
Obstacles to sustainable mobility in Sub-Saharan African cities

Name: Yuxuan Zhang

Supervisor: Dr. Clemence Cavoli

2025-4-11

Dept of Civil, Environ & Geomatic Engineering

DECLARATION & PERSONAL STATEMENT

The project has been carried out by Yuxuan Zhang

The author has read and understood the College's policy regarding plagiarism and the submission of coursework. The author confirms that, except for commonly understood ideas and concepts, or where specific reference is made to the work of other authors, the contents of this report are their own work. This dissertation is presented in 71 pages including bibliography and appendices. It contains approximately 10706 words, 56 figures and 15 tables.

Signature: YUXUAN ZHANG Date: 11/4/2025

Abstract

This study conducts a literature review and thematic content analysis on common transport problems in two African cities, Maputo and Freetown, aiming to identify and compare the main challenges in the operation of their traffic systems. In the literature review section, the characteristics of urban traffic development in low- and middle-income countries around the world and sub-Saharan African countries are studied, including common problems such as long-term infrastructure lag, insufficient public transportation supply, widespread informal transportation, and limited governance capacity. Existing studies have emphasized the huge gap between the growth of urban travel demand and the supply capacity of the transportation system under the background of rapid urbanization, but comparative studies on specific cities are still relatively lacking.

On this basis, this study combines the interview data of 41 respondents (27 in Maputo and 14 in Freetown) and selects the five most frequently mentioned issues as the focus of analysis: poor road conditions, lack of transportation facilities, imperfect road network, limited public transportation options and insufficient coverage, and further identifies the problems with large differences in the two places, insufficient parking spaces in Maputo and traffic congestion in Freetown. In addition, issues such as financial shortages, traffic safety risks, insufficient driver training, and fragmented governance were also mentioned. Although they are secondary topics, they help to construct a more complete structure of the current situation and difficulties of transport problems.

Table of Contents

1. Introduction.....	5
2. Literature Review	6
2.1 A global Sustainable Development Goals (SDG).....	6
2.2 The importance of sustainable transportation and mobility	6
2.3 Transportation and mobility challenges in developing countries.....	7
2.3.1 the Four categories been used.....	7
2.3.2 Supply and Public Demand in Transportation	7
2.3.3 Infrastructure	8
2.3.4 Informality	8
2.3.5 Traffic and parking management	8
2.3.6 Other common traffic issues: traffic congestion and pollution.....	9
2.4 Transportation and mobility challenges in Sub-Saharan African cities.....	9
2.4.1 Supply and Public Demand in Transportation	9
2.4.2 Infrastructure	10
2.4.3 Informality	10
2.4.4 Traffic and parking management	11
2.4.5 Other common traffic issues: traffic accidents and vulnerable groups.....	11
2.5 The case of Maputo and Freetown.....	11
2.5.1 Geography.....	11
2.5.2 Socio- demographic.....	12
2.5.3 Traffic issues especially in Maputo and Freetown.....	12
2.6 Methods for Sustainable Transportation Transformation	14
2.6.1 Governance and Regulatory.....	14
2.6.2 Technology solutions.....	14
2.7 Research Gaps in Sustainable Studies for SSA	15
3. Research plan	16
3.1 Research objectives and questions.....	16
3.2 Dataset.....	16
3.3 Methodology for data analysis.....	17
3.3.1 Thematic content analysis	17
3.3.2 Comparative analysis	17
3.3.3 N-Vivo	17
3.3.4 Data processing.....	18
3.4 Timeline.....	19
4. Ethics Application	21
5. Result.....	22
6. Discussion	26
6.1 common transport issues	26
6.2 Limitation of study	29
6.3 Further research.....	29
7. Conclusion	30
Reference	31

Appendix.....	34
Appendix 1: categorising matrix for Maputo	34
Appendix 2: categories matrix for Freetown.....	38
Appendix 3: coding process for Maputo and Freetown	42
Appendix 4 : result from N-vivo (Maputo).....	43
Appendix 5: result from N-vivo (Freetown).....	57

1. Introduction

With the growing global focus on sustainable development, the concept of sustainable urban mobility (SUM) has been introduced and is gradually becoming an important pathway to achieving the goal of sustainable development. Building sustainable transport systems is a crucial measure to address global environmental, social, and economic challenges, furthermore an important means to enhance the liveability and resilience of cities. In recent years, sub-Saharan African (SSA) cities have been accelerated urbanisation and simultaneous growth in population and income levels, leading to a significant increase in transport demand (Sietchiping, Permezel and Ngomsi, 2012). However, local governments have limited capacity in public transport infrastructure provision to meet the increasingly diverse mobility needs of urban residents.

A key challenge for transport development in this region is to avoid the development of car-oriented transport patterns. Car-orientated development not only brings about serious traffic congestion and environmental pollution but also further exacerbates social inequalities. Therefore, the challenge of how to achieve a transition to sustainable transport system while increasing transport capacity has become a pressing issue for cities in sub-Saharan Africa.

Freetown (Sierra Leone) and Maputo (Mozambique) are typical cases of accelerated urbanisation and exploration of sustainable transport development in Sub-Saharan Africa. Both cities face common challenges such as rapidly increasing numbers of private vehicles, unequal and unreliable public transport services, and worsening traffic congestion. Using Freetown and Maputo as examples, this study combines respondents' perspectives with comparative analyses along four key dimensions: supply and public demand, transport infrastructure, informality, and traffic and parking management, with the aim of comparing the common problems faced by SSA cities in transport and mobility.

2. Literature Review

2.1 A global Sustainable Development Goals (SDG)

The Sustainable Development Goals (SDGs) embody a unifying vision of the international community to collectively pursue coordinated economic, social, and environmental development with the needs of present and future generations. As the centrepiece of the 2030 Agenda for Sustainable Development, which was adopted at the United Nations in 2015, the SDGs construct a global framework comprising 17 goals and 169 targets designed to drive progress in eradicating poverty, combating climate change, and promoting equity and prosperity (United Nations, 2015). The Paris Agreement (2015) further reinforces global commitments in environmental sustainability, particularly in the areas of energy and transport, in order to achieve a transition to a low-carbon model (UNFCCC, 2015). These international agreements and initiatives promote the transformation and upgrading of international development and provide a clear policy direction for social development to safeguard the future of humanity and the planet.



figure 1: goal 11 from SDGs (United Nations, 2024)

2.2 The importance of sustainable transportation and mobility

Transport is an essential element of urban development and has a direct or indirect impact on social, economic, and environmental sustainability. As urban populations and dependence on cars increase, traditional car-oriented transport development threatens the stability of the global climate and ecosystems (Saeidizand, Fransen and Boussauw, 2021). At the societal level, car-oriented development exacerbates inequalities and is an unaffordable mode of travel for disadvantaged groups (Miller et al., 2016).

Sustainable transport plays a vital role in environmental protection by strengthening public transport networks, promoting clean energy vehicles, advancing walking, and cycling infrastructure (Steg and Gifford, 2005). From an economic perspective, an efficient public transport system minimizes commuting time and reduces the economic burden of traffic congestion and accidents (Thisaiveerasingam Thilakshan and Saman Jayaweera Bandara,

2019). In addition, a well-planned transport system eases traffic congestion and ensures equitable access to public transport and travel for all social groups, including the marginalized citizens.

The integration of three dimensions emphasizes the need for a transition from traditional car-oriented patterns to more sustainable urban transport systems and the achievement of long-term sustainable development goals.

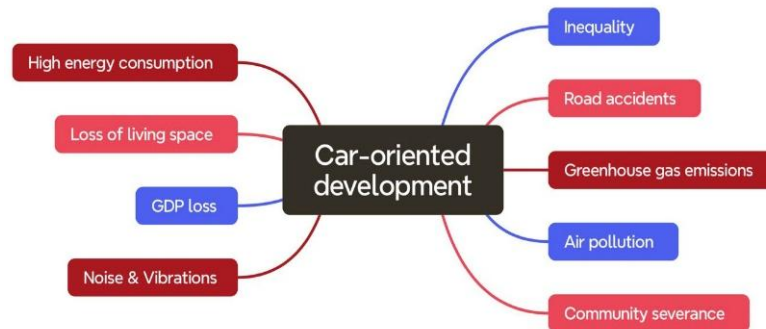


figure 2: negative externalities associated with car-oriented development (Cavoli, 2021)

2.3 Transportation and mobility challenges in developing countries

2.3.1 the Four categories been used

During the search and analysis of available data and related literature, it was concluded that supply and demand, infrastructure, informality and traffic and parking management are the four most common urban transport problems. These problems are prevalent in low- and middle-income countries globally and cause varying degrees of distress to local residents. However, it is worth noting that this categorisation is not meant to cover all transport challenges, and the complexity and geographic variability of urban transport issues dictates that there may be additional factors that have not been fully discussed.

2.3.2 Supply and Public Demand in Transportation

In the case of populations in developing countries with middle or low incomes are more diverse in terms of social class and income levels than populations in developed countries and have more complex transport needs (Thondoo et al., 2020). However, urban planning and transport policymaking in these countries tends to be dominated by middle-class planners (Thondoo et al., 2020). This difference often leads to policies that prioritize the preferences and demands of the middle class. As a result, transport policies in these countries tend to neglect the needs of a wider range of people, particularly low-income groups. A common feature of these policies is a focus on car-orientated development, with limited consideration of alternative modes of transport such as public transport, walking and cycling. This car-centric approach exacerbates existing inequalities in transport mobility and poses a significant challenge to achieving

sustainable transport systems.

2.3.3 Infrastructure

Developing countries across the world are experiencing rapid urbanization as populations grow significantly and urban sprawl (Yasin et al., 2020). However, the pace of infrastructure development has often lagged the growing demand for transport, resulting in serious deficiencies in road networks and accessibility. In Bangladesh, for example, only about 27% of roads are paved and, as of 2003, only 39% of the rural population had access to all-weather roads. By 2004, road density, measured in kilometres per 1,000 population, was two, below the South Asian average of 2.36 (Gordon, 2012). These constraints highlight the infrastructure challenges faced by rapidly urbanizing countries. At the same time, advances in technology have made alternative vehicle options, including battery electric vehicles and hybrid electric vehicles (Jelti, Allouhi and Aoul, 2023). However, the adoption of sustainable transport solutions is severely hampered by the lack of adequate charging and refuelling infrastructure.

2.3.4 Informality

Over the past four decades, cities in developing countries have expanded rapidly. High-density urban centres, concentrations of low-income households and congested streets make efficient public transport services essential. However, formal public transport often struggles to meet market demand, which has provided gaps for the entry of small-scale operators. These semi-informal operators fill the gaps in formal public services and play a significant role, especially in neighbourhoods that are poorly covered by traditional public transport (Cervero and Golub, 2007). Bangkok has various forms of informal transportation, such as minibuses and motorcycle taxis, which make up for the lack of formal public transportation services. The number of informal vehicles operating on any weekday is about 50,000. However, most of these vehicles are unlicensed and operate illegally, which is difficult to regulate, affecting traffic order and safety, and brings serious challenges to urban governance and traffic management (Cervero and Golub, 2007). Although these informal operators are flexible enough to meet the travel needs of specific communities, they also suffer from uneven service quality and low safety due to a lack of systematic regulation and management.

2.3.5 Traffic and parking management

With economic development and rising income levels, the purchase of a private car has become a major consumption goal for many families. This phenomenon stems from the influence of traditional perceptions of the private car as a symbol of social status and economic success, making it a priority pursuit (Appiah, 2020). However, the rapid growth in the number of private

cars has also brought serious parking and traffic congestion issues. First, poorly managed on-street parking leads to large numbers of vehicles repeatedly crossing high-demand roads in search of a parking space, thus exacerbating traffic congestion (Breithaupt and Wagner, 2023). At the same time, on-street parking charges are usually lower than those of parking lots, which further attracts drivers to choose on-street parking and leads to an uneven distribution of parking resources (Breithaupt and Wagner, 2023). As a result, some parking lots remain empty, while the demand for on-street parking spaces outstrips the supply. For example, in Kampala, Uganda, and New Delhi, India, the rapid growth in the number of cars has led to an acute shortage of parking spaces and increasing traffic congestion (Breithaupt and Wagner, 2023).

2.3.6 Other common traffic issues: traffic congestion and pollution

The growing problem of urban transport in low-income countries is also manifested in frequent traffic accidents, environmental pollution, and the negative impact on the mental health of residents, in addition to the four aspects above. For example, in Ettumanoor, India, traffic congestion has become the norm due to poor road planning and lack of traffic lights, leading to longer commuting times and reduced transport efficiency (Lal et al., 2016). In addition, in Sanandaj, Iran, traffic congestion cause residents to spend much time on the road, resulting in great psychological stress (Nadrian et al., 2019). Many residents are tired and weary of being in a congested environment for lengthy periods of time. Furthermore, traffic congestion has caused serious air pollution and noise problems. These environmental problems further affect the physical and mental health of residents and reduce their quality of life. Cities in low-income countries usually lack adequate transport infrastructure and effective management measures, which makes it difficult to alleviate traffic problems. In low- and middle-income cities, transport problems have a direct impact on the daily lives of residents. Promoting a sustainable transport transition is not only key to alleviating the daily travel difficulties of residents in these areas but is also a necessary way to achieve long-term social and environmental sustainability.

