistics application within the enterprises									
(VAR1) Applied	6	2	5	3,83	,543	1,329	1,767	-,326	,845
(VAR2) Not applied	6	2	5	2,83	,543	1,329	1,767	1,207	,845
(VAR4) Not smart	6	2	5	3,33	,494	1,211	1,467	,075	,845
c). Transport logistics of brick products									
(VAR3) Integrated	6	3	4	3,50	,224	,548	,300	,000	,845
(VAR4) Fragmented	6	2	4	3,50	,342	,837	,700	-1,537	,845
Valid N (listwise)	6								

Source: Author's field data, (2022)

Sample: N=6

9.10.1. Interpretation of Table 10.3 study results and observation survey checklist one

Table 9.5 above shows the tabulated analysis of results obtained from the non-participant observation survey fieldwork conducted at the six selected SMBEs sites. The table indicates the studied variables which add up to forty-nine in total. It indicates the number of samples, minimum values, maximum values, mean average statistics, and standard error of the mean, standard deviation, variance, and skewness. What will be discussed in this table will be the interpretation of the highest resulting mean averages as mean scores representing each variable studied.

Under the public and private buildings' use and function, the highest mean average score was 2.83 for both (VAR1) Effectiveness and (VAR2) Efficiency. This means that most of the public and private building usage is effective and efficient. Under aesthetic appeal/appearance of built infrastructure, the highest mean average score was at 2.83, on (VAR2) Fair, this means that the aesthetic appeal of the built infrastructure of the SMBEs is not yet adequate and not satisfying, it will need improvement in terms of revamping the appeal.

9.10.2. Interpretation of observation survey checklist three

On operational performance, the highest mean average score which resulted was 3.67, on (VAR1) Effectiveness this means that most of the operational performance of most SMBEs analysed was effective. Under operational value chain activities, the highest mean average score calculated was 4.00 for (VAR3) Operational efficiency, which means that the system of value chain activities is efficiently operational. In terms of the operational mode, the mean average scores of 3.50 were both on (VAR1) Smart and (VAR3) Sustainable, meaning that the operational mode of most SMBEs is operated with intelligence and with caution observing all regulations and protocols of the manufacturing policies to ensure sustainable productivity.

9.10.3. Interpretation of observation survey checklist four

Under production procedures, the highest mean average score calculated was 4.00, on (VAR1) Followed procedures in all processes, this means that the production procedures of the brick enterprises are being managed and followed as the main activity of making brick products. In the manufacturing process, the highest mean average score was 4.17, in terms of (VAR1) Sustainability. This means that the manufacturing processes of the enterprises are highly sustainable and do not cause harm to the environment. Under production and manufacturing impacts, the highest mean average score was 4.50 for (VAR1) which means that the production and manufacturing impacts are managed in a satisfactory manner and are not polluting the environment.

9.10.4. Interpretation of observation survey checklist five

For the transport and distribution of brick products, the highest mean average score is 3.00 for (VAR2) Logistically managed. This means that indeed the transport and distribution mechanism is logistically managed when delivering brick products. Under smart logistics

application within the enterprises, the highest mean average score calculated was 3.83 this was for (VAR1) Applied. It means that smart processes of the logistics system are applied in most of the enterprises producing bricks, such as the internet of things, digitized logbook, computerized scheduling of trip deliveries, and bookkeeping excel spreadsheets for recording daily work activities. For the transport logistics of brick products both the (VAR3) Integrated and (VAR4) Fragmented were having a mean average score of 3.50 meaning that either most of the enterprise's transport logistics system is integrated or fragmented, in terms of moving brick products from the place of origin to places of destination where customers consume the products.

9.10.5. Study results of the seventh SMBE (Lufule 1 brick makers) non-participant observation survey analysis

Table 9.5 below shows the tabulated analysis of the non-participant observation survey, depicting the scale of measurements with the corresponding mean average statistic, standard deviation, and sample N.

Table 9. 6: Study results of the seventh SMBE (Lufule 1 brick makers) non-participant observation survey analysis.

Variables	Mean	Std. Deviation	N
a). Public and private buildings use and function	**Statistics**	**Statistics**	**Valid**
(VAR1) Effectiveness	3,40	1,140	5
(VAR2) Efficiency	2,40	1,517	5
(VAR3) Optimization	2,60	1,342	5
b). Aesthetic appeal/ appearance of built infrastructure			
(VAR1) Good	2,40	,894	5
(VAR2) Fair	2,60	1,342	5
(VAR3) Not-pleasing	2,40	,894	5
c). Building elevations and design of façade			
(VAR1) Good quality	2,60	1,342	5
(VAR2) Building orientation	2,60	1,342	5
a). Conditions of the site (public and private spaces)			
(VAR1) Convenient	3,00	1,871	5
(VAR2) Accessible	2,60	2,191	5
(VAR3) Inconvenient	3,40	2,191	5
(VAR4) Not accessible	2,60	2,191	5
b). Existing features on the site of the enterprises			
(VAR1) Natural vegetation	2,80	1,789	5
(VAR2) Topsoil	2,60	1,817	5
c). Spatial form of the site			
(VAR1) Organic	3,00	2,000	5
(VAR2) Inorganic	3,00	2,000	5
(VAR3) Planned	2,60	2,191	5
a). Operational performance			
(VAR1) Effectiveness	3,20	1,304	5
(VAR2) Sustainability	3,00	1,871	5
(VAR3) Ineffectiveness	2,20	1,643	5
(VAR4) Not sustainable	2,60	2,191	5
b). Operational value chain activities			
(VAR1) Active	4,40	,548	5
(VAR3) Operational efficiency	3,40	2,191	5
c). Operational mode			
(VAR1) Smart	2,60	1,517	5
(VAR2) Not smart	2,20	1,643	5
(VAR3) Sustainable	4,80	,447	5
a). Production procedures			
(VAR1) Followed	1,60	1,342	5
(VAR2) Not followed	1,60	1,342	5

(VAR3) Strategic approach	3,00	2,000	5
(VAR4) Not Strategic	2,60	2,191	5
b). Manufacturing process			
(VAR1) Sustainable	2,40	1,517	5
(VAR2) Not sustainable	2,20	1,643	5
(VAR3) Strategic approach	2,60	2,191	5
(VAR4) Not strategic	2,60	2,191	5
c). Production and manufacturing impacts			
(VAR1) Good	1,80	,837	5
(VAR2) Fair	2,40	,894	5
(VAR3) Bad	2,20	,447	5
a). Transport and distribution of brick products			
(VAR1) Smart transportation	3,00	1,414	5
(VAR2) Logistically managed	3,80	1,789	5
(VAR3) Not logistically managed	1,80	1,789	5
b). Smart logistics application within the enterprises			
(VAR1) Applied	2,80	1,789	5
(VAR4) Not smart	3,20	,447	5
c). Transport logistics of brick products			
(VAR3) Integrated	3,40	,548	5
(VAR4) Fragmented	2,00	1,414	5

Source: SPSS analysis data, (2022)

The analysis of Table 9.6 is based on the scaling and rating of the studied variables from the non-participant observation survey. The scales of measurements were used to provide reliable data information which can be used to analyse the significance of the variables and how each variable is adopted at the SMBE (Lufule 1 brick makers). The mean average score was calculated together with the standard deviation.

The analysis of public and private buildings' use and function had the highest mean average score of 3.40 for (VAR1) Effectiveness. This means that the variable is rated highest as the only variable on public and private building functions. The analysis of aesthetic appeal/appearance of built infrastructure had the highest mean average score of 2.60 for (VAR2) Fair, this means that the aesthetic appeal is fair. The analysis of building elevations and design of the façade had a mean average score of 2.60 for both (VAR1) Good quality and (VAR2) Building orientation.

The analysis of conditions of the site (public and private spaces) had the highest mean average of 3.40 for (VAR3) Inconvenient. Under the existing features on the site of the enterprises, the highest average score was 2.80 for (VAR1) Natural vegetation. Under the spatial form of the site, the highest mean average score was 3.00 for both (VAR1) Organic and (VAR2) Inorganic. The analysis of operational performance had the highest mean average score of 3.20 for (VAR1) Effectiveness. For the operational value chain activities, the highest mean average score was 4.40 for (VAR1) Active. For the operational mode, the highest mean average score was 4.80 for (VAR3) Sustainable.

The highest mean average score for the production procedures was 3.00 which (VAR3) Strategic approach. For the manufacturing process, the highest mean average was 2.60 for both (VAR3) Strategic approach and (VAR4) Not strategic. The highest mean average score for production and manufacturing impacts was 2.40 for (VAR2) Fair.

The analysis of transport and distribution of brick products had the highest mean average of 3.80 for (VAR2) Logistically managed. For the Smart Logistics application within the enterprises, the highest mean score was 3.20 for (VAR4) Not smart. Under the transport Logistics of brick products, the mean score was 3.40 which was the highest for (VAR3) Integrated.

The previous section was based on the analysis results of the non-participant observation survey checklist with data obtained from fieldwork within the SMBEs premises. The following section will summarise the chapter.