2.4 Transportation and mobility challenges in Sub-Saharan African cities

2.4.1 Supply and Public Demand in Transportation

Sub-Saharan African (SSA) cities face difficulties in providing reliable and affordable public transport services to meet the travelling needs of their residents. A mobility study of sub-Saharan African cities noted that the public transport sector is relatively small and concentrated on urban radial roads, and that the prohibitive cost of transport services is a major constraint on residents' use of public transport (Tembe et al., 2019). A large number of urban residents are unable to use public transport daily because of unaffordable prices and inadequate service coverage. In Douala, for example, residents living on the right bank of the Wouri River take half the time and pay half the cost of those on the left bank when using public transport (Diaz Olvera, Plat and Pochet, 2013). Moreover, walking is another major mode of transport in

African cities, with 11% of pedestrians in Conakry, 13% of pedestrians in Douala, 9% of pedestrians in Conakry and 4% of pedestrians in Douala, in comparison with the economically advantaged residents (Sietchiping, Permezel and Ngomsi, 2012). However, walking conditions are poor due to inadequate or non-existent walking infrastructure.

2.4.2 Infrastructure

Infrastructure for walking and cycling is extremely limited in most SSA cities. New road projects are often car-oriented, with grossly inadequate support for non-motorized and pedestrian modes of transport. This planning model forces motorists, pedestrians, and cyclists to share the use of urban roads, leading to frequent traffic safety issues and further undermining transport equity in these cities (Sietchiping, Permezel and Ngomsi, 2012). In addition, roads in these cities have shown significant deficiencies in coping with natural disasters. Especially in low-lying areas and urban fringes, infrastructure is highly vulnerable to environmental factors. For example, Mozambique's road system is frequently damaged by heavy rains, floods, and tropical cyclones, leading to traffic disruption and reduced accessibility (The African Climate Foundation, 2024). This disaster-vulnerable infrastructure not only threatens the safety of travelling residents but also limits the resilience of cities in the face of extreme weather. In addition, there has been slight improvement since a 1992 survey in Nairobi showed that only 39% of the roads in the urban transport network were rated in good or fair condition. The remaining roads are in poor or poor condition and are in urgent need of resurfacing or reconstruction. Drainage systems are even more problematic, with 56% of drainage facilities in poor condition or ineffective, and a further 17% of roads lacking roadside drains or culverts (Pirie, 2013).

2.4.3 Informality

In Southern African countries, where governments have struggled to cope with rapid urbanization and growing transport demand cannot afford by formal transport infrastructure and service provision. So that, informal transport services have emerged as an important complement to enhance urban mobility. For low-income groups, these services are often one of the few affordable travel options. Informal transport consists mainly of unregulated non-conventional modes of transport, such as minibuses, vans, taxis, station wagons, three-wheelers, auto rickshaws and motorbikes, which are popular because of their flexibility in terms of fares, timetables, and routing (Azunre et al., 2022). In Nairobi, most public transport trips (about 80%) are undertaken by informal shared minibuses known as matatus. It is estimated that matatus account for 70 to 80% of the public transport market, carrying about 700,000 passengers per day. These minibuses provide more than 90% of public transport services in Nairobi and directly or indirectly create tens of thousands of jobs (Pirie, 2013). However, these services

pose serious challenges in terms of public safety, air pollution, and lack of fixed stops, and policy management.

2.4.4 Traffic and parking management

In SSA cities, it is common for pavement areas to be illegally occupied for parking or by street vendors. This behaviour forces pedestrians to walk into the motorway, directly increasing the severity of traffic congestion, while also posing significant safety hazards (Sietchiping, Permezel and Ngomsi, 2012). For example, in Dar es Salaam, Tanzania, parking is one of the noteworthy problems, as few designed parking spaces or car parks on both sides of the road and ineffective traffic management and enforcement have led to residents parking on the streets within the urban core, resulting in overruns of pavements and serious obstacles to the smooth flow of traffic in the city. Where pavements are encroached upon, pedestrians' right of way cannot be effectively safeguarded, resulting in extremely poor walking conditions. This not only affects the daily travelling efficiency of residents, but also further aggravates the chaotic situation of urban roads.

2.4.5 Other common traffic issues: traffic accidents and vulnerable groups

Furthermore, cities in sub-Saharan Africa face several other urban transport problems. Firstly, road safety is a major concern. According to the World Health Organization, Africa has only 2% of the world's vehicles ownership but accounts for 16% of global road deaths, meaning that there are 24.1 road deaths per 100,000 people in Africa, compared to 10.3 in Europe. Vulnerable road users, such as pedestrians, cyclists and riders of motorized two- and three-wheeled vehicles, account for more than half of the traffic fatalities, with pedestrians accounting for 37%. These figures reflect the inadequacy of road safety facilities and the neglect of non-motorised users.

In addition, special consideration needs to be given to the daily travelling of vulnerable groups, including the women, people with disabilities and the elderly in traffic. Their main modes of travel are walking and cycling, but these short-distance journeys do not receive enough attention. In the city of Douala, Cameroon, where the majority of motorbike taxi users are women, but the drivers are all men, safety concerns are evident. In Bamako, Mali, where 87% of women have no personal vehicles, travel restrictions are even more severe. The needs of vulnerable groups have also often been ignored. Women and girls are vulnerable to harassment while travelling, people with disabilities face inadequate infrastructure, and there is a similar lack of attention to the travel needs of marginalised ethnic and religious groups and sexual minorities.

2.5 The case of Maputo and Freetown

2.5.1 Geography

The city of Maputo, located in the south of Mozambique, bordering the Indian Ocean, is the

economic and administrative centre of the country (Mazzolini, 2023). As the core area of the Maputo Metropolitan Area (AMM), the city of Maputo, together with the city of Matola and the municipal town of Boane, and the town of the Marracuene District, make up this extensive region (Mazzolini, 2023). AMM is not only the centre of the country's economic activity, but also its strategic position has made it an important node in transport (Mazzolini, 2023).

Freetown is located in the western part of Sierra Leone in West Africa and is the largest city and capital of the country, situated on a peninsula in the western region (Koroma et al., 2021). The city covers an area of approximately 82 square kilometres and has a complex topography and is prone to natural disasters, such as floods and mudslides, which cause considerable damage to the city, especially during the rainy season (July to September) (Koroma et al., 2021).

2.5.2 Socio- demographic

According to the 2017 census data, the population of Maputo Municipality is 2,582,219 (Mazzolini, 2023). The total population of the AMM is growing rapidly and at an average annual rate of 3.10% (Mazzolini, 2023). A comparison of the different population growth rates in each city reveals a shift in population growth to the outskirts (Mazzolini, 2023). This trend is placing greater demands on transport, housing, and infrastructure needs.

Freetown has a population of approximately 1.1 million, or 14.9 per cent of the country's population, but a high population density of 12,959 persons per square kilometre, well above the national average of 98 persons per square kilometre (Koroma et al., 2021). The population has been growing at an average annual rate of 4.2% in recent years and is expected to reach approximately two million by 2028 (Koroma et al., 2021). Urban development has failed to keep pace with population growth, leading to basic transport services, further exacerbating socio-economic inequalities and environmental vulnerability.

2.5.3 Traffic issues especially in Maputo and Freetown

The urban transport systems of Maputo and Freetown are facing multiple challenges, including weak infrastructure, inadequate governance, and limited sustainability. The existence of these problems not only seriously affects the daily mobility of the residents but also constrains the economic development of the cities.

In the Maputo Metropolitan Area (AMM), the transport system is characterised by an imbalance between supply and demand for public transport and the predominance of informal transport. Data shows that around 32.9% of the population rely on 'Chapas' as their main means of commuting, while 'My Loves' (small pick-up trucks) have become a common mode of travel (Maputo City Profile, n.d.). However, Maputo's road infrastructure is fragile and under-maintained, which means it is often affected by harsh weather. The vulnerability of the transport

system is further exacerbated by frequent natural disasters such as heavy rains, floods, and tropical cyclones, which cause damage to roads, disruption to traffic and reduced capacity (Maputo City Profile, n.d.). Despite the government's '1,000 Buses Programme' and the introduction of BRT (Bus Rapid Transit), the supply of public transport still falls short of demand and is inefficiently operated (Maputo City Profile, n.d.). At the same time, the growth in the number of private cars has increased traffic congestion, while the lack of walking and cycling facilities has made travelling more difficult for low-income groups.

Freetown's transport system also faces serious challenges and is characterised by a high reliance on informal modes of transport such as Okada (motorbikes), Kekehs (tricycles) and private minibuses (CITY PROFILE: Freetown Base Conditions of Mobility, Accessibility and Land Use, 2021). As a result of inefficient traffic management, chaotic parking on the streets and encroachment on the pavements are common, seriously affecting the safety of pedestrian movement. The lack of infrastructure makes it difficult for the public transport system to meet demand, and walking has become the main mode of travel for many low-income groups (CITY PROFILE: Freetown Base Conditions of Mobility, Accessibility and Land Use, 2021). However, poorly maintained roads and lack of pedestrian facilities expose pedestrians to significant safety risks. In addition, the occupation of road space by traders has led to inefficient traffic operations, while the government's lack of coordination and enforcement capacity in traffic management has further exacerbated traffic problems.

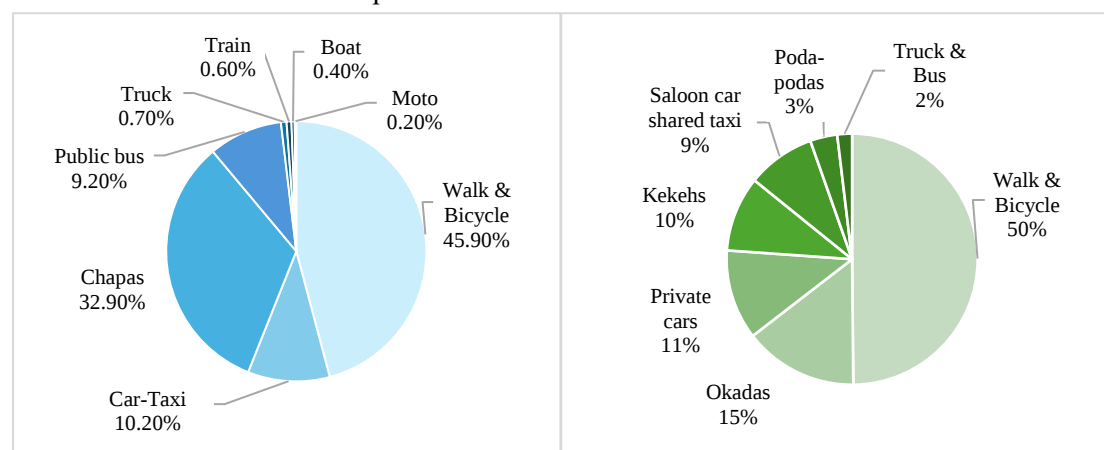


figure 3:travel options in AMM (JICA, 2014) and Freetown

Sub-Saharan African countries also have significant economic challenges. These countries, especially Mozambique and Sierra Leone, have limited financial capacity and are highly dependent on investments from international organisations and institutions. However, the lack of comprehension by international investments of actual local needs, socio-economic conditions and environmental challenges makes it difficult to fully integrate transport investments with local sustainable development goals, leading to insufficient and underfunding of public transport, walking and cycling infrastructure development.

In addition, there are multiple impediments to the implementation of transport policies. Sectors in the areas of transport, land use and environmental governance often lack cross-sectoral cooperation, leading to inefficient policy implementation. Corruption in local governments and

lack of transparency in the use of funds further exacerbate the lag in the construction and maintenance of transport infrastructure and reduce public trust in the Government's ability to govern transport. In Maputo and Freetown, the insufficient monitoring of transport policy implementation and the slow progress in public transport reform and infrastructure development have not been effective in alleviating transport problems.

Overall, the transport systems in Maputo and Freetown face significant challenges in terms of infrastructure, governance, and sustainability. Both cities need to strengthen their public transport systems, improve infrastructure development, enhance government governance capacity and promote sustainable transport investments to achieve more equitable, efficient, and environmentally friendly urban transport systems.

2.6 Methods for Sustainable Transportation Transformation

2.6.1 Governance and Regulatory

In recent years, accelerated urbanization with combined population and income growth has led to a significant increase in demand for car-oriented transport, especially in developed urban areas. In the context of rapid urbanization, the success of sustainable transport transition often depends on the promotion and involvement of political and business leaders. While political leaders can have a profound impact on the transport system through legislation, policy development and resource allocation (Jelti, Allouhi and Aoul, 2023). Business leaders can shape consumer choices through business practices and market trends and drive the development of cleaner and more efficient vehicle technologies (Jelti, Allouhi and Aoul, 2023). Some of the organizational problems of sustainable transport relate to the lack of effective stakeholder engagement in the design and implementation of policies to promote more sustainable transport systems, and the limited collaboration between government agencies and other stakeholders in the sector (Jelti, Allouhi and Aoul, 2023). This has resulted in policies and programs to develop and implement sustainable transport not being effectively coordinated. Initiative-taking action by governments and all stakeholders is essential to promote sustainable transport systems, and cooperation between the two will accelerate the transformation of the transport sector.

2.6.2 Technology solutions

Technological innovation is considered to be a key factor for sustainable development, through advanced engineering technologies to control emissions of environmental pollutants and promote the use of renewable resources. However, the transition to innovative technologies faces many challenges. Major constraints include barriers to accessing cleaner resources, high production costs, availability of raw materials, and lack of public awareness. To some extent, these factors have hindered the adoption of innovative technologies. What is more, alternative fuels and vehicles have become commercially viable, including liquid biofuels, biogas, battery-powered vehicles, and hybrid electric vehicles (Pojani and Stead, 2015). Although these

alternative technologies still face problems such as the high viscosity of biofuels and the potential for unmodified vegetable oils to cause excessive engine combustion (Pojani and Stead, 2015). These technical problems limit the spread of alternative fuels and vehicles. At the same time, the lack of charging and refuelling facilities and weak public transport infrastructure further hinder the development of sustainable transport systems.

2.7 Research Gaps in Sustainable Studies for SSA

At present, there are certain deficiencies in the study on the sustainable development of SSA countries. To begin with, the majority of the existing studies mainly focus on individual case studies and lack systematic cross-national comparative analysis, making it difficult to disclose the commonalities and differences of the development models within the region. Secondly, there is an inadequate comprehensive analysis of the exploration of the influences of these challenges from a macroscopic perspective has not been profound enough.

3. Research plan

3.1 Research objectives and questions

Given the need for cities in Sub-Saharan Africa to transition to sustainable transport and the transport and mobility challenges they are facing. This study aims to identify the most common transport and mobility issues in Maputo and Freetown through a comparative study. The objectives of this study are:

1. Analyse the current transport challenges in Maputo and Freetown in terms of the four dimensions of supply & demand; infrastructure; informality and traffic and parking management.
2. To make recommendations to help Maputo and Freetown and wider sub-Saharan African cities to improve the quality of transport and promote a sustainable transport transition.

3.2 Dataset

The dataset analysed in this study comes from a series of semi-structured interviews and group discussions conducted by the T-SUM project team in Maputo and Freetown between 2018 and 2019. The main purpose of this data collection was to gain a deeper understanding of the key challenges and potential opportunities faced by the two cities in terms of transport and land use, so as to provide decision-making support for urban transport transformation and sustainable development. The research team interviewed approximately 41 key stakeholders and organized a focus group discussion with 5 to 8 supranational representatives. The interviewees included government officials at the national, provincial, and local levels, as well as representatives of institutions related to transport and land governance, city associations and some citizen representatives, ensuring diversity of perspectives and comprehensiveness of the data. All interviews and discussions strictly followed the ethical guidelines of University College London (UCL), and all participants signed informed consent forms before the interview to ensure the anonymity of the data and the use of the data for research and analysis purposes only. With this dataset, the research team was able to construct a portrait of urban transport and land use in Maputo and Freetown, providing a solid empirical basis for the design and analysis of subsequent policy workshops of T-SUM. These first-hand data reveal structural barriers in many aspects such as local governance, institutional capacity, and fiscal arrangements, and are an important reference for understanding the process of urban sustainable transformation.

3.3 Methodology for data analysis

3.3.1 Thematic content analysis

Thematic analysis is a method widely used in qualitative research to systematically identify, analyse, and interpret key themes in data. Through in-depth analysis of the raw data, the researcher is able to distil the core concepts that are closely related to the research objectives (Naeem et al., 2023). Thematic analysis usually involves the following steps: first, the researcher needs to read the data repeatedly to familiarize himself with its content; second, preliminary themes are extracted through step-by-step coding by categorizing and labelling the data; subsequently, developing a framework for analysis by comparing and refining the preliminary themes (Naeem et al., 2023). This approach is flexible to allow for both inductive analyses in data-driven situations and deductive analyses in conjunction with theoretical frameworks, providing a useful tool for exploring complex social phenomena.

3.3.2 Comparative analysis

Comparative analysis is an important research methodology, widely used in social science and interdisciplinary research, for identifying similarities and differences between research objects to reveal patterns and mechanisms (Miri and Shahrokh, 2019). Its core lies in exploring the causal relationships and regularities behind specific phenomena by comparing different cases or variables. Comparative analysis usually consists of the following steps: firstly, defining the research problem and selecting a suitable comparator to ensure its comparability and research significance; secondly, identifying the dimensions and criteria of the analysis; and lastly, conducting an analysis under the framework of multi-dimensionality to refine the commonalities and characteristics, and to explain the findings of the study (Miri and Shahrokh, 2019). Comparative analysis provides researchers with systematic and logical tools for the understanding and interpretation of complex social phenomena.

3.3.3 N-Vivo

N-Vivo is a qualitative data analysis software (QDA) widely used in qualitative research, designed for processing, and analysing complex unstructured data, including interview texts, observation transcripts, open-ended questionnaires, and multimedia files (Wikipedia Contributors, 2019). Through its powerful coding features and flexible analysis tools, N-Vivo helps researchers to systematically organize, manage, and interpret their data in a way that improves efficiency and depth (Lumivero, 2024). In interview text analysis, N-Vivo can support researchers to code data paragraph by paragraph or sentence by sentence and transform a large amount of raw data into ordered information for comparison and generalization through thematic classification (Lumivero, 2024). Its systematic and precise nature makes N-Vivo play a vital role in supporting theory generation, pattern recognition, and cross-case comparisons.

3.3.4 Data processing

After obtaining the interview records of the interviewees in the two cities, all the text materials were read through to fully understand the main traffic problems raised by the interviewees. Based on preliminary familiarity with the materials, combined with the existing literature review, a preliminary classification system of traffic problems was sorted out, covering the detailed problems under multiple dimensions such as infrastructure, traffic supply and demand, informal transportation, and traffic management. Subsequently, all the interview texts were manually coded, and the statements of the interviewees were classified according to the above classification system. At the same time, some problems that were not clearly stated in the literature but frequently appeared in the interviews were identified during the coding process, and they were added to the initial classification system to ensure the completeness and pertinence of the analysis. After completing the preliminary manual coding, all the sorted transcripts and the constructed classification system were imported into the qualitative analysis software N-Vivo, and its automatic coding function was used to perform a second round of coding on the text materials. Automatic coding helps to identify a wider range of keyword expressions and improve the coverage of the analysis. Finally, the results of automatic coding were cross-compared with the previous manual coding results, and omissions were checked and supplemented based on manual coding, and synonymous expressions that were not recognized by N-Vivo were ensured not to be ignored. Through the combination of manual and automatic coding, on the one hand, the contextual grasp and theoretical depth of qualitative analysis are guaranteed, and on the other hand, the accuracy of text processing is improved with the help of software functions, making the conclusions more convincing.

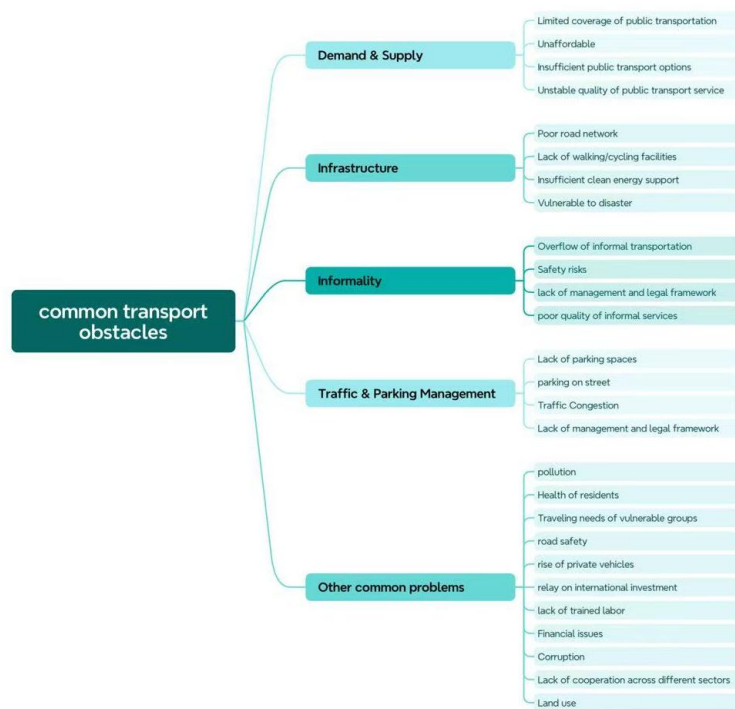


Figure 4: full structure of traffic issues in two cities

3.4 Timeline

This table is my research timeline and milestone of submission.

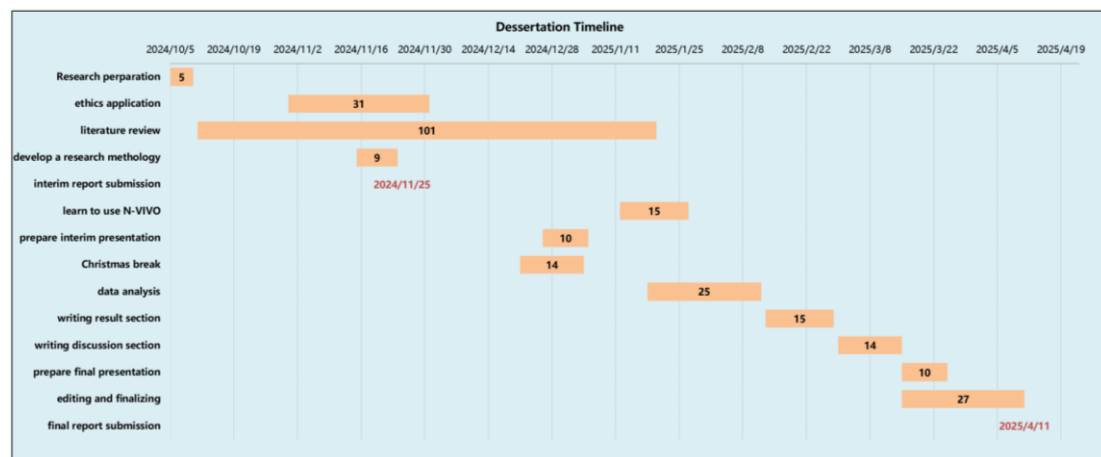


Table 1: dissertation timeline

	tasks	start date	end date	duration
1	Research perparation	2024/10/5	2024/10/10	5
2	ethics application	2024/10/31	2024/12/1	31
3	literature review	2024/10/11	2025/1/20	101
4	develop a research methology	2024/11/15	2024/11/24	9
5	interim report submission	2024/11/25	2024/11/25	0
6	learn to use N-VIVO	2025/1/12	2025/1/27	15
7	prepare interim presentation	2024/12/26	2025/1/5	10
8	Christmas break	2024/12/21	2025/1/4	14
9	data analysis	2025/1/18	2025/2/12	25
10	writing result section	2025/2/13	2025/2/28	15
11	writing discussion section	2025/3/1	2025/3/15	14
12	prepare final presentation	2025/3/15	2025/3/25	10
13	editing and finalizing	2025/3/15	2025/4/11	27
14	final report submission	2025/4/11	2025/4/11	0

Table 2: specific start and end dates for each task

4. Ethics Application

This study has been approved by the ethics committee and deemed to be low-risk research, involving semi-structured interviews and focus group discussions with stakeholders. During the research process, strict adherence to ethical guidelines was maintained to ensure privacy protection and data security. I fully recognize the importance of research ethics, not only as a fundamental requirement to protect research subjects, but also as an important foundation to ensure transparency, fairness, and reliability in the research process.

5. Result

Based on in-depth interviews with 41 respondents in Maputo (27) and Freetown (14), this study sorted out the problems related to urban transportation in the two cities through manual coding and the use of N-VIVO. In the preliminary analysis, the main challenges in the transportation system were summarized from multiple dimensions, covering infrastructure, transportation supply and demand, informal transportation, transportation and parking management, and other factors. In order to ensure the systematic and focused analysis and find out the common transportation problems in the two cities, this study used the frequency of occurrence as the core screening criterion and selected the five problems mentioned most by the respondents as the main analysis objects of this study.

These five high-frequency problems are: poor road condition, lack of facilities, poor road network, insufficient public transportation options, and limited coverage of public transportation. These problems were repeatedly mentioned by a large number of respondents in both cities, reflecting the common weaknesses of the transportation system in terms of accessibility and service capacity, and are related to the daily travel experience of urban residents. They are obviously universal and therefore become the focus of the study.

In addition, to supplement the comparative dimension, this study specifically selected two issues with significant differences in urban performance for in-depth analysis, namely: lack of parking spaces and traffic congestion. Although these two issues are reflected in both places, there are obvious regional differences in the attention paid by the respondents, which helps to further understand the factors that lead to traffic pressure.

Maputo	frequency	Freetown	frequency
Poor road conditions	12	44.40% Lack of roads; walking/cycling/bus lanes and other facilities	11
Poor road network	10	37% Poor road conditions	8
Lack of walking/cycling/bus lanes and other facilities	9	33.30% Poor road network	6
Limited coverage of public transportation	9	33.30% Lack of parking spaces	6
Insufficient public transportation options	8	29.60% Traffic congestion	6
Road safety	6	22.20% Insufficient public transportation options	5
Rise number of private vehicles	6	22.20% Fiscal constraints in public transportation	5
lack of trained labour	6	22.20% street trading	5
not reliable on public transportation	5	18.50% Safety risks of informal transportation	4
Fiscal constraints in public transportation	5	18.50% Lack of management and legal framework	4
Lack of cooperation across different government sectors	5	18.50% Relay on international investment	4
Lack of parking spaces	4	14.80% Parking on street/pavement	3
Traffic congestion	4	14.80% Limited coverage of public transportation	3
Relay on international investment	4	14.80% not reliable on public transportation	3
Unaffordable	3	11.10% Parking on street/pavement	3
Lack of management and legal framework	3	11.10% Road safety	3
Corruption	3	11.10% lack of trained labour	3
		Land use	3

Table 3: frequency of each category in Maputo and Freetown

Regarding other issues, such as shortage of financial resources, informal traffic management, safety risks, law enforcement and corruption, chaotic use of urban space, and insufficient driver training, although they are reflected in some interviews, the frequency of occurrence in the

overall sample is relatively low. Therefore, they are briefly presented as secondary topics in this study and are not the focus of analysis.