9.11. Chapter summary

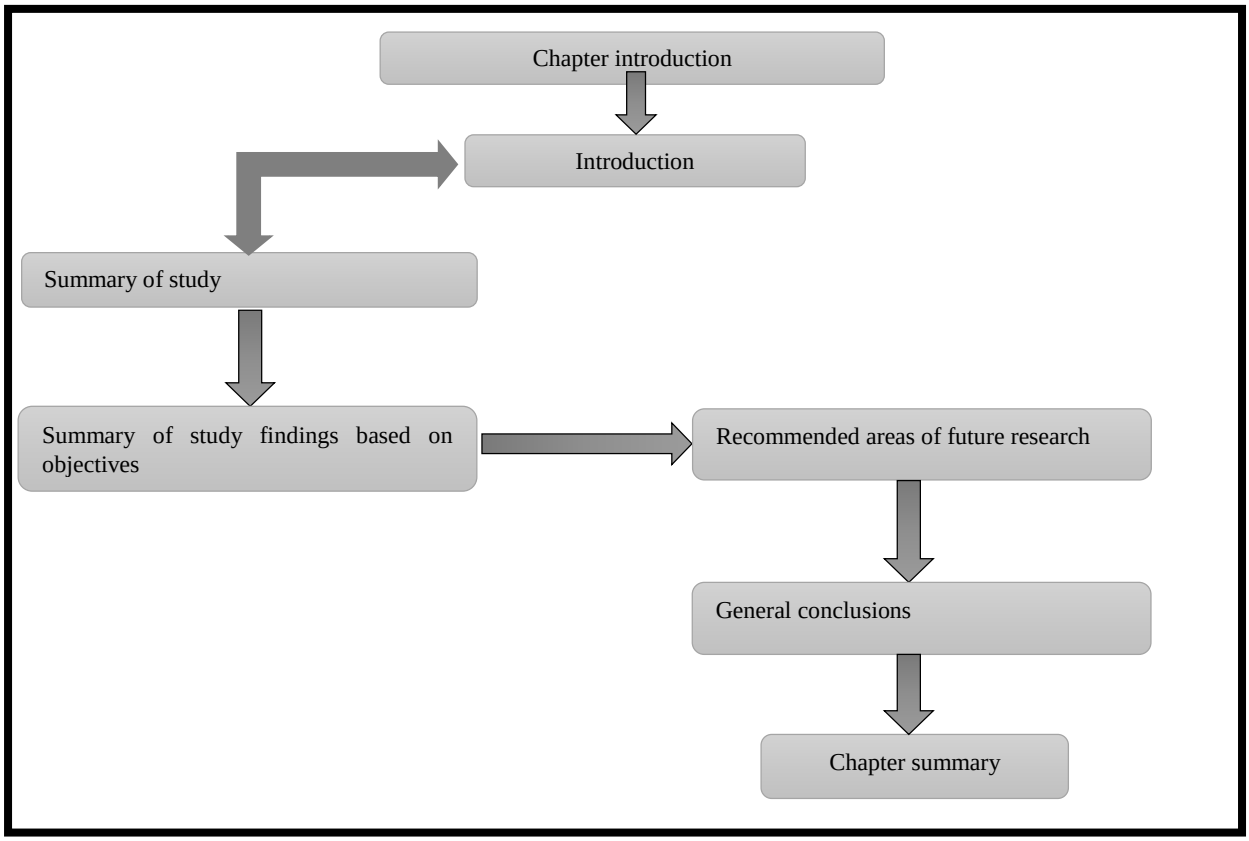
Chapter nine was based on the recommendations of the smart value chain framework guideline and its significance in terms of the application of the smart concepts, theories, and models. The chapter introduced the analysis of objective three, based on the scenario analysis methodology comprising the smart value chain logistics critical paths, conceptual approach, theoretical approach, model approach, and strategic approach. The chapter introduced the demographic profile of the key respondents and the highlights of the findings. The analysis of the non-participant observation survey fieldwork was conducted as the main data collection method to obtain valid information for analysis and justification. the contents that have been discussed under this chapter are namely: chapter introduction, introduction, recommendations in support of developing the small-medium brick manufacturing enterprises in the brick-making sector of Thohoyandou town, the rationale for recommending the smart value chain logistics framework for developing small-medium brick manufacturing enterprises, the application of the smart logistics conceptual approach in support of small-medium brick enterprises, ways in which the smart value chain approach can be utilised to improve and maximise the value of manufacturing and transporting brick products in Thohoyandou town, Scenario analysis of objective three interpretation of results, highlights of findings, highlights of findings based on the non-participant observation survey fieldwork, non-participant observation survey analysis results. and lastly chapter summary.

CHAPTER TEN: SUMMARY, CONCLUSION, AND RECOMMENDATIONS

10.1. Chapter Introduction

This chapter presents the summary of the study, conclusions drawn from the study findings, and recommendations for future research towards the application of the smart value chain logistics for the small-medium brick manufacturing enterprises, of Thohoyandou town, in South Africa. It comprises of a thorough chapter introduction, introduction, summary of study, summary of study findings based on objectives, recommended areas for future research, general conclusion and lastly chapter summary. Figure 10.1 below shows the structure layout of chapter ten which is represented as follows:

Figure 10. 1: The structure layout of chapter ten



Source: Author's construct, (2022)

Figure 10.1 above shows the structure of chapter ten layout, comprises of seven components namely: chapter introduction, introduction, summary of study, summary of study findings based on objectives, recommended areas of future research, general conclusions and lastly chapter summary.

The previous section focused on the chapter introduction with a thorough outline of the components to be discussed later from the chapter. And the figure 10.1 which outlined the structure of the components in a diagrammatic layout. The following section will introduce the chapter in detail.

10.2. Introduction

This section introduces chapter ten as the last chapter for the entire research study and as a comprehensive summary of study discussions and conclusions. The study explored the initial findings from a firsthand information gathering perspective, as indicated, and discussed in chapter one (setting the scene and background to the study). Chapter one introduced the study based on the aim, scope of study, problem statement, rational and significance of the application of smart value chain logistics within the small-medium brick manufacturing enterprises of Thohoyandou town, South Africa. The main aim of the study therefore was to interrogate and assess the application of smart value chain logistics approach in the manufacturing of bricks for the Small-Medium Brick Enterprises in land use, transportation, and physical construction industry of Thohoyandou Town. The study's intention was to recommend a smart value chain logistics framework guideline for the development of SMBEs within the logistics and manufacturing sectors. The study's notion was on addressing the unknown constraints, freight logistics implications, identification of opportunities within the international realm of logistics trade industry, local economic growth of the town, land use consolidation issues on logistics hubs and facilities, and high transactional costs on manufacturing and production of brick products from the SMBEs. The rational for conducting a study at Thohoyandou town in a radius of 12 km, was because of the areas interest in the building of new houses, construction buildings for retail companies, improving the local economic growth of the Thulamela local municipal region through producing and marketing of brick products. The method of data analysis which was applied was observation / survey analysis, which was based on a non-participant observation. The main purpose was to identify the conditions, effectiveness, production procedures, smart transport applications and aesthetic appeal of the brick making enterprises to name a few. The study aimed to contribute to an understanding of the topic through the theoretical scope, comprehensive framework foundations and the literature review which sought to expand knowledge and generating of new insights and contributing to the existing body of knowledge. What is going to be covered

under this chapter will be, the introduction and summary of study, summary of findings and conclusions, and some recommendations on areas of future research.

The previous section introduced the chapter with a specific focus on the main purpose of discussing the components identified in the chapter introduction. The following section will summarise study.

10.3. Summary of study

This section seeks to introduce the organisation of findings and conclusions on the results obtained in data analysis presented in chapter four through the research questions so as to convey the specific findings of the study.

This study investigated the main application of smart value chains concepts, theories, and models together with their strategic approaches as applied within the SMMEs cooperative industry focusing on logistics operations such as the Small-medium brick manufacturing enterprises. It has also shown how the application of smart logistics can be initiated to control the daily activities and management of procurement of materials and distribution of products into the market to sell and make a profit for the logistic enterprise. The study applied the smart value chain logistics framework guidelines towards the development and growth of the small-medium brick manufacturing enterprises of Thohoyandou town, South Africa. Data was acquired using the key informant questionnaire and key informant interviews from the Thulamela local municipality, Vhembe district municipality and the seven small-medium brick manufacturing enterprises. The study used the content analysis approach to formulate objectives as chapters. It also adopted the value chain analysis for the identification of critical paths for the SMBEs. Objectives analysis synthesis and the non-participant observation survey findings were both analysed using the SPSS analytical tool and tables to present the study findings.

The section on the previous discussion was based on the summary of the study in general. Whilst the following section will be based on the summary of study findings which emanates from the analysis results for each of the three main research objectives.

10.4. Summary of study findings based on the objectives

The summary of the study findings is based on the three main research objectives of the study, wherein objective three was formulated as a recommendation chapter, and the summary is as follows:

10.4.1. To map the spatial distribution of Small-Medium Brick Enterprises and analyze their existing value chain logistics, to identify constraints and opportunities impacting and impacted within the Small-Medium Brick Enterprises in Thohoyandou town.

The analysis of mapping the spatial distribution of small-medium brick enterprises informed the research study in terms of applying spatial analytical tools as well as mapping, to pave the way for the researcher in understanding the spatial location of the logistics enterprises. The objective achieved what it was intended for, which was to map the spatial distribution of the SMBEs, in a radius of 12 km. The objective's results were achieved based on the fundamental and significant responses obtained from the constructive key informant's interviews administered by the researcher. The spatial and directional distribution map of the Small-medium brick manufacturing enterprises was created and developed to address the question of how the spatial distribution of small-medium brick manufacturing enterprises could be mapped and spatially analyzed in Thohoyandou. The analysis of objective one informed the researcher on the application of mapping and addressed the need for the application of the use of GIS software packages such as, QGIS, ArcMap 10.8 version, and Google earth. The spatial location of the SMBEs and their measured service areas on 2 km radius was created to understand where there could be possibilities for future investments and new business establishments and to also show direction of the local brick enterprises to allow local authorities to have access to the services offered by the SMBEs. The locational analysis and spatial configuration map on a radius of 12 km, was also created to identify the locational areas of the SMBEs position on the spatial layout of Thohoyandou town and surrounding neighborhoods.