When analysing the road conditions in Maputo and Freetown, it can be clearly seen that poor road conditions are the key issues frequently mentioned by respondents in both cities. In Maputo, 44.4% of the respondents mentioned this issue; in Freetown, 57.1% of the respondents pointed out that poor road conditions have a serious impact on urban traffic and travel. First, many roads in Maputo, especially local roads, are seriously damaged and lack maintenance. SSI_M_5 mentioned that “the roads are damaged, and new areas do not have asphalt roads, huge potholes”. Many respondents also mentioned that the public transportation routes are full of potholes, which makes it difficult for buses to travel. Some buses have been purchased but cannot be put into use normally due to road problems. Regarding the lack of dedicated bus lanes, SSI_M_16 mentioned that “We had an experience with bus lanes in N1. Roads are not prepared for dedicated lanes”. Freetown also faces similar difficulties. Its road infrastructure has been seriously degraded due to long-term lack of maintenance and war damage, and the problem of bridge damage is prominent, resulting in a significant shortening of the service life of vehicles such as motorcycles. In addition, many roads in Freetown are still left over from the colonial period and can no longer cope with the current traffic volume. In addition, Freetown has serious traffic jams due to the narrow existing roads in the city centre, especially between Up-gun and PZ.

When it comes to the supporting transportation infrastructure of Maputo and Freetown, it can be clearly seen that “lack of facilities” is a problem frequently mentioned by respondents in both cities, especially in Freetown. The data shows that 33.3% of respondents in Maputo and as many as 78.6% of respondents in Freetown pointed out that basic transportation facilities are seriously lacking. First, Maputo has long lagged behind in the construction of supporting transportation facilities, “Marraquene, Bello Horizonte nice houses but not even roads with pavements” (SSI_F_4). Many respondents pointed out that the city lacks sufficient bus lanes, bus stops, bus parking and boarding places, bicycle lanes and modern transportation hubs, resulting in insufficient coverage of the bus system and chaotic station settings. In contrast, Freetown's problems are more concentrated in the chaotic organization of urban transportation space, the coexistence of multiple modes of transportation, but the lack of separation of roads, and light vehicles (such as Kekehs) roaming around on the roads at will. There are no sidewalks or bicycle lanes for pedestrians and cyclists to pass through, “there is no space for the pedestrians” (IDI_04). More importantly, rubbish blocks the drainage system, making some roads impassable, which has a serious impact on the transportation system. Freetown also generally lacks key transportation facilities such as bridges, underpasses, and shipping terminals, resulting in a lack of attraction to local people.

The incomplete road network is one of the crucial factors hindering the improvement of urban transportation efficiency in Maputo and Freetown and was widely mentioned in the feedback of respondents. The data shows that 33.3% of the respondents in Maputo and 42.9% of the respondents in Freetown believe that the incomplete road network seriously restricts the operation of the urban transportation system and the convenience of residents' travel. In Maputo, the structural defects of the road network are manifested in the insufficient number of trunk roads and poor internal connectivity in the city. Especially in the Greater Maputo area, the road system fails to effectively connect the inner city and the suburbs, resulting in poor traffic mobility. In addition, remote areas are excluded from the bus system, "Because of lack of quality roads in the rural areas Chapas don't go" (SSI_M_15). The road network problem in Freetown is manifested in the city's single entrance and exit and bottleneck channels. Several respondents pointed out that there is only one main channel for east-west access to Freetown's central business district (CBD), especially in the direction of Waterloo and Wellington, which is particularly difficult to enter and exit (SSI_F_4). The accessibility to the city centre is poor," These two roads are the Fourahbay road and the Kissy road. And they are the only roots to the central parts of the city" (SSI_F_12). In addition, the connection between urban and rural areas in Freetown is also extremely weak, there are no roads in rural areas, and the accessibility between rural and urban areas is poor (SSI_F_5).

The singleness of transportation modes and insufficient capacity are another frequent problem faced by Maputo and Freetown in the construction of transportation systems. Specifically, 29.6% of respondents in Maputo and 35.7% of respondents in Freetown pointed out that the existing public transportation and capacity can no longer meet the growing travel demand. In Maputo, many respondents pointed out that buses are the main public transportation mode for citizens, but the number of existing vehicles and capacity are far from meeting the actual demand. Although "Government made a big effort to big buses, create cooperatives and let the private sector operators. It is not sufficient because people are still using Mylove" (SSI_F_7). The situation in Freetown is similar. With the increase in population and commuting population, especially the surge in commuting demand from Lungi to the city, the existing public transportation system is unable to bear the high-intensity transfer pressure. Passengers have to queue for a long time during peak hours and walk to the intersection to find Poda Podas or buses (IDI_08). The capacity of the 19-30-seat small buses mainly used in the city is limited and cannot effectively cope with peak passenger flow. Passengers often need to arrive at the station in advance to grab seats, and latecomers can only wait for the next bus (IDI_014).

Although the lack of coverage of the bus network is not frequently mentioned in the public transportation systems of Maputo and Freetown, it is also the most mentioned transportation

supply and demand problem in Maputo. According to the survey data, 33.3% of Maputo respondents and 21.4% of Freetown respondents pointed out that the bus network failed to achieve reasonable coverage, resulting in transportation inequality in urban fringe areas and under-service areas. In Maputo, bus routes are highly concentrated in the core area of the city, and the urban fringe areas and informal settlements are almost ignored by the public transportation system, which makes it extremely inconvenient for residents in these areas to travel (SSI_M_6). Several interviewees mentioned that some communities even lack available public transportation, forcing residents to rely on walking or informal transportation, such as "Mylove" or Chapas, to fill the gaps in public transportation. In contrast, although Freetown has a concentrated demand for public transportation, it also has significant spatial coverage blind spots. Most residents can only rely on local minibuses and some taxis on a daily basis because "the SLRTC buses where they are available, but it was restricted to Freetown Urban Areas" (IDI_02). In addition, there is a lack of subsequent bus routes around the ferry terminal from Lungi to Freetown, resulting in low transfer efficiency and long waiting time, especially during peak hours, forming a bottleneck (IDI_08).

Insufficient parking spaces are a prominent problem faced by Maputo and Freetown in urban traffic management, especially in Freetown. Survey data show that 14.8% of respondents in Maputo and as many as 42.9% of respondents in Freetown pointed out that the shortage of parking resources has become an important cause of urban traffic congestion and chaotic space management. In Maputo, the problem of parking shortage runs through small towns on the edge of the city and busy areas in the city centre. Many respondents said that they can hardly find available parking spots near their destinations. In addition, a large number of buildings were not planned with supporting parking spaces at the initial design stage, so residents and visitors can only temporarily park their vehicles on both sides of the road (SSI_M_26). In Freetown, the same problem "You have people doing high rise buildings with not necessarily the requisite commensurate available space for them to park off street within the facility" (IDI_04). In addition, the widely operated Kekehs (three-wheeled vehicles) in the city are parked randomly due to the lack of fixed parking spots, exacerbating traffic congestion and disorderly use of space (IDI_09).

Traffic congestion is one of the highly familiar challenges faced by Maputo and Freetown in urban traffic management. According to the survey data, 14.8% of respondents in Maputo and 42.9% of respondents in Freetown clearly pointed out that traffic congestion is their most concerned travel problem, and the perception of congestion in Freetown is particularly prominent. In Maputo, many respondents mentioned that the road capacity is limited, especially in the main roads, which are often congested due to excessive traffic volume. In addition, "Another problem is that everything is concentrated at the centre for the city. It creates a big congestion problem" (SSI_F_4). In Freetown, the traffic congestion problem is more serious,

especially in the main roads and core transportation hubs. The main traffic axes such as Circular Road and Hurton Street have long been crowded with vehicles, making them one of the most inefficient areas for public transportation operations. (IDI_07). In addition, the traffic volume in the city centre surges in the afternoon, especially in the Fourahbay Road area, which has become a typical section most prone to congestion during peak hours (IDI_09).

6. Discussion

6.1 common transport issues

First, in Maputo and Freetown, the root cause of poor road conditions can be traced back to a structural problem: the pace of urban expansion has far exceeded the pace of infrastructure construction. As mentioned in the literature, urbanization has brought about a rapid increase in population and transportation demand, but infrastructure investment and construction often lag behind this demand. In Maputo, this mismatch is particularly obvious. The urban fringe is constantly being developed, but a large number of newly built communities do not even have basic asphalt roads, and many roads are still dirt roads. Even in the city centre, some main roads and public transportation routes are still full of potholes. Secondly, the problem of insufficient transportation infrastructure. As mentioned in the literature, these countries have a rapid urbanization process, but the development of infrastructure is seriously lagging, especially in terms of road construction, sidewalks, bicycle lanes and transportation hubs. This imbalance is more prominent in Freetown, with as many as 78.6% of respondents pointing out that infrastructure is seriously lacking. Freetown not only lacks road separation and organizational design, but also has mixed traffic, informal vehicles (such as Kekehs) roaming around at will, and pedestrians and cyclists have no way to go. There is also the problem of lagging road network construction. It is also mentioned in the literature that in Bangladesh, only about 27% of the roads are paved, and most rural areas are inaccessible during the rainy season, which directly limits the resilience and fairness of urban and rural transportation. In line with this, in Freetown, the accessibility of the city centre is extremely poor. For example, the CBD area relies on only two main roads, which significantly limits the accessibility and commuting efficiency of the city centre. The limitations of the transportation network are not only a problem of infrastructure but also expose the over-centralization of urban spatial planning and the neglect of long-term transportation accessibility and social equity.

The core problems faced by Maputo and Freetown in terms of transportation supply and demand confirm the summary of urban transportation challenges in low- and middle-income countries in the literature review on multiple levels. First, in terms of bus network coverage,

the literature points out that the public transportation industry in sub-Saharan African cities is relatively small and mainly concentrated on urban radial roads. This is particularly prominent in Maputo, where many respondents pointed out that transportation routes are highly concentrated in the city centre, and there is almost no public transportation coverage in the peripheral areas. Freetown also has similar problems, such as the narrow service area of the SLRTC line and the lack of connecting lines at the ferry terminal, which all illustrate the reality of the uneven distribution of transportation emphasized in the literature. Secondly, in terms of the singleness of public transportation modes and insufficient capacity, the literature points out that transportation planning in low- and middle-income countries often fails to fully consider the travel needs of different social classes, resulting in narrow coverage and limited choices of public transportation services. Corresponding to this is the feedback from Maputo residents on the insufficient number of buses, as well as the serious transfer congestion and capacity bottlenecks in Freetown during peak hours, which all reflect the dual dilemma of this singleness and lagging supply. Finally, in terms of transportation costs, the concerns of Maputo and Freetown respondents about fares and travel costs echo the high cost of transportation services mentioned in the literature as the main constraint on residents' use of public transportation. The literature emphasizes that low-income groups are more sensitive to transportation costs, and high fares may further exacerbate travel inequality. From the high fares of Metrobus in Maputo to the high travel costs of motorcycles in Freetown, this feedback highlights the key role of economic accessibility in actual transportation choices.

The existing informal transportation in Maputo and Freetown presents multiple problems. First, the literature points out that with the shortage of formal transportation supply, informal transportation has become an important mode of travel for many urban residents, filling the gap in the public transportation system. Due to the lack of diversified public transportation in the city, a large number of Okada and Kekehs in Freetown have seriously affected public transportation, while Maputo has formed an alternative dependence on the formal transportation system under the widespread use of Mylove. In fact, similar transportation dilemmas are also common in other developing countries. For example, in Nairobi, small private operators mostly dominate public transportation. In addition, poor quality of informal services is also a common concern in the survey and literature. The problems mentioned by the interviewees, such as old vehicles, simple facilities, poor riding experience, and overloading, echo the discussion in the literature about public safety, air pollution, and lack of fixed stations for informal services. Finally, the lack of governance and legal supervision is the root cause of the above problems, which is also one of the key challenges of informal transportation transformation emphasized in the literature. Many respondents in the survey pointed out problems such as weak regulatory systems, lack of unified management, and unclear operating areas, which are all informal

transportation problems faced by low- and middle-income countries around the world and other sub-Saharan African countries mentioned in the literature.

The problems faced by Maputo and Freetown in terms of transportation and parking management have a lot in common with the problems mentioned in the literature review in low- and middle-income countries and sub-Saharan African cities. First, "lack of parking spaces" is one of the frequently mentioned problems in the two cities. Whether in the core area or the fringe of the city, public and private buildings generally lack specially planned parking areas when they were originally designed. This phenomenon directly leads to another traffic problem, that is, since it is difficult for residents to find parking spaces near their destination, they can only choose parking on the street or pavement. The second is the problem of traffic congestion. The main roads in Maputo and the transportation hubs in Freetown both show obvious congestion during peak hours, and the efficiency of the public transportation system is seriously affected. The reasons for the emergence of the above problems can be referred to in the literature. With economic development, people's income levels have gradually increased, and buying a car has become one of people's main wishes. However, the number of private cars has gradually increased, and parking and congestion have also become serious traffic problems. Finally, there is a lack of management and regulations for urban traffic, and weak law enforcement. Although some areas have begun to try to regulate management (such as the implementation of a paid parking mechanism in Maputo), the overall lack of traffic management system and legal support has led to lax enforcement of rules and chaotic order. This is just as the literature states that many low- and middle-income countries have policy frameworks, but at the implementation level, they are often difficult to implement due to loose supervision, human resource shortages or corruption, which ultimately affects the operating efficiency and public trust of the urban transportation system.