The analysis of this objective was based on the existing value chain logistics used and applied by the Small-medium brick manufacturing enterprises in Thohoyandou town, South Africa. The objectives main aim was to validate the respondent's responses regarding activities that added value to the brick products, monitoring and evaluation processes in making brick products, logistics chains situation in the distribution of brick products, and contribution to the industries of Thohoyandou town. Wherein the highest mean average score was 4.57 on

activities that added value to the processing and manufacturing of brick products. This meant that the activities that added value to the product were fundamental and essential in the making of brick products, they added significant value from processing of raw materials to finished brick products.

The intention of the objective was to find out what were the existing constraints and opportunities that the enterprises were facing. In this regard the respondents responded on the main variables which were formulated as statements in the following manner: constraints faced by the SMBEs in making brick products; competition with other brick enterprises; the ways in which brick products reach the public; and lastly growing the enterprise locally, provincially, and internationally. The results have shown that the average mean, that was the highest was 4.14, that reflects on how brick products reach the public. This meant that the way in which brick products were produced and manufactured made the enterprises more competitive and that this would increase more opportunities for local communities and the rural market. This would then enable an enterprise to gain profit share and more trust from the customers when the brick product reaches the public and get consumed through supply and demand of the product.

10.4.2. To examine the Small-Medium Brick Enterprises and products' physical operational mode, production procedures, land use, transportation, and socio-economic impacts on the host community (Thohoyandou)

The analysis of objective two was based on examining the small-medium brick manufacturing enterprises and product's physical operational mode, production procedures, land use, transportation, and socio-economic impacts on the host community (Thohoyandou). The objective intended to draw conclusions based on the understanding of the SMBEs performance status through examining the types of brick-making techniques used and applied in the manufacturing processes. Also, on the operations and production procedures in manufacturing and producing brick products within the enterprise; identification of staff members' qualifications studied; issues in distribution and delivering of brick products; and to respond on any issues or comments presented by the respondents regarding the scope of the study. The study of the objective has shown that there were 7 valid responses, without any missing responses, average mean, standard deviation, mode, variance, skewness, standard error of skewness, range, and maximum values. The highest mean average score was 3.57 for the operations and production procedures. This meant that most of the operating enterprises

produce and manufacture, brick product as a means of increasing their competitive advantage of the enterprise performance.

10.4.3. To recommend the smart value chain logistics framework that seeks to support the Small-Medium Brick Manufacturing Enterprises development in the brick-making sector of Thohoyandou town

The study findings revealed various gaps within the domain of the value chain system applications and logistics demand for transport costs reduction strategies occurring within the operations of the SMBEs. And these findings needed to be addressed through applying smart solutions and guidelines for strategic transformations of the SMBEs. Enabling them to grow and develop in the manufacturing sector, construction, physical planning, transportation, and Local Economic Development domains of Thohoyandou town, South Africa. These gaps in knowledge has been addressed by the smart value chain logistics framework guideline, strategic model application and the smart logistics value chain management strategy. The objective on recommendation is based on the notion of increasing the competitive advantage of the seven SMBEs and other manufacturing enterprises that are related to the SMBEs operations.

10.4.3.1. To recommend the Smart Logistics Value Chain Management Strategy (SLVCMS) for SMBE's operational performance

The recommendation is based on the operational planning process that control the efficiency of product and service flow. From raw materials procurement, warehousing management, transport cost management, and value chain to the point of consumptions, (Uckelmann, 2008: p 204). The strategic approach of the recommendation is to effectively optimise the activities efficiencies and impacts of the socio-economic profile within the study area and transport inventory control, supply and demand of the product, mobility and accessibility of the logistics enterprises sites and market, (Kijewska, *et al*, 2016).

10.4.3.2. To recommend the application of a smart value chain logistics framework model which seeks to guide the development of the SMBEs

The study sought to recommend a smart value chain logistics framework guideline that will enable the enterprises to develop their own guidelines and frameworks based on the recommended framework of the study. It will enable the enterprises to create cost benefit analysis spreadsheets and digitised logbook scheduling and also enable them to think smart

about the operations of manufacturing their brick products and other products. They will adopt the smart and strategic implementation plans for the future development and growth of the enterprises value chain management system and the supply chain of bricks that are logistically management in terms of the smart logistics conceptual approaches and theories as presented in the literature chapter. The framework guideline is comprised of six components namely; the roles of the smart value chain logistics framework guideline which seeks to support the growth of the SMBEs, contextualising and prioritising the policy and legislative frameworks in support of the informal brick manufacturing enterprises of Thohoyandou town; description of the focal point of the guideline framework mobility determinants; recommended guidelines; definition of the smart value chain logistics guideline framework terms and lastly diagrammatic model of the guideline framework that seeks to support the development of the SMBEs.

10.4.3.3. To prioritize the implementation of the creation and development of the satellite centres, truck inns, trans-shipment hubs, warehouses, and storage facilities for the manufacturing sector of Thohoyandou town.

Table 10. 1: Key priority issues in Transport Logistics functions and proposed centres for Small-Medium Brick Manufacturing Enterprises sector of Thohoyandou town.

Proposed Central Location	Function	Facilities for Traditional Supply Chains	Facilities for Modern Supply Chains	Communication facilities	Timeframe and estimated budget	Sponsor
Proposed Satellite Centre	Buying point Trans-shipment hub	Short storage facilities Loading facilities Truck inns	Pre-facilities safe conditions for storing products	Telephone Fax Fleet	Short term R800 000.00	Municipal infrastructure grant
Proposed Multi-purpose rural town service centre	Local market trans-shipment hub	Storage facilities Loading facilities services Logistics procurement agency	Packaging houses Unloading facilities Ablutions	Telephone Fax Internet Fleet	Medium term R1 million	Municipal infrastructure grant
Proposed Major Rural Service Centre	District Market Transhipment hub	Additional to the above: Transport brokering service			Short term R950 000.00	District municipal infrastructure grant

Source: (Department of Transport, 2007; Sieber, 2011).

The above implementation plan mechanism has been adopted as a priority plan which seeks to highlight the proposed central location and their activities that ensure to resolve the issue of lack of logistics facilities, truck inns and trans-shipment hubs for the local manufacturing enterprises of Thohoyandou town and responsible authority satisfaction. The planning of a

cost-effective project is subject to a complex mission of coordinating a wide range of activities, sponsors, timeframes and assigning tasks to project champions. The above proposal seeks to meet those aspirations.

The previous section was based on the summary of study findings which emanated from the analysis results for each of the three main research objectives, wherein the framework guideline for the recommendation priorities was formulated and drafted to effect the change in the growth and development of the small-medium brick enterprises. The following section will however provide a description of the recommended areas of future research.

10.5. Recommended areas of future research

(Haksever, 2004: pp. 74-77) noted that value creation is an important aspect of business enterprise, but they do not know for whom the value is created because it only needs to be created for its shareholders and stakeholders. Value can be created from various activities, policies, and practices in any organization. The value-added process directly or indirectly affects five groups of people, such as owners/shareholders, employees, customers, suppliers and society. Shareholders receive value in money, employees in health insurance, childcare services in lieu of salary, while customers receive valuable products at reasonable prices, society in charitable contributions and corporate social responsibility. According to (Walter and Lancaster, 2000: pp. 74-77), the supply chain and logistics management are the main functions that support activities throughout the value chain. Supply chain management connects the relationship between the stakeholder and a business function that has occurred in maximizing value creation to increase a company's competitive advantage. Therefore, the recommended areas for future research to meet the needs of intelligent value chain creation and logistics management are as follows:

- Improving the logistics enterprises main value activities through inbound logistics, manufacturing operations, outbound logistics, market and sales, service, and support activities to increase the competitive advantage of the enterprises.
- Assessing the rural freight logistics situation in various regions by adopting the freight logistics strategies that inform the implementation of smart value chain framework guidelines.

- Prioritisation of the provision for network routing options in the distribution of brick products in rural areas and urban regions, through application of Hub-and-Spoke, Corridor Routing, and Flexible Routing.
- The application of digital logistics platforms that aim to optimise logistics decisions and automate execution processes by integrating advanced technology.

10.5.1. Hypothesis testing interpretation

The alternative hypothesis that has been tested aimed to justify the focus of applying the smart value chain logistics framework for the small-medium brick enterprises (SMBEs) manufacturing in Thohoyandou town. In this case if it would be applied to the operations of the enterprises will enhance the transportation, siting and physical location, process, manufacturing, and pricing strategies of brick products in the SMBEs market of Thohoyandou town. The study results have proven that the hypothesis was possible to be achieved through the analysis of objective one which has drawn its conclusion based on the identification of constraints and opportunities impacting and impacted on the manufacturing and distribution of small-medium brick enterprises (SMBEs) and products in Thohoyandou town.

The null hypothesis has been proven to be achieved if the smart value chain logistics framework can be adopted to enhance and improve the siting and physical location, process, manufacturing, and pricing strategies for brick-making small-medium enterprises of Thohoyandou town. This will then conclude that the smart solutions in addressing such problems faced by the enterprises will not be realized if they are not properly justified.

The section on the recommended areas of future research has shown that four implementable and key focus areas for further research can be used to investigate other possibilities for the adoption of the application of smart value chain logistics strategies, models, theories, concepts, and policy guidelines. However, the following section will focus on the discussion of the general conclusions for the entire study up to its completion

10.6. General conclusions

The study interrogated the application of smart value chain logistics for the small and medium brick manufacturing enterprises of Thohoyandou town, South Africa. Its initial findings revealed that the brick-making industry in these contemporary times is playing a major role in the economic growth of both developing and developed countries globally, especially within the construction and building industry, (Clay brick association of South Africa, 2019 p: 14).

The study main application direction was on the adoption of the smart value chain logistic system as a new way for reimagining the traditional operations for transport inventory control, supply chain management, and the distribution from different satellite centers between urban regions and rural markets. The notion of smart value chain logistics was based on the utilization of applied Information and Communication Technology (ICT) platforms within the brick-making sector. The value chain was used to describe the activities, that the enterprises perform and linked them to the organization's competitive position to increase the enterprises competitive advantage, (Michael, 1985: p 74, Dagmar, 2001: p 2). The study focus and aim was to interrogate the application of the smart value chain logistics approach in the manufacturing of bricks for small medium brick enterprises in the land use, transportation, and physical construction industry of Thohoyandou town. The significance of the study and its contribution to the body of knowledge revealed an intersection of transportation planning, physical planning, construction, and local economic domains within small rural towns and their small medium brick enterprises, (Mudau *et al*, 2014: p 210). The importance of documenting these sectors of the brick manufacturing and the logistics management is because they are recognized as one of the major contributors to the economic growth in many parts of the world and across the Southern African Development Countries (SADC) including Bangladesh, India, and Ghana, (Maithel, *et al*, 2012: p 121). Furthermore, the importance of logistics in integrated land uses, and transportation is about the distribution and movement of goods, therefore, without these transport logistics systems put in place then there won't be any progress and productivity within the enterprises that manufacture brick products. The alternative hypothesis has been addressed through the application of the conceptual, theoretical, modeling, and strategic approaches of the smart value chain logistics incorporation for small-medium brick manufacturing enterprises in Thohoyandou town. This is accomplished to show that it can enhance the transportation, siting and physical planning, process, manufacturing, and pricing strategies of brick products in the SMBEs market of Thohoyandou town if properly adopted as an effective framework guideline mechanism.

The section forms the general conclusions discussions was based on the overall concluding description detailing the most critical aspects of the study and focusing on the future possibilities of the growth and development of the small-medium brick manufacturing enterprises of Thohoyandou town, South Africa. That were configured on a radius of 12 km,

within the Thulamela local municipal region. The following and last section of the discussions summarises the chapter.

10.7. Chapter summary

The last chapter was on the summary of the study, summary of findings based on the specific research objectives, general conclusions, and recommended areas for future research. It highlighted the notion of the applications of the logistics and value chain concepts, theories, models, and strategies. The policy environment was adequately defined within the informal and formal manufacturing sectors in relation to the SMBEs and the SMMEs sectors. The chapter on an exploration of theoretical foundations and frameworks applications on the smart transportation logistics debates highlighted the need for the theories and concepts as well as models that are relevant to the research study on smart value chain logistics applications in small-medium brick manufacturing enterprises of Thohoyandou town, south Africa. Wherein the study aim was achieved through applying and proposing the smart value chain logistics framework guideline as a tool-driven mechanism towards the development of the brick making enterprise. Chapter nine highlighted the relevance of recommending the Smart Value Chain Logistics Framework that seeks to support the small-medium brick manufacturing enterprises development in the brick-making sector of Thohoyandou town.

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ANNEXURE A: KEY INFORMANTS QUESTIONNAIRE

Faculty of Science, Engineering and Agriculture

Department of Urban and Regional Planning

Student: Mr. Mawelewele Lutendo (0725980119), Email: lmawelewele7@gmail.com

Student number: 14002821

Supervisor: Professor James Chakwizira, (University of Venda, South Africa)

Co-supervisor: Dr. Emaculate Ingwani, (University of Venda, South Africa)

Co-supervisor: Dr. Per. Schubert, (Malmo University, Sweden)

This questionnaire is directed to key informants from the 7 small-medium brick manufacturing enterprises in Thohoyandou town on a radius covering 12km. No one under 18 years or minor will be interviewed and will not participate in the project.

I am currently conducting a study entitled **"Application of Smart Value Chain Logistics for the Small-Medium Brick Manufacturing Enterprises in Thohoyandou Town, South Africa"** This is part of the requirements for a Master's degree award in Urban and Regional Planning. Therefore, I am kindly asking you to complete this questionnaire. Your response will be solely used for academic purposes only.

Administrative information

DATE:	TIME OF INTERVIEW:	RESPONDENT NUMBER:	PLACE OF INTERVIEW:

INSTRUCTION FOR ALL QUESTIONS: Respond by filling in your answer in the blank spaces provided, where options are ☑ provided, please tick the appropriate answer.

SECTION A: PERSONAL AND EMPLOYMENT STATUS SOCIAL DEMOGRAPHIC PROFILE

SECTION B: EVALUATION OF EXISTING VALUE CHAIN LOGISTICS USED BY

MAIN QUESTIONS.	OPTIONS FOR ANSWERS: TICK WHERE NECESSARY	
a). Gender	Male	
	Female	
b). Age	15-20 years	
	21-30 years	
	31-50 years	
	50+ years	
c). Race	Black	
	Coloured	
	Whites	
	Indian	
	Others (please specify)	
d). Language	English	
	Afrikaans	
	Venda	
	Tsonga	
	Zulu	
	Sepedi	
	Northern Sotho	
	Others (Please specify)	
e). Years of experience in the field.	1-5 years	
	6-10 years	
	Or more	
f). Ranking in the profession		

THE SMALL-MEDIUM BRICK MANUFACTURING ENTERPRISES

MAIN QUESTIONS	ANSWER AND TICK WERE NECESSARY	
a) In your manufacturing activities, how do you add value to the processing and manufacturing of brick products?	Please Circle on the appropriate numeric 1 - Cost Benefit Analysis 2 - Investment 3 - Pricing strategies 4 - Logistics activities 5 - Value Chain activities 6 - All of the above	
b) Do you monitor and evaluate the process of manufacturing brick products? If yes, how… If no, why… If don't know elaborate in short…on the provided space…	Yes	
	No	
	Don't know	
c) What are the existing logistics chains in the delivery and distribution of brick products for the local communities?	Please Circle on the appropriate numeric 1 - Value-added chains 2 - Supply Chains 3 - Value Chains 4 - Transport network 5 - All of the above	
d) Is your brick-making enterprise contributing to the construction and the	Yes	
	No	
	Don't know	

physical infrastructure industries of Thohoyandou town?	If yes, how is it contributing….? If no, why is it not contributing….? If don't know elaborate….

SECTION C: IDENTIFICATION OF CONSTRAINTS AND OPPORTUNITIES ON MANUFACTURING OF BRICK PRODUCTS BY SMALL-MEDIUM BRICK ENTERPRISES

MAIN QUESTIONS	**ANSWER AND TICK WERE NECESSARY**	
a) What are the challenges that you face with regard producing brick products?	Please Circle on the appropriate numeric 1 - Maintenance 2 - Logistics costs 3 - Buying of materials 4 - Transportation costs 5 - All of the Above	
b) Are there any threats (competition) in the marketing of your product with other brick-making enterprises in the sector? If yes, how many do you know……	Yes	
	No	
	Don't know	
c) How do you market your brick products to the host community (Thohoyandou)?	Please Circle on the appropriate numeric 1 - Advertising	

	2 - Promotion 3 - Sales 4 - Social Media correspondences 5 - All of the above	
d) Are there any opportunities in growing the enterprise locally, provincially, nationally, and internationally? If yes, what is the nature of the opportunities that may be presented to you as an enterprise?	Yes	
	No	
	Don't know	
	If no, why is there no opportunities….? If don't know elaborate….	

SECTION D: EXAMINING OF THE SMALL-MEDIUM BRICK ENTERPRISES, PHYSICAL OPERATIONAL MODE, PRODUCTION PROCEDURES, AND TRANSPORTATION

MAIN QUESTIONS	ANSWER
a) How are the brick products manufactured and produced?	Please Circle on the appropriate numeric 1 - Traditionally 2 - Modern 3 - Machinery 4 - Handcraft 5 - All of the above
b) Who performs the operations and production procedures in manufacturing and	Please Circle on the appropriate numeric 1 - Manager

producing brick products within the enterprise?	2 - Supervisors 3 - Manufacturers 4 - Producers 5 - All of the above
c) What qualifications do they have?	1 - Primary education 2 - Matric 3 - Graduate (not in transport and logistics), 4 - Graduate (transport and logistics/related) 5 - Others specify
d) There are negative impacts of producing finished brick products on the transportation and construction industries of Thohoyandou town. Why is this?	1 - Strongly agree 2 - Agree 3 - Disagree 4 - Strongly disagree 5 - Other specify….
e) Any issues or comments for the researcher?	

f. What is the distance of your enterprise from Thohoyandou CBD? Tick where necessary.

1. 0-5 km	
2. 6-10 km	
3. 11-15 km	
4. 16-20km	
5. +21 km	

g. What is the distance of your enterprise to the following centres?

1. Sibasa	
2. Malamulele	
3. Njakanjaka	
4. Elim	
5. Louis Trichardt	
6. Vuwani	
7. Others, please specify….	

h. Where do you supply most of your products to or where do customers who buy most of your products come from?

1. Sibasa	
2. Malamulele	
3. Njakanjaka	
4. Elim	
5. Louis Trichardt	
6. Vuwani	
7. Others, please specify….	

i. Who supplies the materials, machinery, and trucks for manufacturing, operation, and transportation of brick products? Tick where necessary.

1. Construction agencies …….
2. Investors …….
3. Transport agencies …….
4. Developers …….
5. Industrial agencies …….
6. Others, please specify …….

j. How many km occurs between the agencies identified and the SMBE's trade premises?