The series of "other traffic problems" faced by Maputo and Freetown in the operation of the transportation system further confirm the structural analysis of the urban traffic dilemma in low- and middle-income countries in the literature review from multiple dimensions. Among them, road safety is of irreplaceable importance in the urban transportation system. The road safety problems reflected by the interviewees in Maputo and Freetown are mainly reflected in weak infrastructure, chaotic traffic order and irregular driving behaviour. Maputo faces problems such as mixed traffic of people and vehicles and frequent speeding, while Freetown exposes safety hazards such as lack of vehicle safety inspection, widespread drunk driving, and use of inferior tires, which significantly increases the risk of accidents. These factors have led to the fact that although Africa only accounts for 2% of the world's motor vehicle population, it bears about 16% of traffic fatalities. This high proportion itself reflects the profound consequences of road safety being systematically ignored in developing cities.

6.2 Limitation of study

In the process of sorting out the urban traffic problems in Maputo and Freetown, this study still has some limitations that cannot be ignored. First, the data source is mainly based on semi-structured interviews conducted around 2019, so the traffic conditions reflected are timely. With the adjustment of urban policies, the implementation of international aid projects and the gradual application of new technologies in the field of transportation in recent years, the transportation systems of the two cities may have changed to a certain extent, and the severity or manifestation of some problems may be different from the picture presented in the study.

Secondly, there are also deviations in the composition of the respondents. Most of the interviewees are from the middle class or above social groups and generally have the conditions for private car travel. Therefore, their observation of the transportation system is mostly based on the perspective of motor vehicle drivers, and they have limited understanding of the daily travel experience of pedestrians, non-motor vehicle users and low-income groups who rely on informal transportation. This structural deviation may lead to less mention of informal transportation (such as Chapas, Poda Podas, Kekehs, etc.) in the study, and fail to fully capture the essential functions they actually undertake in the transportation system. In addition, when identifying traffic problems, these respondents tend to focus more on issues related to private cars, such as road congestion and parking difficulties, and their evaluation and expectations of public transportation may have certain class biases.

Another potential limitation is that this study mainly uses qualitative interview data. Although it can deeply reveal the perceptions and experiences of stakeholders, it lacks a systematic quantitative survey and traffic data to match it, which limits the broad representativeness and comparability of the results. In addition, the interview content relies on the interviewee's self-report, which may have recall bias or social expectation effect, and may be subjective or strategically expressed.

6.3 Further research

Given that the data of this study mainly comes from interviews around 2019, future research should combine the latest traffic data, policy changes and infrastructure construction progress to conduct cross-period comparative analysis. This will help evaluate the changes and effectiveness of the transportation system in dealing with problems in recent years, and further identify which problems are still persistent and which have been alleviated by policy intervention.

Second, future research should strengthen the coverage of vulnerable groups in transportation, especially low-income residents, women, the elderly, students, and workers who rely on

informal transportation. Through more inclusive sample selection, the perspective limitations of current research due to the emphasis on the middle class can be avoided, to understand the problems of urban transportation systems more comprehensively in terms of fairness and accessibility.

Combining qualitative interviews with quantitative surveys (such as residents' travel mode surveys, traffic flow monitoring, commuting time statistics, etc.) can more systematically depict the operating status and efficiency of urban transportation systems. This mixed method can not only enhance the representativeness of the research results but also help provide a more data-driven basis for formulating policy recommendations.

7. Conclusion

This study compares the transportation systems of two sub-Saharan African cities, Maputo and Freetown, and identifies several of the most prominent problems in the urban transportation systems of the two cities. Five frequently mentioned problems - poor road conditions, lack of transportation facilities, incomplete road networks, limited public transportation options, and insufficient coverage - constitute common challenges for the transportation systems of the two cities. These problems are not unique to individual cities but are widely representative in low- and middle-income countries, reflecting the current imbalance between urban development and transportation governance. The survey results show that there are significant differences in the way different social groups rely on transportation, and transportation policies and resource allocation often ignore the basic travel needs of low-income residents and vulnerable groups. The importance of this study lies not only in the identification of specific problems, but also in reminding us that we should face up to the basic right to travel of hundreds of millions of people in the context of rapid urbanization in sub-Saharan Africa. Transportation is not only a means of access but also related to all aspects of urban life such as education, employment, and medical care. If transportation policies in this region continue to ignore fairness and sustainability, social inequality will be further exacerbated. Therefore, promoting a more inclusive transportation governance framework and strengthening the financial and technical capacity of local governments are key paths to achieving sustainable urban development.

Reference

Reference list

- Appiah, S. (2020). *Understanding Car Ownership among Households in Developing Countries: A Case Study of Accra, Ghana*. [online] Available at: <https://etheses.whiterose.ac.uk/28077/1/Samuel%20Adjei%20Appiah%20Thesis.pdf>.
- Azunre, G.A., Amponsah, O., Takyi, S.A., Mensah, H. and Braimah, I. (2022). Urban informalities in sub-Saharan Africa (SSA): A solution for or barrier against sustainable city development. *World Development*, 152, p.105782. doi:<https://doi.org/10.1016/j.worlddev.2021.105782>.
- Breithaupt, M. and Wagner, A. (2023). *On-Street Parking Managment - SUTP*. [online] SUTP. Available at: <https://sutp.org/publications/on-street-parking-managment/> [Accessed 25 Nov. 2024].
- Cavoli, C. (2021). Accelerating sustainable mobility and land-use transitions in rapidly growing cities: Identifying common patterns and enabling factors. *Journal of Transport Geography*, 94, p.103093. doi:<https://doi.org/10.1016/j.jtrangeo.2021.103093>.
- Cervero, R. and Golub, A. (2007). Informal transport: A global perspective. *Transport Policy*, 14(6), pp.445–457. doi:<https://doi.org/10.1016/j.tranpol.2007.04.011>.
- CITY PROFILE: Freetown Base Conditions of Mobility, Accessibility and Land Use. (2021). Available at: https://www.tsum.org/_files/ugd/b4aba8_cc74de707508443688aa0e310963d10e.pdf [Accessed 10 Apr. 2025].
- Diaz Olvera, L., Plat, D. and Pochet, P. (2013). The puzzle of mobility and access to the city in Sub-Saharan Africa. *Journal of Transport Geography*, 32, pp.56–64. doi:<https://doi.org/10.1016/j.jtrangeo.2013.08.009>.
- Gordon, C. (2012). The challenges of transport PPP's in low-income developing countries: A case study of Bangladesh. *Transport Policy*, 24, pp.296–301. doi:<https://doi.org/10.1016/j.tranpol.2012.06.014>.
- Jelti, F., Allouhi, A. and Aoul, K.A.T. (2023). Transition Paths towards a Sustainable Transportation System: A Literature Review. *Sustainability*, 15(21), p.15457. doi:<https://doi.org/10.3390/su152115457>.
- JICA (2014). *Municipal Council of Maputo Republic of Mozambique Comprehensive Urban Transport Master Plan for the Greater Maputo Final Report Volume 1 Master Plan Report*. [online] Available at: https://openjicareport.jica.go.jp/pdf/12152617_01.pdf.
- Koroma, B., Oviedo, D., Yusuf, Y., Macarthy, J. and S Sellu (2021). *City Profile: Freetown: Base conditions of mobility, accessibility and land use*. [online] Available at: https://www.researchgate.net/publication/349731392_City_Profile_Freetown_Base_conditions_of_mobility_accessibility_and_land_use.
- Lal, G., Divya, L.G., Nithin, K.J., Mathew, S. and Kuriakose, B. (2016). Sustainable Traffic Improvement for Urban Road Intersections of Developing Countries: A Case Study of Ettumanoor, India. *Procedia Technology*, 25, pp.115–121. doi:<https://doi.org/10.1016/j.protcy.2016.08.088>.
- Lumivero (2024). *NVivo 15: Grow Your Research Team with Qualitative Data Analysis Software (QDA Software) - Lumivero*. [online] Lumivero. Available at:

<https://lumivero.com/resources/blog/nvivo-15-grow-your-research-team-with-qualitative-data-analysis-software-qda-software/>.

Maputo City Profile. (n.d.). Available at: https://www.tsum.org/_files/ugd/b4aba8_c1853e0511ee45e0bc5ab0884ff7d24b.pdf [Accessed 10 Apr. 2025].

Mazzolini, A. (2023). Maputo City Profile - Mobility, Accessibility and Land Use in the Maputo metropolitan area. *Academia.edu*. [online] doi:https://doi.org/1085774/76870787/s200_anna.

Miller, P., de Barros, A.G., Kattan, L. and Wirasinghe, S.C. (2016). Public transportation and sustainability: A review. *KSCE Journal of Civil Engineering*, 20(3), pp.1076–1083. doi:<https://doi.org/10.1007/s12205-016-0705-0>.

Miri, S.M. and Shahrokh, Z.D. (2019). *A Short Introduction to Comparative Research*. [online] ResearchGate. Available at: https://www.researchgate.net/publication/336278925_A_Short_Introduction_to_Comparative_Research.

Nadrian, H., Taghdisi, M.H., Pouyesh, K., Khazaei-Pool, M. and Babazadeh, T. (2019). ‘I am sick and tired of this congestion’: Perceptions of Sanandaj inhabitants on the family mental health impacts of urban traffic jam. *Journal of Transport & Health*, [online] 14, p.100587. doi:<https://doi.org/10.1016/j.jth.2019.100587>.

Naeem, M., Ozuem, W., Howell, K.E. and Ranfagni, S. (2023). A step-by-step Process of Thematic Analysis to Develop a Conceptual Model in Qualitative Research. *International Journal of Qualitative Methods*, [online] 22(1), pp.1–18. doi:<https://doi.org/10.1177/16094069231205789>.

Pirie, G. (2013). *Sustainable Urban Mobility in ‘Anglophone’ Sub-Saharan Africa Thematic study prepared for Global Report on Human Settlements 2013*. [online] Available at: <https://unhabitat.org/sites/default/files/2013/06/GRHS.2013.Regional.Anglophone.Africa.pdf> [Accessed 27 Jan. 2025].

Pojani, D. and Stead, D. (2015). Sustainable Urban Transport in the Developing World: Beyond Megacities. *Sustainability*, [online] 7(6), pp.7784–7805. doi:<https://doi.org/10.3390/su7067784>.

Saeidizand, P., Fransen, K. and Boussauw, K. (2021). Revisiting car dependency: A worldwide analysis of car travel in global metropolitan areas. *Cities*, 120(0264-2751), p.103467. doi:<https://doi.org/10.1016/j.cities.2021.103467>.

Sietchiping, R., Permezel, M.J. and Ngomsi, C. (2012). Transport and mobility in sub-Saharan African cities: An overview of practices, lessons and options for improvements. *Cities*, 29(3), pp.183–189. doi:<https://doi.org/10.1016/j.cities.2011.11.005>.

Steg, L. and Gifford, R. (2005). Sustainable transportation and quality of life. *Journal of Transport Geography*, 13(1), pp.59–69. doi:<https://doi.org/10.1016/j.jtrangeo.2004.11.003>.

Tembe, A., Nakamura, F., Tanaka, S., Ariyoshi, R. and Miura, S. (2019). The demand for public buses in sub-Saharan African cities: Case studies from Maputo and Nairobi. *IATSS Research*, 43(2), pp.122–130. doi:<https://doi.org/10.1016/j.iatssr.2018.10.003>.

The African Climate Foundation (2024). *From Climate Risk to Resilience: Unpacking the Economic Impacts of Climate Change in Mozambique - The African Climate Foundation*. [online] The African Climate Foundation - Pushing the Frontier of Climate, Development and

Economic Transformation in Africa. Available at:
<https://africanclimatefoundation.org/research-article/from-climate-risk-to-resilience-unpacking-the-economic-impacts-of-climate-change-in-mozambique/> [Accessed 25 Nov. 2024].

Thisaiveerasingam Thilakshan and Saman Jayaweera Bandara (2019). Identification of Relevant Sustainable Transportation Links to Sustainable Development Goals (SDGs) in the National Context. *113th Annual IESL Sessions 2019*. [online] Available at:
https://www.researchgate.net/publication/336639704_Identification_of_Relevant_Sustainable_Transportation_Links_to_Sustainable_Development_Goals_SDGs_in_the_National_Context .

Thondoo, M., Marquet, O., Márquez, S. and Nieuwenhuijsen, M.J. (2020). Small cities, big needs: Urban transport planning in cities of developing countries. *Journal of Transport & Health*, [online] 19, p.100944. doi:<https://doi.org/10.1016/j.jth.2020.100944>.

UNFCCC (2015). *The Paris Agreement*. [online] United Nations Climate Change. Available at: <https://unfccc.int/process-and-meetings/the-paris-agreement>.

United Nations (2015). *Transforming Our World: the 2030 Agenda for Sustainable Development*. [online] United Nations. Available at: <https://sdgs.un.org/2030agenda>.

United Nations (2024). *Communications materials - United Nations Sustainable Development*. [online] United Nations Sustainable Development. Available at: <https://www.un.org/sustainabledevelopment/news/communications-material/>.

Wikipedia Contributors (2019). *NVivo*. [online] Wikipedia. Available at: <https://en.wikipedia.org/wiki/NVivo>.