1. 0-10 km	
2. 11-20 km	
3. 21-30 km	
4. 31-40 km	
5. +41 km	

k. What is the distance from the CBD to the markets where you distribute your brick product?

1. 0-5 km	
2. 6-10 km	
3. 11-15 km	
4. 16-20km	
5. +21 km	

l. What are the names of the agencies' market areas identified in question (i) above?

……

m. Where are the major market agencies identified in question (i) located respectively?

……

ANNEXURE B: KEY INFORMANTS QUESTIONNAIRE

Faculty of Science, Engineering and Agriculture

Department of Urban and Regional Planning

Student: Mr. Mawelewele Lutendo (0725980119), Email: lmawelewele7@gmail.com

Student number: 14002821

Supervisor: Professor James Chakwizira, (University of Venda, South Africa)

Co-supervisor: Dr. Emaculate Ingwani, (University of Venda, South Africa)

Co-supervisor: Dr. Per. Schubert, (Malmo University, Sweden)

This questionnaire is directed to key informants from the transport and housing departments of Thulamela local municipality and Vhembe district municipality in Thohoyandou town. No one under 18 years or minor will be interviewed and participate in the project.

I am currently conducting a study entitled **"Application of Smart Value Chain Logistics for the Small-Medium Brick Manufacturing Enterprises in Thohoyandou Town, South Africa"** This is part of the requirements for a Master's degree award in Urban and Regional Planning. Therefore, I am kindly asking you to complete this questionnaire. Your response will be solely used for academic purposes only.

Administrative information

DATE:	TIME OF INTERVIEW:	RESPONDENT NUMBER:	PLACE OF INTERVIEW:

INSTRUCTION FOR ALL QUESTIONS: Respond by filling in your answer in the blank spaces provided, where options are ☑ provided, please tick the appropriate answer.

SECTION A: PERSONAL AND EMPLOYMENT SOCIAL STATUS

DEMOGRAPHIC PROFIL

	OPTIONS FOR ANSWERS: TICK WHERE NECESSARY	
a). Gender	Male	
	Female	
b). Age	15-20 years	
	21-30 years	
	31-50 years	
	50+ years	
c). Race	Black	
	Coloured	
	Whites	
	Indian	
	Others (please specify)	
d). Language	English	
	Afrikaans	
	Venda	
	Tsonga	
	Zulu	
	Sepedi	
	Northern Sotho	
	Others (Please specify)	
e). Years of experience in the field.	1-5 years	
	6-10 years	
	Or more	

f). Ranking in the profession	

SECTION B: TRANSPORT LOGISTICS AND MANAGEMENT DIVISION

Main questions	Answer
a) How can the spatial distribution of small-medium brick enterprises identified be mapped and spatially configured on a radius of 12km in Thohoyandou town?	1 – Spatial analysis 2 – Mapping 3 – Scenario analysis 4 – Enterprise distribution mapping 5 – Locational analysis 6 – All of the above 7 – Others, specify
b) What are the value chain logistics constraints on the transport flow in delivering brick products in Thohoyandou town?	Please Circle on the appropriate numeric 1 - Lack of human capital 2 - High transaction costs 3 - Transportation trip delays 4 - Constraints on the cost of production 5 - All of the above
c) What transport logistics methods do you use	1. Manual Book Transport Booking Register 2. Excel Spread Sheet Transport Register 3. Owner/Operations Manager Directives 4. Any other – please elaborate

Do you know about the concept of smart value chain logistics?

Tick were appropriate:

Yes	
No	
Don't know	

If yes, elaborate on how applicable it is to the development of the small-medium brick manufacturing enterprises. If no, elaborate……, If don't know, elaborate…….

Do you think that the concept of smart value logistics could benefit your enterprise?

enterprises? Tick were appropriate:

Yes	
No	
Don't know	

If yes, elaborate on how it is applicable to the development of the small-medium brick manufacturing enterprises. If no, elaborate……, If don't know, elaborate…….

Is the smart value chain logistics framework a key indicator toward the development of small-medium brick enterprises? Tick ☑ were appropriate:

Yes	
No	
Don't know	

If yes, elaborate on how it is applicable to the development of the small-medium brick manufacturing enterprises. If no, elaborate……, If don't know, elaborate……

Any other issues you would like to bring to the attention of the researcher?

THANK YOU FOR YOUR TIME AND ATTENTION

SECTION C: HOUSING AND CONSTRUCTION DIVISION

MAIN QUESTIONS	ANSWER
a) What is the most suitable brick material product for the construction industry in housing?	Please Circle on the appropriate numeric 1 - Concrete Brick 2 - Fire brick 3 - Cement brick 4 - Mampara brick 5 - Glazed brick 6 - All of the above
b) What can be proposed to support the small-medium brick manufacturing enterprises development in the brick-making sector of Thohoyandou town?	Please specify in detail……
c) How can the housing and the construction sector benefit from the provisions made by the small-medium brick manufacturing enterprises?	Elaborate in brief…….
d) Any issues or comments that you would like to bring to the attention of the researcher?	

SECTION D: LOCAL ECONOMIC DEVELOPMENT DIVISION

MAIN QUESTIONS	ANSWER
a) How can the constraints be addressed, and the opportunities be identified, which are impacting and impacted on the manufacturing and distribution of small-medium brick enterprises (SMBEs) and products in Thohoyandou town?	Circle appropriate answer 1 - SWOT analysis 2 - Enterprise Key Performance Indicators (KPI) 3 - Profit generation 4 - Work expertise 5 - Identification of poor performance 6 - All of the above
b) The socio-economic impacts are the most crucial disparities in producing, manufacturing, and distribution of brick products by the small-medium brick enterprises?	1 –Strongly disagree 2 – Disagree 3 – Agree 4 – Strongly agree 5 – Neutral
c) What can be recommended in support of developing the small-medium brick enterprises in the brick-making sector of Thohoyandou town?	Please provide some recommendation options…. where possible….
d) Any issues or comments that you would like to bring to the attention of the researcher?	

THANK YOU FOR YOUR TIME AND ATTENTION

ANNEXURE C: NON-PARTICIPANT OBSERVATION (SURVEY CHECKLIST) FOR EACH (SMBE)

Observation checklist one: Observation checklist for orientation of built infrastructure within the SMBEs

The scales of measurement that were used were defined as follows:

a). Public and private buildings use and function	**(VAR1) Effectiveness**	Very poor function and use of buildings	Poor function and use of buildings	Fairly poor use of buildings	Adequate functioning and usage of buildings	Excellent usage and function of buildings	Evidence:
		1	2	3	4	5	
	(VAR2) Efficiency	Very poor efficient buildings usage and function	Poor efficient buildings usage and function	Fairly poor efficient function of buildings	Adequate efficiency for the usage of buildings	Excellent function and usage of building efficiency	Evidence:
		1	2	3	4	5	
	(VAR3) Optimization	Very poor optimized function of buildings	Poorly optimized usage of buildings	Fairly optimized building usage	Adequate building function and use	High-quality optimization of building function	Evidence:
		1	2	3	4	5	
b). Aesthetic appeal/ appearance of	**(VAR1) Good**	Poorly painted built form	Fairly painted built form	Pleasing built infrastructure	Good quality design of the built infrastructure	Excellent appeal of the built infrastructure	Evidence:

built infrastructure		1		2		3		4	5			
	(VAR2) Fair	Very poor appeal		Poor appeal		Not painted at all		Fairly painted	Fairly attractive		Evidence:	
		1		2		3		4	5			
	(VAR3) Not-pleasing	Not attractive built form		Unappealing built form		Poorly designed built form		Fairly designed built form	Pleasing built form		Evidence:	
		1		2		3		4	5			
c). Building elevations and design of façade	**(VAR1) Good quality**	Very poorly designed elevations		Poor design of elevations		Elevations are attractive		The façade is attractive	Excellent		Evidence:	
		1		2		3		4	5			
	(VAR2) Building orientation	Very-poor		Poor		Fairly poor		Adequate	Excellent		Evidence:	
		1		2		3		4	5			
	(VAR3) Culturally diverse	Strongly disagree		Disagree		Agree		Strongly agree	Neutral		Evidence:	
		1		2		3		4	5			

Observation checklist two: Observation checklist for physical siting and conditions of the SMBEs environment

The scales of measurement that were used were defined as follows:

a). Conditions of the site (public and private spaces)	**(VAR1) Convenient**	Very poor site conditions	Poor site conditions	Good site conditions	Suitable site conditions	Excellent site conditions	Evidence:
		1	2	3	4	5	
	(VAR2) Accessible	Accessible by heavy vehicles	Accessible by walking only	Accessible by cycling only	Not accessible at all	Accessible by private cars	Evidence:
		1	2	3	4	5	
	(VAR3) Inconvenient	Very poor site conditions	Poor site conditions	Good site conditions	Suitable site conditions	Excellent site conditions	Evidence:
		1	2	3	4	5	
	(VAR4) Not accessible	Strongly disagree	Disagree	Agree	Strongly agree	Neutral	Evidence:
		1	2	3	4	5	
b). Existing features on the site of the enterprises	**(VAR1) Natural vegetation**	Trees	Green Grass	Bushes	Flowers	Natural plants	Evidence:
		1	2	3	4	5	
	(VAR2) Topsoil	Sandy soil	Peat Soil	Silt soil	Clay soil	Loam soil	Evidence:
		1	2	3	4	5	
	(VAR3) Structures	Toilets (ablution block)	Administrative office building	Site building	Warehouse	Manufacturing facility	Evidence:
		1	2	3	4	5	

c). Spatial form of the site	**(VAR1) Organic**	Poorly planned	Not planned at all	Poorly Serviced	Serviced	Well, planned and serviced	Evidence:
		1	2	3	4	5	
	(VAR2) Inorganic	Poorly planned	Not planned at all	Poorly Serviced	Serviced	Well, planned and serviced	Evidence:
		1	2	3	4	5	
	(VAR3) Planned	Poorly planned	Fairly serviced	Fairly planned	Well, planned	Well serviced	Evidence:
		1	2	3	4	5	

Observation checklist three: Observation checklist for operational mode within the SMBEs

The scales of measurement that were used were defined as follows:

a) Operational performance	**(VAR1) Effectiveness**	Very poor operational performance	Poor operational performance	Fair operational performance	Good operational performance	Excellent operational performance	Evidence:
		1	2	3	4	5	
	(VAR2) Sustainability	Eco-friendly	Carbon emission-free	Long-lasting sustainable operation	Not eco-friendly	Not sustainable	Evidence:
		1	2	3	4	5	
	(VAR3) Ineffectiveness	Very poor	Poor	Fair	Good	Excellent	Evidence:
		1	2	3	4	5	
	(VAR4) Not Sustainable	Strongly disagree	Disagree	Agree	Strongly agree	Neutral	Evidence:

		1		2		3		4		5	
b). Operational value chain activities	**(VAR1) Active**	Inbound logistics		Outbound logistics		Marketing and sales		Operations		Services	Evidence:
		1		2		3		4		5	
	(VAR2) Not active	Inbound logistics		Outbound logistics		Marketing and sales		Operations		Services	Evidence:
		1		2		3		4		5	
	(VAR3) Operational efficiency	Very poor		Poor		Fair		Good		Excellent	Evidence:
		1		2		3		4		5	
c). Operational mode	**(VAR1) Smart**	Not smart		Not ICT driven		Traditionally driven		Modernized		Information Communications Technology (ICT) driven	Evidence:
		1		2		3		4		5	
	(VAR2) Not smart	Very poor ICT application		Lack of technology resources		Fair ICT application		Traditionally driven		Modernized	Evidence:
		1		2		3		4		5	
	(VAR3) Sustainability	Reduces manufacturing costs		Improves production processes		Eco-friendly		Carbon emission-free		Emits carbon gases	Evidence:
		1		2		3		4		5	
	(VAR4) Not Sustainable	Increases production costs		Emits carbon gases		Poorly operational		Fairly sustainable		Not eco-friendly	Evidence:
		1		2		3		4		5	

Observation checklist four: Observation checklist for production procedures and manufacturing processes of brick products for each SMBE.

The scales of measurement that were used were defined as follows:

a). Production procedures	**(VAR1) Followed**	Don't know	No	Not sure	Fairly Sure	Yes	
		1-3	3-5	5-7	7-9	9-10	
	(VAR2) Not followed	Don't know	No	Not sure	Fairly Sure	Yes	
		1-3	3-5	5-7	7-9	9-10	
	(VAR3) Strategic approach	Very poor	Poor	Fair	Good	Excellent	
		1-3	3-5	5-7	7-9	9-10	
	(VAR4) Not strategic	Strongly disagree	Disagree	Agree	Strongly agree	Extremely agree	
		1-3	3-5	5-7	7-9	9-10	
b). Manufacturing process	**(VAR1) Sustainable**	Pollutes the environment	Not eco-friendly	Can withstand forces of nature	Eco-friendly to the environment	Carbon emission-free	
		1-3	3-5	5-7	7-9	9-10	
	(VAR2) Not Sustainable	Pollutes the environment	Not eco-friendly	Can withstand forces of nature	Eco-friendly to the environment	Carbon emission-free	
		1-3	3-5	5-7	7-9	9-10	
	(VAR3) Strategic approach	Very poor	Poor	Fair	Good	Excellent	
		1-3	3-5	5-7	7-9	9-10	
	(VAR4) Not strategic	Strongly disagree	Disagree	Agree	Strongly agree	Neutral	

		1-3		3-5		5-7		7-9		9-10		
c). Production and manufacturing impacts	**(VAR1) Good**	High manufacturing costs		Poor productivity		Reduces cost of buying materials		Reduces fuel expenses		Improves competitive advantage		
		1		2		3		4		5		
	(VAR2) Fair	High manufacturing costs		Poor productivity		Less cost of buying materials		Less cost on fuel expenses		Improved competitive advantage		Evidence:
		1		2		3		4		5		
	(VAR3) Bad	High manufacturing costs		Poor productivity		Less cost of buying materials		Less cost on fuel expenses		Improved competitive advantage		Evidence:
		1		2		3		4		5		

Observation checklist five: Observation checklist for transport logistics process of the SMBEs

The scales of measurement that were used were defined as follows:

a). Transport and distribution of brick products	**(VAR1) Smart transportation**	Hydro-electric powered freight trucks		GPS tracker device installed on freight trucks		Diesel-powered trucks		Smart logistics is applied		ICT-driven transport distribution		Evidence:									
		1		2		3		4		5											
	(VAR2) Logistically managed	Strongly disagree		Disagree		Agree		Strongly agree		Neutral		Evidence:									
		1		2		3		4		5											
	(VAR3) Not logistically managed	Don't know		No		Not sure		Fairly Sure		Yes		Evidence:									
		1		2		3		4		5											
b). Smart logistics application within the enterprises	**(VAR1) Applied**	Don't know		No		Not sure		Fairly Sure		Yes		Evidence:									
		1		2		3		4		5											
	(VAR2) Not applied	Strongly disagree		disagree		agree		Strongly agree		Neutral		Evidence:									
		1		2		3		4		5											
	(VAR3) Smart	The use of the internet of things		The use of artificial intelligence		The use of a computerized logbook		ICT-driven administrative activities		Intelligent cloud computing and big data		Evidence:									
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
	(VAR4) Not smart	Strongly disagree		Disagree		Agree		Strongly agree		Neutral		Evidence:									
		1		2		3		4		5											

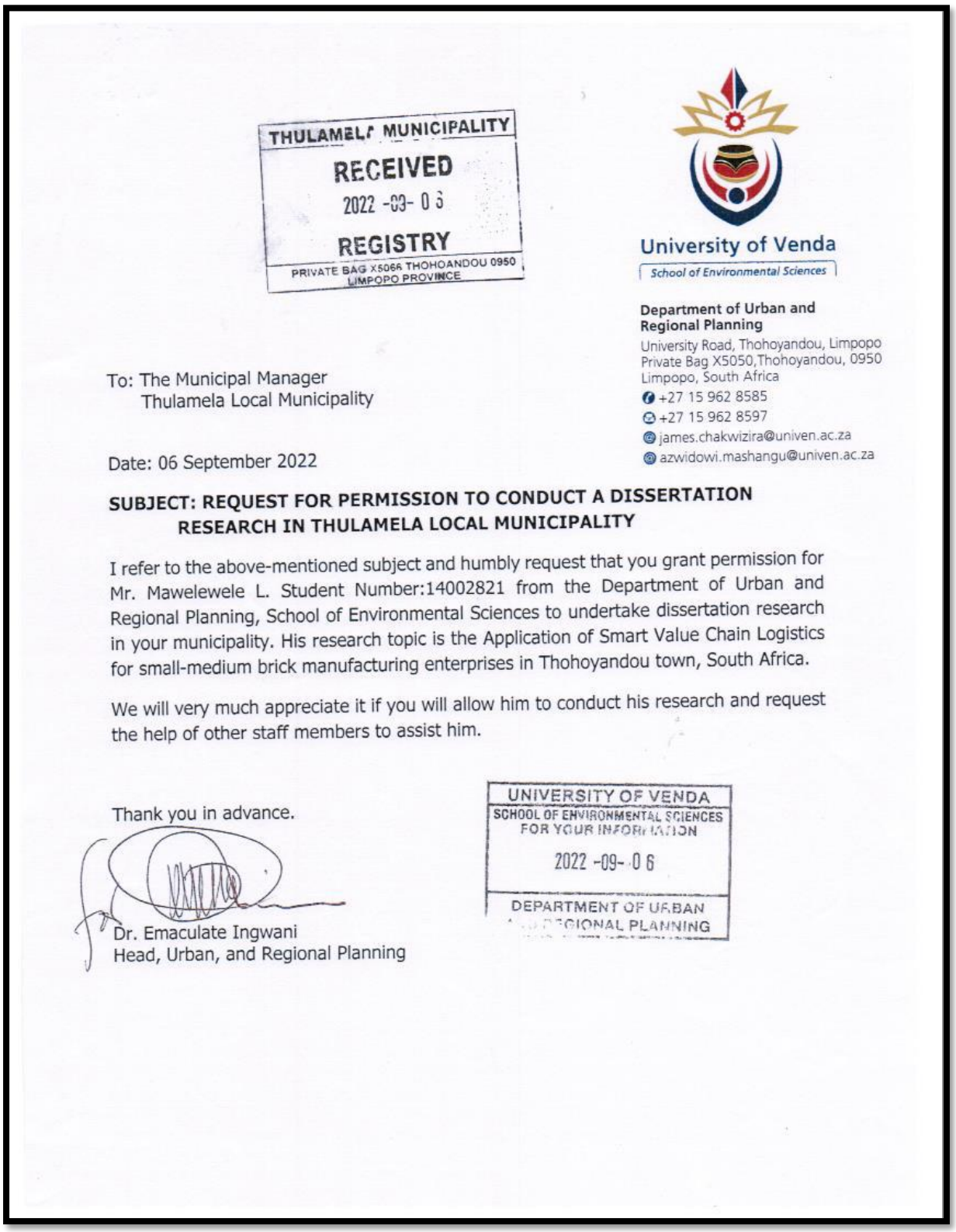
c). Transport logistics of brick products	**(VAR1) Sustainable enough**	Transport logistics is eco-friendly to the environment	Contributes to zero-carbon emissions	Transport logistics is not damaging roads	Pollutes the environment	Not sustainable enough	Evidence:
		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
	(VAR2) Not sustainable enough	Transport logistics are eco-friendly to the environment	Contributes to zero-carbon emissions	Transport logistics do not damage roads	Pollutes the environment	Not sustainable enough	Evidence:
		Yes No Don't know	Yes No Don't know	Yes No Don't know	Yes No Don't know	Yes No Don't know	
	(VAR3) Integrated	Very poorly integrated	Poorly integrated	Fairly integrated	Regulated transport logistics	Integrated exceptionally well	Evidence:
		1	2	3	4	5	
	(VAR4) Fragmented	Poorly regulated	Not regulated at all	Fairly regulated	Transport logistics is operating legally	The logistics of brick distribution is well serviced	Evidence:
		1	2	3	4	5	