Yasin, M.Y., Mohd Yusoff, M., Abdullah, J. and Mohd Noor, N. (2020). Is urban sprawl a threat to sustainable development? A review of characteristics and consequences. *Malaysian Journal of Society and Space*, 16(4). doi:<https://doi.org/10.17576/geo-2020-1604-05>.

Appendix

Appendix 1: categorising matrix for Maputo

	Limited coverage of public transportation	Unaffordable	Insufficient public transportation options	Unreliable service in public transportation
SSI_M_1			There is a serious shortage of public transport capacity and the existing number of buses cannot meet the demand	
SSI_M_2	Public transport coverage is limited and many emerging communities and suburbs lack bus routes			
SSI_M_3			There is a serious shortage of public transport capacity, and the existing number of buses is unable to meet demand. The lack of reliable public transport also prevents many residents from travelling to medical facilities	
SSI_F_4	Lack of planning for public transport coverage and lack of knowledge of what services are needed by residents in each area			
SSI_M_4		The high cost of transport in Greater Maputo makes it unaffordable for many citizens. Minibus fares are too high, making them unaffordable for a large part of the population, especially for low-income groups such as civil servants		
SSI_M_5		Minibuses are only for the middle class and is unaffordable for lower income people	The mass transit system is inadequate, there are no trams, resulting in many people still relying on minibuses	Poor reliability of the existing public transportation system, overcrowding, inappropriate schedules and poor passenger experience
SSI_M_6	The existing public transport system struggles to keep up with demand, with services concentrated in the city center and traffic directed mainly to the city center, with many areas lacking effective public transport connections			
SSI_F_7			The number of public transport has increased, with the government introducing buses, co-operative and private operators, but it is still not enough to meet demand	Routes need to follow schedules at their terminals to avoid overcrowding, inappropriate schedules and poor service quality
SSI_M_8				
SSI_M_9				Public transportation has not improved
SSI_M_10			Existing public transport capacity is insufficient, the number of vehicles is far below the demand and passengers have to wait for a long time, making it difficult to meet the needs of urban residents	
SSI_M_11				
SSI_M_12	Lack of mass transport system			
SSI_M_13	Poor public transportation			The poor quality of Mozambique's public transport system, with overcrowded buses and inconsistent service quality
SSI_M_14	Despite the availability of many buses, there are still only people who need transport. People should have the opportunity to use public transport when they need it			
SSI_M_16			The BRT system is costly and if Mulanje and Chapeau are banned from operating between Matola and Matola, there is a need to ensure that there are sufficient alternative transport options	
SSI_M_18				
SSI_M_19		Price of bus ticket can't increase because the people can't afford paying more		
SSI_M_20				
SSI_M_21	Residents of many regions do not have easy access to public transport			The lack of reliability of the public transport system, long waiting times for passengers and the fact that buses sometimes do not follow the prescribed routes
SSI_M_22	Public transport does not cover the large number of informal settlements, where infrastructure is lacking, urban planning is lagging and service provision has not kept pace with population growth			
SSI_M_23				
SSI_M_25	Poor transport links between Beira and Matola, and lack of effective public transport in rural areas, making access to many places difficult		Existing modes of transport are limited, with rural areas relying on taxis, but there is still a lack of modes of transport adapted to different needs, such as BRT or minibuses	
SSI_M_26			We need to promote other modes of transport not just buses, such as taxis, we have many railway lines	

	Poor road network	Lack of walking/cycling/bus lanes and other facilities	Vulnerable to disaster	Poor road conditions
SSI_M_1		Inadequate transport infrastructure in greater Maputo, with a lack of adequate public transport vehicles and roads adapted to demand leads to traffic congestion and increased fuel consumption. At the same time, the infrastructure is poorly maintained.		
SSI_M_2				
SSI_M_3				
SSI_F_4		Infrastructure development is lagging behind, and many newly built urban neighbourhoods lack supporting public service facilities or even pavements.		
SSI_M_4	The lack of well-developed roads in some areas makes it difficult for operators to access them.	Public transport lanes are also not functioning effectively due to occupation by private vehicles.		Poor road conditions and lack of capacity in the greater Maputo affect traffic operations.
SSI_M_5		The city lacks the necessary transportation infrastructure, such as unsafe bike lanes and insufficient bus lanes.		Road standards are substandard, with many regional roads in serious disrepair. New transport policies and some of the new development areas are not even served with asphalt.
SSI_M_6				Many roads are in poor condition, especially on public transport routes, affecting access and maintenance costs. In addition, bus stops and terminals lack proper infrastructure coverage.
SSI_F_7	Increase to three lanes to the city centre during peak hours, with only two lanes open at other times.			Improving the condition of roads requires significant investment, such as building elevated or underground roads or widening existing roads.
SSI_M_8	Due to road problems, the buses could not reach their destinations successfully.			
SSI_M_9	Mozambique currently lacks major arterial roads connecting the country.	we need more railway line		
SSI_M_10		inadequate infrastructure, lack of dedicated bus lanes and expand road, and poor condition of existing bus stops.		Bus roads in some remote areas are in poor condition, and the problem is exacerbated by the fact that large buses operate.
SSI_M_11		There is a lack of modern transport facilities in greater Maputo, such as an automated toll collection system that has not yet been introduced. In addition, there are no toll booths on the ring road.		
SSI_M_12			As a coastal city, Maputo is highly vulnerable to the effects of climate change, including coastal erosion, flooding, and sea-level rise. These natural disasters pose a serious threat to the city's infrastructure and the lives of its inhabitants.	The narrow roads in Maputo's informal settlements are the hot spot for accidents when building infrastructure, which makes planning difficult.
SSI_M_13				Although new buses have been introduced, the poor condition of the roads prevents them from functioning. The bus support system is operational, but the roads need to be maintained.
SSI_M_14				
SSI_M_16	Need to define structural/ connecting roads in the Gran Maputo			We had an experience with bus lanes in NL. Roads are not prepared for dedicated lanes.
SSI_M_18		There is a lack of alternative roads, the organisation of bus stops within the city is confusing and roads need to be built to alleviate congestion and traffic problems.		Development of bus network but the roads are not in good condition.
SSI_M_19	It is hard to have access to remote areas.		Heavy rainfall brings potholes and public authorities do not repair it quickly.	The roads are in very poor condition, large buses have difficulty travelling on bad roads and there are many potholes at bus stops.
SSI_M_20				
SSI_M_21	The road system in the greater Maputo area does not effectively connect the inner city, resulting in poor traffic mobility.			Many roads, especially local roads, are badly damaged and maintenance by the public sector is inadequate.
SSI_M_22	The inadequate road system in most parts of the city not only affects overall traffic flow but also makes travelling within the community difficult.			
SSI_M_23				
SSI_M_25	Because of lack of quality roads in the rural areas, people don't go.			The poor quality and lack of maintenance of rural roads affects the operation of transport modes, especially informal ones (e.g. Chape).
SSI_M_26	Lack of access roads.	There is a lack of roads suitable for bus operations, and dedicated bus lanes and more transport hubs are urgently needed.		

	Overflow of informal transportation	Safety risks	Poor quality of informal services	Informal transport become more expensive because of tariffs.	Lack of management and legal framework
SSI_M_1					
SSI_M_2					
SSI_M_3	The large number of informal transport (e.g. Chape) in the greater Maputo area, which has led to a high level of congestion in the city centre, is a result of the phasing out of government subsidies for minibuses. 80% of the Chape have been forced to switch to private roads.			Informal transport has become more expensive as a result of government subsidy cuts to minibuses and rising operating costs.	
SSI_F_4					
SSI_M_4					
SSI_M_5					
SSI_M_6					
SSI_F_7		Maputo has some security issues and the city will be under control.			
SSI_M_8					
SSI_M_9					
SSI_M_10					
SSI_M_11					
SSI_M_12					
SSI_M_13					
SSI_M_14					
SSI_M_16			Uncomfortable transport in Chape and Mafene. Lack of humane conditions in Mafene.		
SSI_M_18					
SSI_M_19					
SSI_M_20					
SSI_M_21		Informal transportation (e.g. Mafene) has a lot of problems.	Conditions of these informal transportation (Mafene) should improve.		
SSI_M_22					
SSI_M_23					
SSI_M_25					Chape is operating in Mafene. Mafene needs to be phased out in the future, and there is a lack of standardized management.
SSI_M_26					

SSI_M_2	there is a severe shortage of parking spaces in Maputo, especially in the mornings in the town on the edge of the city, where residents can barely find a space to park.			
SSI_M_3				
SSI_F_4	Insufficient parking spaces in greater Maputo, especially in the heavily trafficked downtown area, resulting in a lack of safe walking space for pedestrians.			
SSI_M_4		Greater Maputo has an over-concentration of urban functions in the city centre, where all important services, employment and infrastructure are concentrated, resulting in heavy traffic congestion for a large number of residents who commute to and from the city on a daily basis.		
SSI_M_5				
SSI_M_6				
SSI_F_7		Complex traffic in greater Maputo, with heavy congestion on the main arterial roads, affecting travelling.	Parking management is already being implemented, but there is a need to optimise charging methods and parking order, and the Government is trying to guide the public to regulate parking.	
SSI_M_8				
SSI_M_9				
SSI_M_10		Traffic congestion in greater Maputo is severe, with narrow roads and a lack of dedicated bus lanes hampering the operation of large buses.		
SSI_M_11			The lack of a sound parking management and legal framework in Greater Maputo has led to chaotic parking. Urban planning and traffic management are not effectively integrated and there is a lack of clear implementation legislation.	
SSI_M_12				
SSI_M_13				
SSI_M_14	Insufficient parking spaces is a problem and there is a need for public awareness of proper parking spaces as people do not want to park too far away.		All buses go towards the same areas.	
SSI_M_16				
SSI_M_18		There is a need for an elevated bridge to reduce congestion & traffic.		
SSI_M_19				
SSI_M_20				
SSI_M_21				
SSI_M_22				
SSI_M_23				
SSI_M_25				
SSI_M_26	We have no parking spaces, we build building but we do not provide parking spaces.			

[illegible]

Appendix 2: categories matrix for Freetown

	Limited coverage of public transportation	Unaffordable	Insufficient public transportation	unreliable service in public transportation
IDI_01			Existing public transport is unable to meet the demand for large-scale travel, leading to an over-reliance on the private car.	The current transport system lacks punctuality and reliability, and the public is unable to predict the arrival times and journey times of transport modes compared to developed regions such as Europe.
IDI_02	Most commuters rely on minibuses and taxis due to the limited coverage of SLRTC buses.			
IDI_03				
IDI_04				
IDI_05				
IDI_06	Currently, most activities and facilities in Freetown are concentrated in the city center, including job opportunities, infrastructure (such as electricity and water supply), etc. This has led to a large influx of migrants from rural areas into the city, competing for limited resources and facilities, thus exacerbating the traffic pressure in the city.			
IDI_07				
IDI_08	The opposite side of the terminal (the other side of the terminal) also has a large number of passengers, but the passenger demand in this area has not been fully considered.		Due to population growth and the increase in commuters, the demand for ferries from Lungi to Freetown is increasing. Passengers need to walk to the intersection to find a podo podo or bus, and due to poor management of the interchange, there may be serious queues during peak hours.	
IDI_09				
IDI_10		Although motorcycles can avoid traffic jams, they are more expensive than public transportation. Low-income people lack low-cost transportation to the city.		
IDI_11		Toll roads are expensive		
IDI_12			The shortcomings of public transportation: if public transportation can arrive on time and be comfortable, many people will consider giving up using private cars and using public transportation instead.	Poor bus service and unfriendly attitudes of drivers and trainees have led many people to prefer private cars.
IDI_13				
IDI_14			Passengers often need to arrive at the station early, and those who arrive early can grab seats on the first bus, while other passengers have to wait for the second bus. The 15- and 30-seat buses currently in use cannot meet the transportation needs within the city because the capacity of these buses is too small to carry more passengers efficiently. Inadequate public transportation services have led many people to rely on private cars. It is mentioned that there are not enough commuter buses in the current traffic situation, especially large buses that can accommodate more than 100 people at a time.	In the current bus system, drivers usually wait until the bus is full before driving, which results in untimely bus operation.