END

ANNEXURE D: TABLE 1: THE CRITICAL PATH ANALYSIS FOR EACH (SMBE)

Critical Paths / Activities	Inbound Logistics	Operations	Outbound Logistics	Marketing And Sales	Service
Receiving, warehousing, and transport inventory control		N/A	N/A	N/A	N/A
Value-creating activities that transform inputs into products	N/A		N/A	N/A	N/A
Activities required to get a finished product to a customer	N/A	N/A		N/A	N/A
Activities associated with getting a buyer to purchase a product	N/A	N/A	N/A		N/A
"Activities that maintain and enhance a product's value, such as customer support"	N/A	N/A	N/A	N/A	

ANNEXURE E: LETTER FOR PERMISSION TO CONDUCT RESEARCH IN THULAMELA LOCAL MUNICICPLAITY



THULAMELA MUNICIPALITY
RECEIVED
2022 -09- 0 3
REGISTRY
PRIVATE BAG X5066 THOHOANDOU 0950
LIMPOPO PROVINCE

University of Venda
School of Environmental Sciences

Department of Urban and Regional Planning
University Road, Thohoyandou, Limpopo
Private Bag X5050,Thohoyandou, 0950
Limpopo, South Africa
+27 15 962 8585
+27 15 962 8597
james.chakwizira@univen.ac.za
azwidowi.mashangu@univen.ac.za

To: The Municipal Manager
Thulamela Local Municipality

Date: 06 September 2022

SUBJECT: REQUEST FOR PERMISSION TO CONDUCT A DISSERTATION RESEARCH IN THULAMELA LOCAL MUNICIPALITY

I refer to the above-mentioned subject and humbly request that you grant permission for Mr. Mawelewele L. Student Number:14002821 from the Department of Urban and Regional Planning, School of Environmental Sciences to undertake dissertation research in your municipality. His research topic is the Application of Smart Value Chain Logistics for small-medium brick manufacturing enterprises in Thohoyandou town, South Africa.

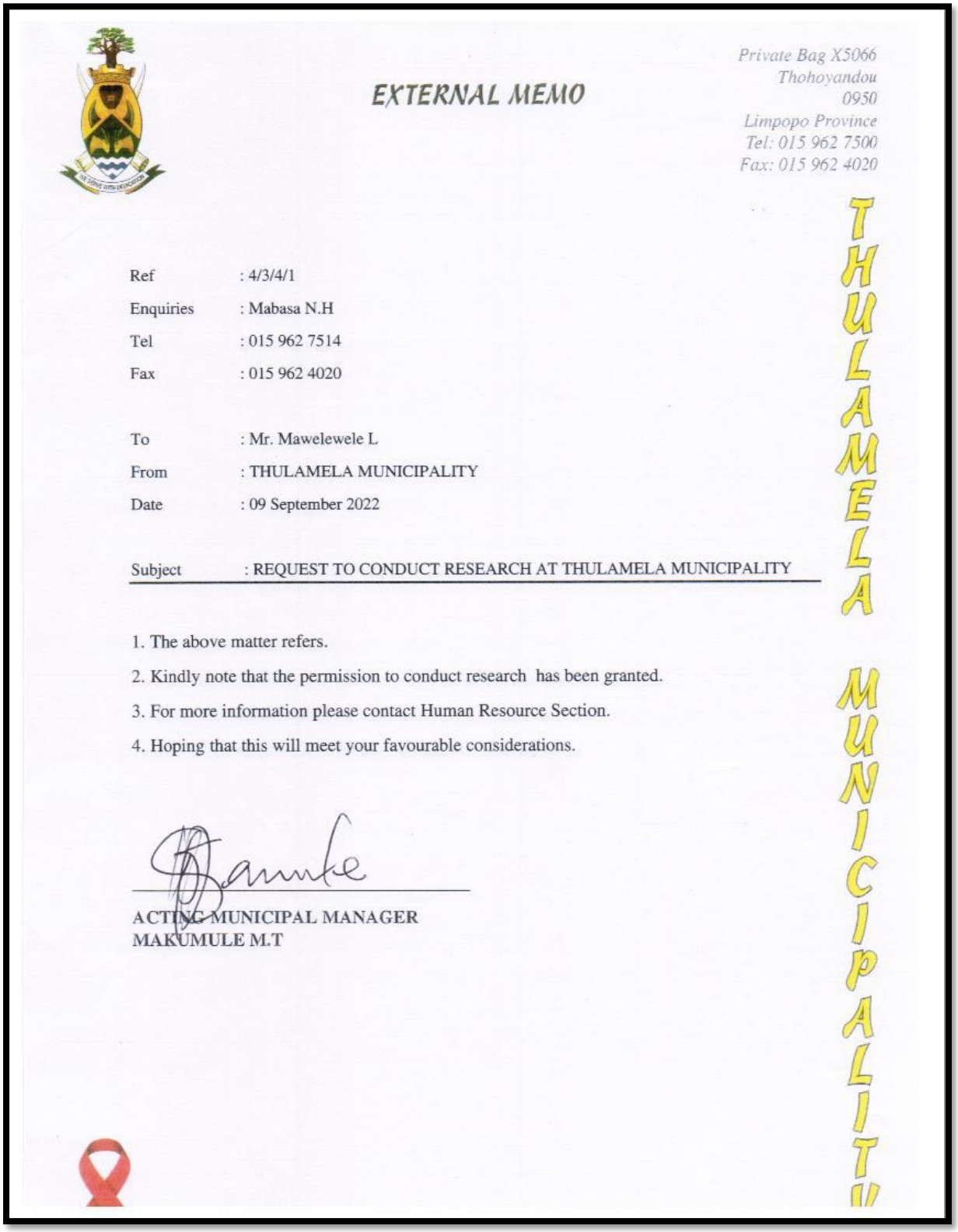
We will very much appreciate it if you will allow him to conduct his research and request the help of other staff members to assist him.

Thank you in advance.

Dr. Emaculate Ingwani
Head, Urban, and Regional Planning

UNIVERSITY OF VENDA
SCHOOL OF ENVIRONMENTAL SCIENCES
FOR YOUR INFORMATION
2022 -09- 0 6
DEPARTMENT OF URBAN AND REGIONAL PLANNING

ANNEXURE F: LETTER OF APPROVAL TO CONDUCT RESEARCH AT THULAMELA MUNICIPALITY



EXTERNAL MEMO

Private Bag X5066
Thohoyandou
0950
Limpopo Province
Tel: 015 962 7500
Fax: 015 962 4020

THULAMELA MUNICIPALITY

Ref : 4/3/4/1
Enquiries : Mabasa N.H
Tel : 015 962 7514
Fax : 015 962 4020

To : Mr. Mawelewele L
From : THULAMELA MUNICIPALITY
Date : 09 September 2022

Subject : REQUEST TO CONDUCT RESEARCH AT THULAMELA MUNICIPALITY

1. The above matter refers.
2. Kindly note that the permission to conduct research has been granted.
3. For more information please contact Human Resource Section.
4. Hoping that this will meet your favourable considerations.

ACTING MUNICIPAL MANAGER
MAKUMULE M.T

ANNEXURE G: LETTER OF APPROVAL TO CONDUCT ACADEMIC RESEARCH AT VHEMBE DISTRICT MUNICIPALITY

VHEMBE DISTRICT MUNICIPALITY
PRIVATE BAG X5006, THOHOYANDOU, 0950
TEL: 015 960 2000, FAX: 015 962 1017
Website: www.vhembe.gov.za

Ref: 4/2/1
Enq: Tshikovha N.C
Date: 14 September 2022

Attention: Mawelewele Lutendo, Student No: 14002821

APPLICATION TO CONDUCT ACADEMIC RESEARCH: YOURSELF

1. Your application dated 06 September 2022 refers.
2. It is with pleasure to inform you that your application to conduct research on "Application of smart value chain logistics for small-medium brick manufacturing enterprises in Thohoyandou town" within the Vhembe District Municipality is hereby granted to you.
3. Please contact General Manager Departmental Planning at 015 960 3599 in order to arrange the starting date.
4. Should there be anything you need clarity on, feel free to call our office at 015 960 3558/015 960 3541.

Kind Regards

MUNICIPAL MANAGER
NDOU T.S

14/09/2022
DATE

"A developmental municipality focusing on sustainable service delivery and socio-economic development towards an equal society"

ANNEXURE H: COVID-19 REGULATIONS RESEARCH PROTOCOL COMPLIANCE – INFORMED CONSENT

Administration of questionnaires for a semi-structured interview during the times of the global pandemic Covid-19 (Corona Virus)

Student Name: Mawelewele Lutendo

Student No: 14002821

Project title: **Application of smart value chain logistics for the small-medium brick manufacturing enterprises in Thohoyandou town, South Africa.**

I agree/disagree to participate in this project:

Agree: ☐

Or

Disagree: ☐

The project is aimed at interrogating the application of a smart value chain logistics approach in the manufacturing of bricks for the Small-Medium Brick Enterprises in the land use, transportation, and physical construction industry of Thohoyandou Town for this purpose, a semi-structured questionnaire will be distributed to the key informants. Key informant interviews will be conducted with key informants (from the local municipality divisions, district municipal divisions as well as the (Small-Medium Brick Manufacturing Enterprises) SMBEs. The research informed consent is to conduct a study at your enterprise, by taking pictures and observing.

The ethical considerations of the semi-structured protocols during the crisis of the global pandemic of the Covid-19 (Corona Virus).

The interviewer will make use of a face mask, having washed, and cleansed his hands (in this case sanitized), bearing in mind health issues. Also, the interviewer will be aware of the risks of infection with Covid-19. Both the interviewer and the key informant will first do a screening test on their mobile phones. To do this, there is a USSD code that will be used to check for the screening test (*134*832*2#).

Risk of infections' precautions:

If it is found that one of the individuals in the interview session is infected with the virus, the The interviewer will not carry on preventing the risk of infecting other individuals with the virus. The infected individual will quickly be directed to sick medical attention or to be quarantined, as this will limit the rate of the spread of the virus.

ANNEXURE I: ETHICS APPROVAL CERTIFICATE

ETHICS APPROVAL CERTIFICATE

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Mr L Mawelewele

STUDENT NO:
14002821

PROJECT TITLE: **Application of smart value chain logistics for the small-medium brick manufacturing enterprises in Thohoyandou town, South Africa.**

ETHICAL CLEARENCE NO: **FSEA/22/URP/06/2006**

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Prof J Chakwizira	North-West University	Supervisor
Dr. E Ingwani	University of Venda	Co - Supervisor
Dr. P Schubert	Malmo University, Sweden	Co - Supervisor
Mr L Mawelewele	University of Venda	Investigator – Student

Type: **Masters Research**
Risk: **Minimal risk to humans, animals or environment (Category 2)**
Approval Period: **June 2022 – June 2024**

The Research Ethics Social Sciences Committee (RESSC) hereby approves your project as indicated above.

General Conditions
While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following.

- The project leader (principal investigator) must report in the prescribed format to the REC:
  - Annually (or as otherwise requested) on the progress of the project, and upon completion of the project
  - Within 48hrs in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.
  - Annually a number of projects may be randomly selected for an external audit.
- The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the REC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.
- The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date; a new application must be made to the REC and new approval received before or on the expiry date.
- In the interest of ethical responsibility, the REC retains the right to:
  - Request access to any information or data at any time during the course or after completion of the project,
  - To ask further questions; Seek additional information; Require further modification or monitor the conduct of your research or the informed consent process.
  - withdraw or postpone approval if:
  - Any unethical principles or practices of the project are revealed or suspected.
  - It becomes apparent that any relevant information was withheld from the REC or that information has been false or misrepresented.
  - The required annual report and reporting of adverse events was not done timely and accurately,
  - New institutional rules, national legislation or international conventions deem it necessary

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE
Date Considered: May 2022

Name of the RESSC Chairperson of the Committee: Prof TS Mashau

Signature

UNIVERSITY OF VENDA
OFFICE OF THE DIRECTOR
RESEARCH AND INNOVATION
2022 -06- 20
Private Bag X5050
Thohoyandou 0950

University of Venda
PRIVATE BAG X5050, THOHOYANDOU, 0950, LIMPOPO PROVINCE, SOUTH AFRICA
TELEPHONE (015) 962 8504/8313 FAX (015) 962 9060
"A quality driven financially sustainable, rural-based Comprehensive University"

ANNEXURE J: UHDC APPROVED MASTERS PROPOSAL

UNIVERSITY OF VENDA

OFFICE OF THE DVC: RESEARCH AND POSTGRADUATE STUDIES

TO : MR/MS L. MAWELEWELE

FACULTY OF SCIENCES, ENGINEERING AND AGRICULTURE

FROM: PROF. N.N FEZA

DVC: RESEARCH AND POSTGRADUATE STUDIES

DATE : 26 JANUARY 2022

DECISIONS TAKEN BY UHDC OF 25th JANUARY 2022

Application for approval of Masters Proposal Report in Faculty of Sciences, Engineering and Agriculture: **L. Mawelewele(14002821)**

Topic: "Application of Smart Value Chain Logistics for the Small-Medium Brick Manufacturing Enterprises in Thohoyandou Town, South Africa."

Supervisor	NWU	Prof. J. Chakwizira
Co-supervisors	UNIVEN	Dr. E. Ingwani
	MaU(Sweden)	Dr. P. Schubert

UHDC approved Masters proposal

PROF N.N FEZA
DVC: RESEARCH AND POSTGRADUATE STUDIES

ANNEXURE K: ETHICS RESEARCH COMMETTEE, UNIVEN INFORMED CONSENT

LETTER OF INFORMATION

Title of the Research Study : Application of Smart Value Chain Logistics for the Small-Medium Brick Manufacturing Enterprises IN Thohoyandou Town, South Africa

Principal Investigator/s/ researcher : (*Mawelewele Lutendo, Bachelor of Urban and Regional Planning (Honours Degree Program)*)

Co-Investigator/s/supervisor/s : (*Prof. J. Chakwizira, Professor, Dr. E. Ingwani, Doctor, Dr. P. Schubert, Doctor*)

Brief Introduction and Purpose of the Study:

Outline of the Procedures : (*The participant will be expected to answer questions directed to them during the key informant interviews. The venue is the location where the informants being interviewed is based. The semi-structured questionnaires will be distributed to the respondents. Then the outcome of the results will be quantified and analysed using content analysis, Microsoft office tools, tables, charts, and graphs. The participant will be given a maximum amount of time where they feel they can stop providing their responses. Participants are expected to wear face masks, be sanitized, have a keen interest in the topic of the research study, and be well prepared to respond to any type of questions distributed.*

Risks or Discomforts to the Participant: (*It might happen that the participant being interviewed is experiencing some illness diseases and may be hospitalized this will mean that the interview will not continue as usual. If the participant behaves in an unhappy behaviour, they will be given a chance to respond about their dissatisfaction with the interviewer for the interview to proceed to the next respondent.*

Benefits : (*Publications*)

Reason/s why the Participant May Be Withdrawn from the Study: (*This can be informed by Non-compliance, illness, and adverse reactions. There will be no adverse consequences for the participant should they choose to withdraw)*

Remuneration :(*The participant will not receive any remuneration from the research project)*

Costs of the Study : (*The participant will not be required to cover any costs towards the study)*

Confidentiality : (*Ethical considerations will be the priority for the privacy of the participant details, integrity, and*

honesty to providing safe reliable information that are bound to be confidential)

Research-related Injury : (*If there is any injury caused to the participant there will not be a compensator as the interview will be safe and secure in an environment that is free from harmful objects or chemicals or emissions*).

Persons to Contact in the Event of Any Problems or Queries:

(Prof. J. Chakwizira and +27 76 387 7841/ 26878208@.ac.za) Please contact the researcher (tell no. 072 598 0119/ lmawelewele7@gmail.com), and my supervisor (tell no. 076 387 7841). University Research Ethics Committee Secretariat on 015 962 9058 / Vanecia.Khoza@univen.ac.za

Complaints can be reported to the University Research Ethics Committee Secretariat on 015 962 9058 / Vanecia.Khoza@univen.ac.za or Whistle-blowing Ethics Hotline Tollfree Telephone number: 0800212755 Email.univenhotline@tipoffs.com

General:

Potential participants must be assured that participation is voluntary and the approximate number of participants to be included should be disclosed. A copy of the information letter should be issued to participants. The information letter and consent form must be translated and provided in the primary spoken language of the research population

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, (*Mawelewele Lutendo*), about the nature, conduct, benefits, and risks of this study - Research Ethics Clearance Number: FSEA/22/URP/06/2006_,
- I have also received, read, and understood the above-written information (*Participant Letter of Information*) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full Name of Participant Date Time Signature

I, ……. …… …… ……..

(*MAWELEWELE LUTENDO*) herewith confirm that the above participant has been fully

Informed about the nature, conduct, and risks of the above study.

Full Name of Researcher

…… Date ……. Signature……...

Full Name of Witness (If applicable)

…… Date ……. Signature……...

Full Name of Legal Guardian (If applicable)

…… Date……..….. Signature……

ANNEXURE L: LANGUAGE EDITING CERTIFICATE

Language Editing Report

Date: 26 February 2023

To whom it may concern.

This letter serves to confirm that I, B N Rumutsa proofread and edited a dissertation entitled: **"Application of smart value chain logistics for the small-medium brick manufacturing enterprises of Thohoyandou Town, South Africa."**, by **Mawelewele Lutendo** (Student number **14002821**), to be submitted to the Department of Urban and Regional Planning, Faculty of Science, Engineering and Agriculture, University of Venda.

I carefully read through the dissertation focusing on language and grammatical construction errors that needed corrections to the best of my ability. Neither the dissertation content nor the author's intentions were altered in any way during the editing process.

Yours sincerely

B. N Rumutsa
(Language editor)

Email: brendarumucha@yahoo.com

ANNEXURE M: TURNITIN ORIGINALITY REPORT

Application of smart value chain logistics for the small-medium brick manufacturing enterprises in Thohoyandou town, South Africa

ORIGINALITY REPORT

14%	13%	5%	6%
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