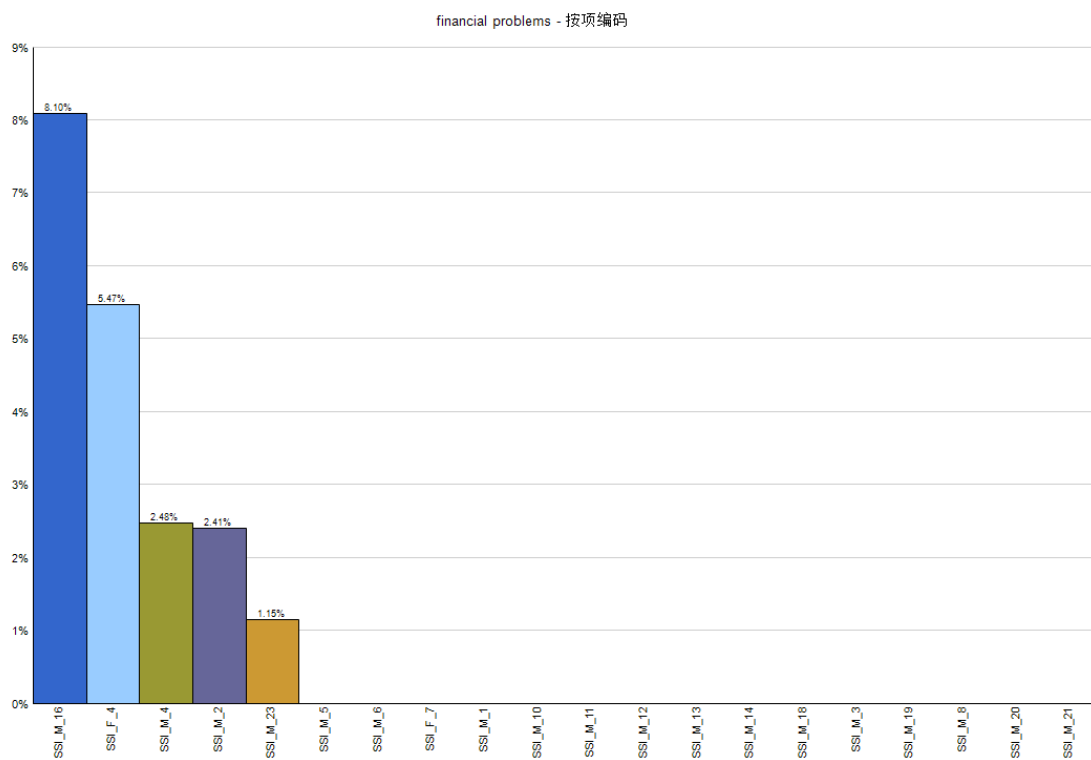
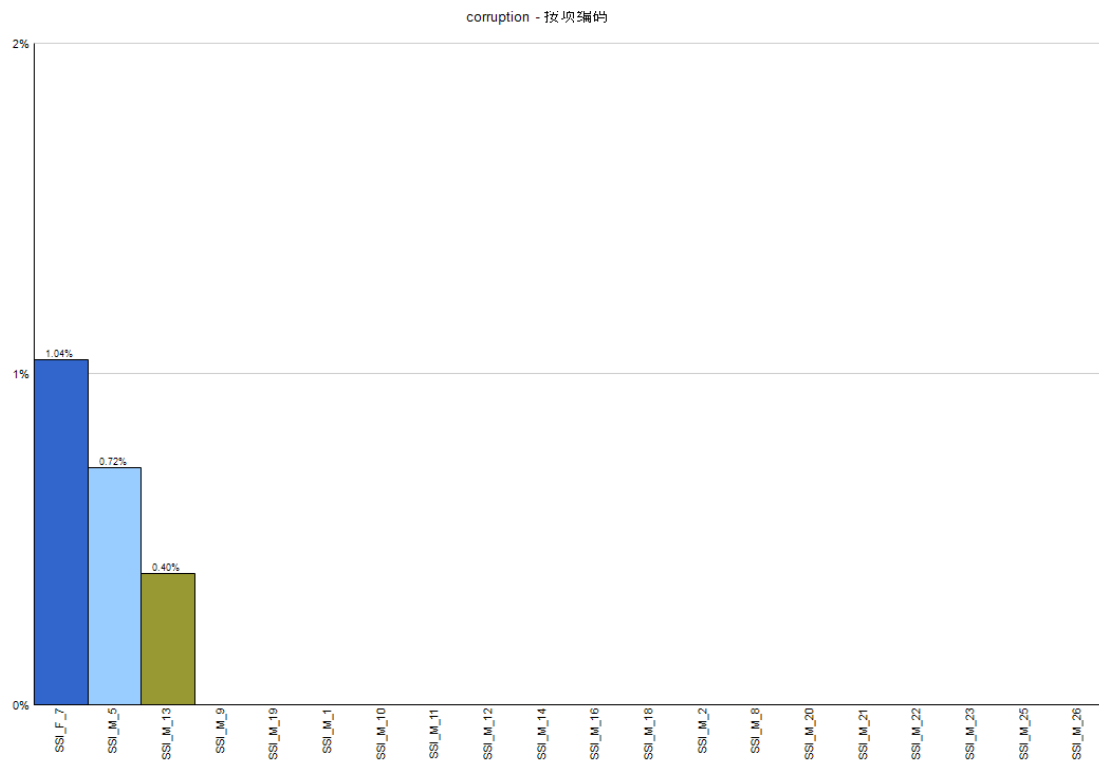
	Poor road network	Lack of walking/cycling/bus lanes and other facilities	Vulnerable to disaster	Poor road conditions
IDL_01	Lack of effective connectivity of the existing roads network due to inefficient urban roads	Light transport (e.g. 'Kisaki') travelling freely on all roads, lack of Kisaki using special routes		Many of the roads are still of colonial dimensions and cannot accommodate the current traffic flow. Many of the older roads are in a state of disrepair, leading to a deterioration in road quality, which affects road safety and efficiency. Also, some roads that could be used as alternative routes do not divert traffic effectively due to inadequate maintenance.
IDL_02	Difficulty in reaching the countryside because of the lack of connectivity of the road system in rural areas		Vulnerability of roads to extreme weather conditions resulting in traffic disruptions affecting the urban economy and daily travelling	
IDL_03		Parking spots in Freetown, while scattered throughout the city, lack adequate space, especially sheltered facilities for riders to rest or take shelter from the rain.		Roads are in bad condition due to some broken bridges caused by the war; the roads are in very poor condition, leading to a reduction in the lifespan of motorcycles (from 2 years to 1½ years) and the need for frequent repairs.
IDL_04		The coexistence of multiple modes of transport on Freetown's roads and the lack of dedicated road space for the different modes of transport leads to serious safety hazards and traffic congestion. The lack of pavements on streets is a safety issue for pedestrians. Lack of consideration of bicycle lanes in the design of roads.		
IDL_05	Freetown's central business district (CBD) has only one main entrance, especially from the east end (such as Waterloo and Wellington directions).	Garbage blocks drainage systems, which not only affects the urban environment, but can also exacerbate traffic problems, as some roads that were once passable become impassable due to garbage. There is a lack of dedicated bus lanes, which can reduce traffic congestion and encourage more people to use public transportation.		
IDL_06	Freetown's traffic problem is not just about the number of vehicles, but about the incomplete road network. Even if more public transportation is added, if the road conditions are not improved, traffic problems will still exist.			The roads are narrow and in poor condition, lacking adequate sidewalks, which are often occupied by street vendors, slowing down vehicle movement and exacerbating traffic congestion.
IDL_07	The road condition is poor and needs improvement	There is a lack of standardized bus stops, and currently buses stop randomly on the road. There are no traffic lights at the intersection, and traffic police are the only ones directing traffic. There are no sidewalks or motorcycle lanes, but there is no space for them.		There is a need to expand and upgrade roads, especially to increase road capacity (e.g., convert roads to four or six lanes). However, the main challenge is the lack of sufficient funding to carry out these upgrades.
IDL_08		More sea routes cannot be opened because there are not enough terminals in other regions		
IDL_09				More roads need to be built and existing roads need to be repaired.
IDL_10	There is only one main road in Freetown, and there are only two roads leading to the city center.	Traffic in Luba, Lumley and surrounding areas is limited by two-lane bridges. Many facilities have been encroached. For example, the Hastings air transport facilities and the airport have been encroached by the influx of people, and the roads lack clear demarcation between vehicles, motorcycles and pedestrians. The lack of air transport after the war caused damage and has not been repaired.		The secondary roads are designed to be very narrow and cannot accommodate large or medium trucks. This results in trucks blocking traffic while driving, further exacerbating traffic congestion. Freetown's rapid population growth has resulted in the transportation infrastructure being unable to meet the increasing traffic demand.
IDL_011		Due to limited roads, traffic congestion and delays occur.		The existing roads are narrow, which limits the efficiency of vehicle traffic. Freetown's road structure narrows as it enters the city center, forming a traffic bottleneck, especially between US-gon and PZ.
IDL_012		Lack of bus stops and places for buses to park and pick up passengers		
IDL_013		The lack of bridges makes their low cost more attractive to locals Road expansion, construction of viaducts and underpasses are needed to ease traffic congestion, especially around schools and densely populated areas.		
IDL_014		Lack of dedicated bus lanes and high-capacity buses to improve the efficiency of public transportation. Setting up dedicated bus lanes on major routes can reduce traffic congestion and prevent small vehicles (such as tricycles and motorcycles) from occupying bus lanes, thereby increasing the speed of buses.		

	Overflow of informal transportation	Safety risks	Poor quality of informal services	Lack of management and legal framework
IDI_01				
IDI_02	In recent years, the growth rate of Okaada and Kekehs in Freetown has been much higher than that of formal public transport such as minibuses.			In the absence of clear delineation of operational zones, motorbikes and tricycles traverse the CBD and major trunk roads at will, affecting the operation of large-scale public transport.
IDI_03				
IDI_04				
IDI_05		The vehicles of "Poda podas" are in poor condition, do not meet safety standards, and are in poor condition, which poses a safety hazard to passengers while riding. These vehicles are often crowded, dilapidated, and have limited space. In the event of an accident, the injuries can be very serious. Motorcycle riding is risky, and many riders may be on drugs or under the influence of medication, which increases the probability of an accident.	The vehicles of "Poda podas" are in poor condition, do not meet safety standards, and are in poor condition, which poses a safety hazard to passengers while riding. These vehicles are often crowded, dilapidated, and have small spaces, and if an accident occurs, the injuries may be very serious.	
IDI_06				
IDI_07				
IDI_08				
IDI_09				
IDI_10		Although motorcycles are convenient to use, traffic accidents are prone to occur due to their inherent high risks.		
IDI_011	There are too many vehicles in Kekeh, occupying the road and making it difficult for buses to pass.	Okaada causes a large number of traffic accidents, affecting traffic safety.		Some motorcycle drivers ignore traffic regulations and change lanes or drive at will, increasing the risk of accidents.
IDI_012				
IDI_013				
IDI_014		Minibus and motorcycle drivers often fail to obey traffic rules, and these behaviors lead to an increase in traffic accident rates.		

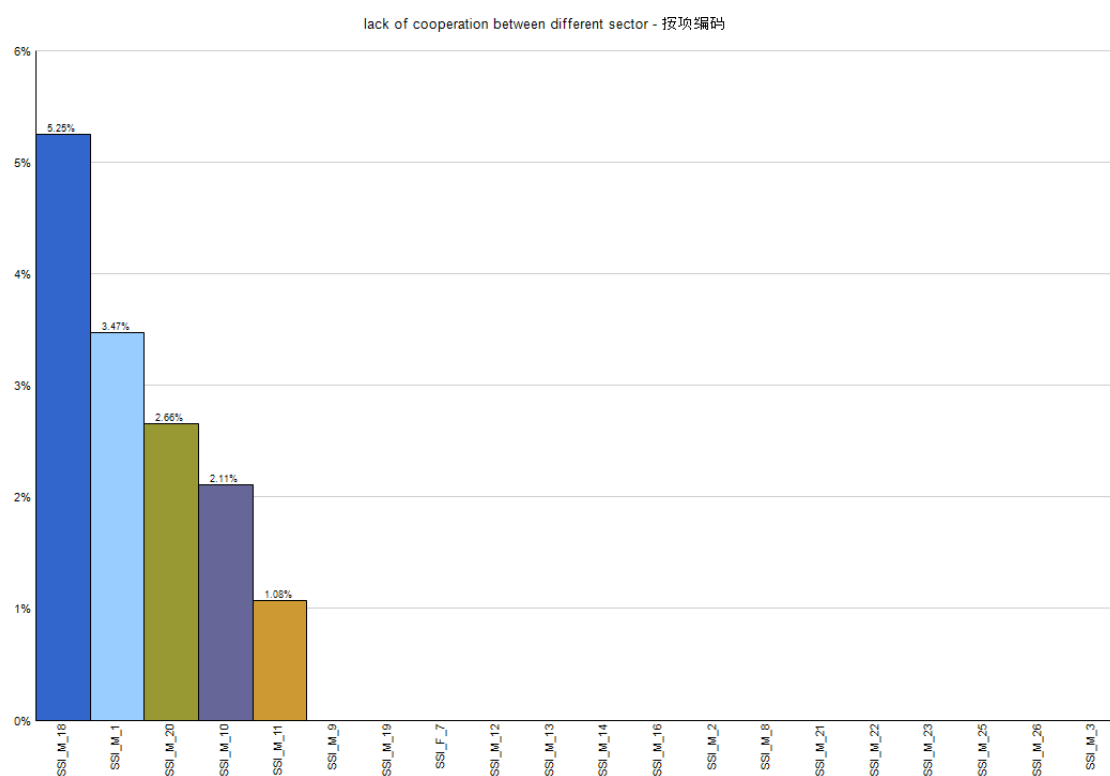
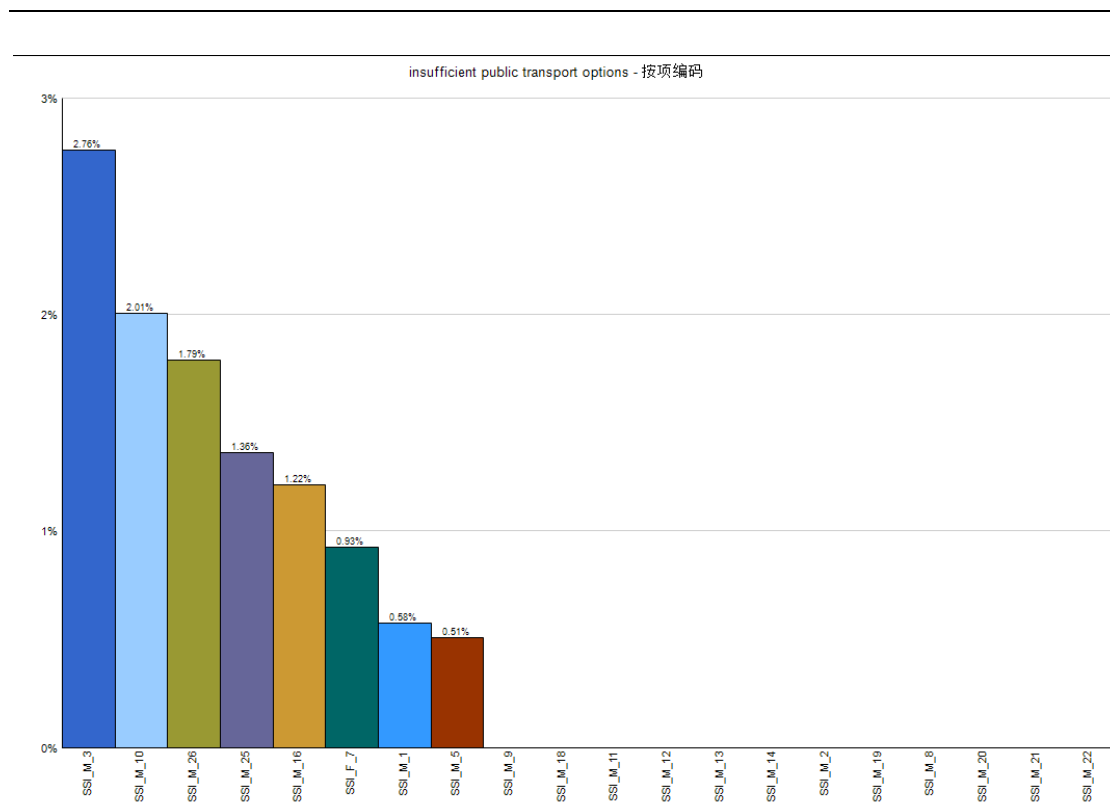
[illegible]

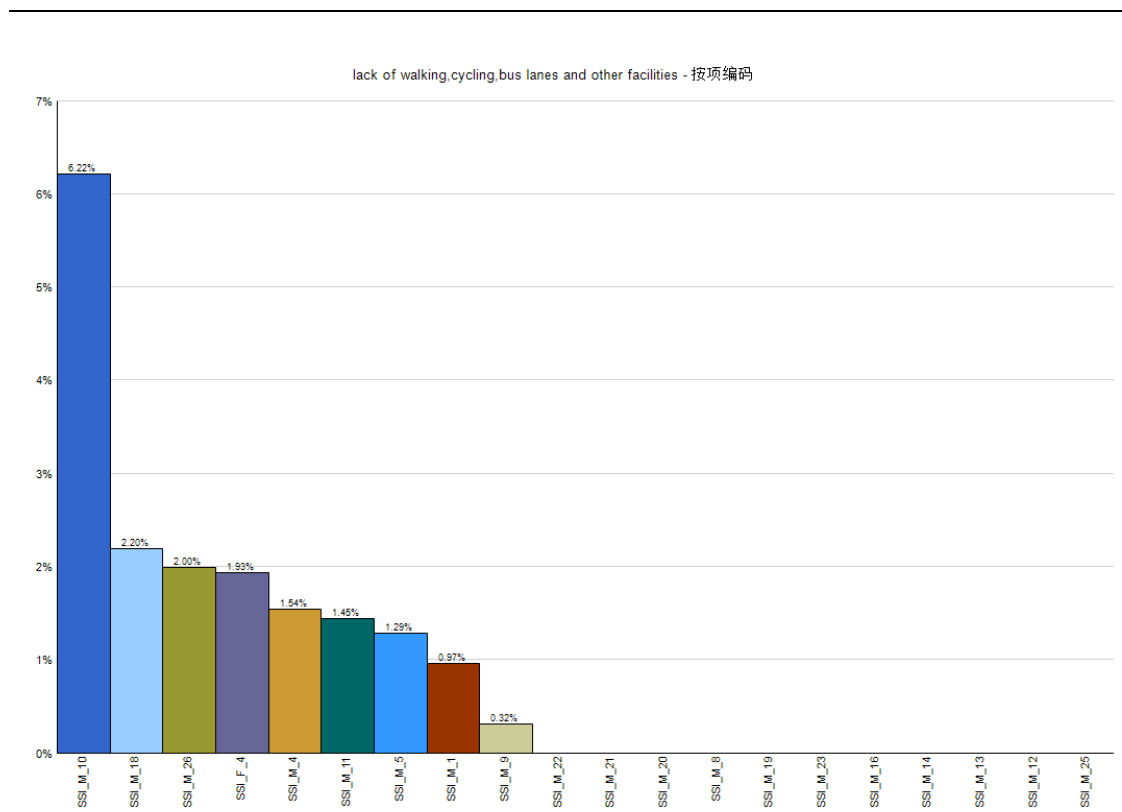
Appendix 4 : result from N-vivo (Maputo)

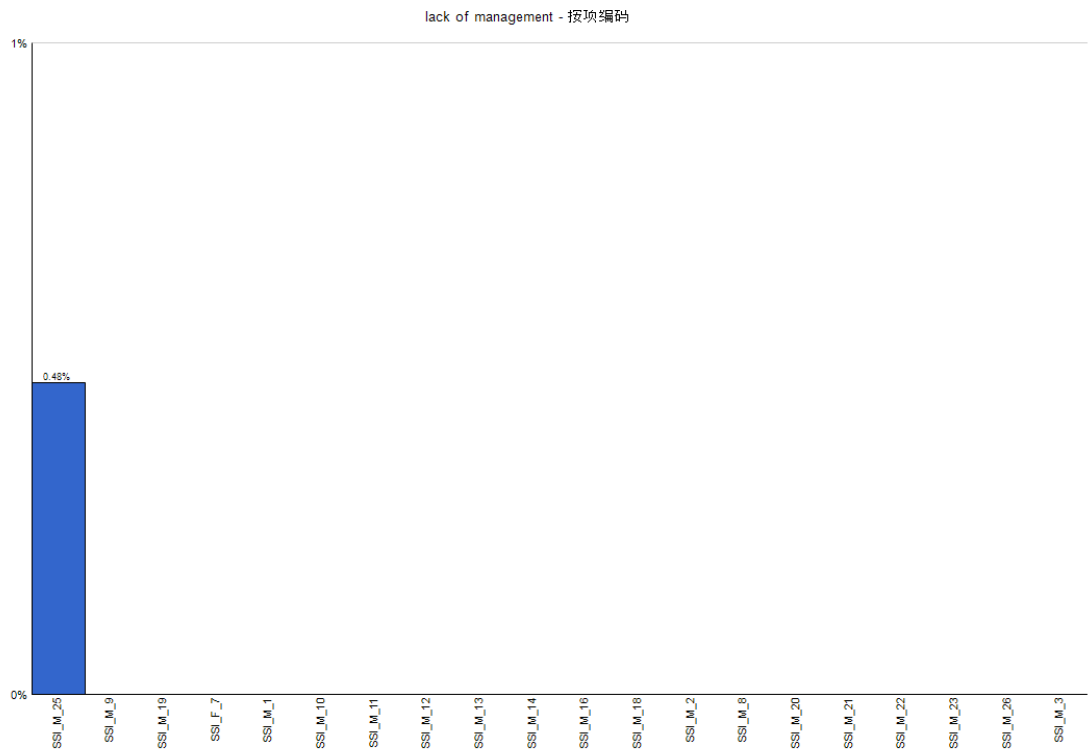
These results reflect the proportion of this issue mentioned by the respondents in the overall interviews.

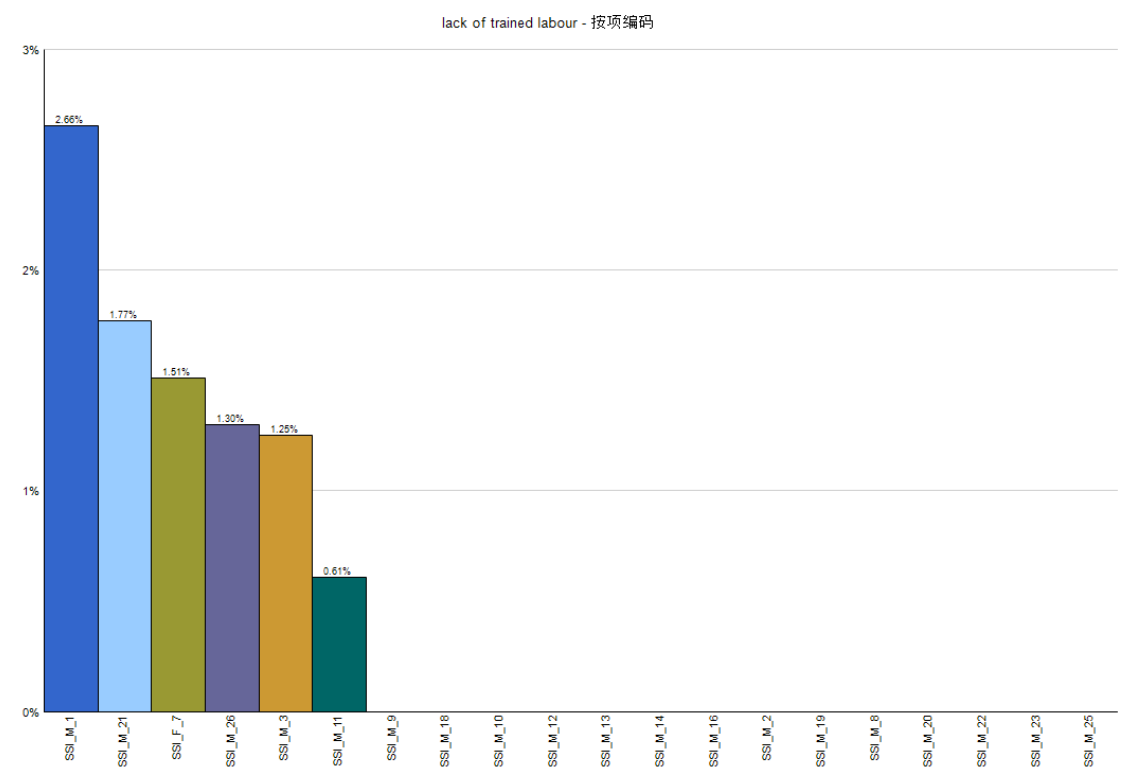
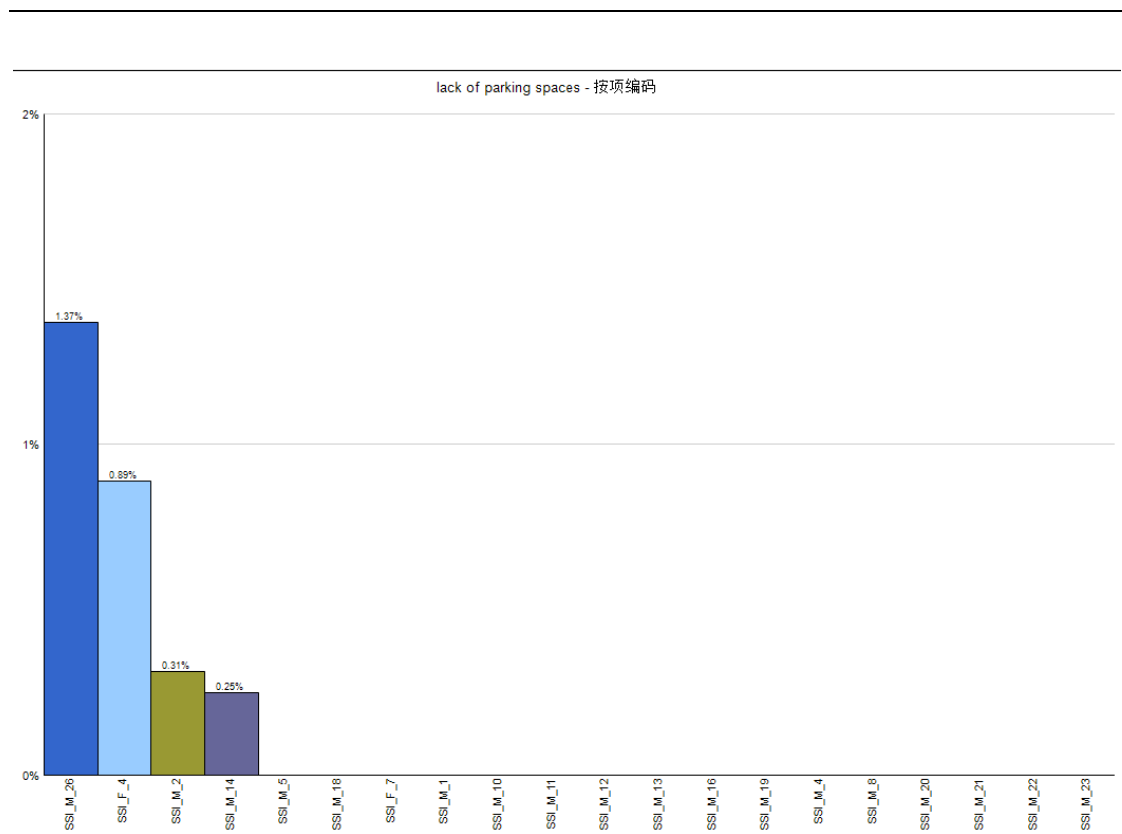


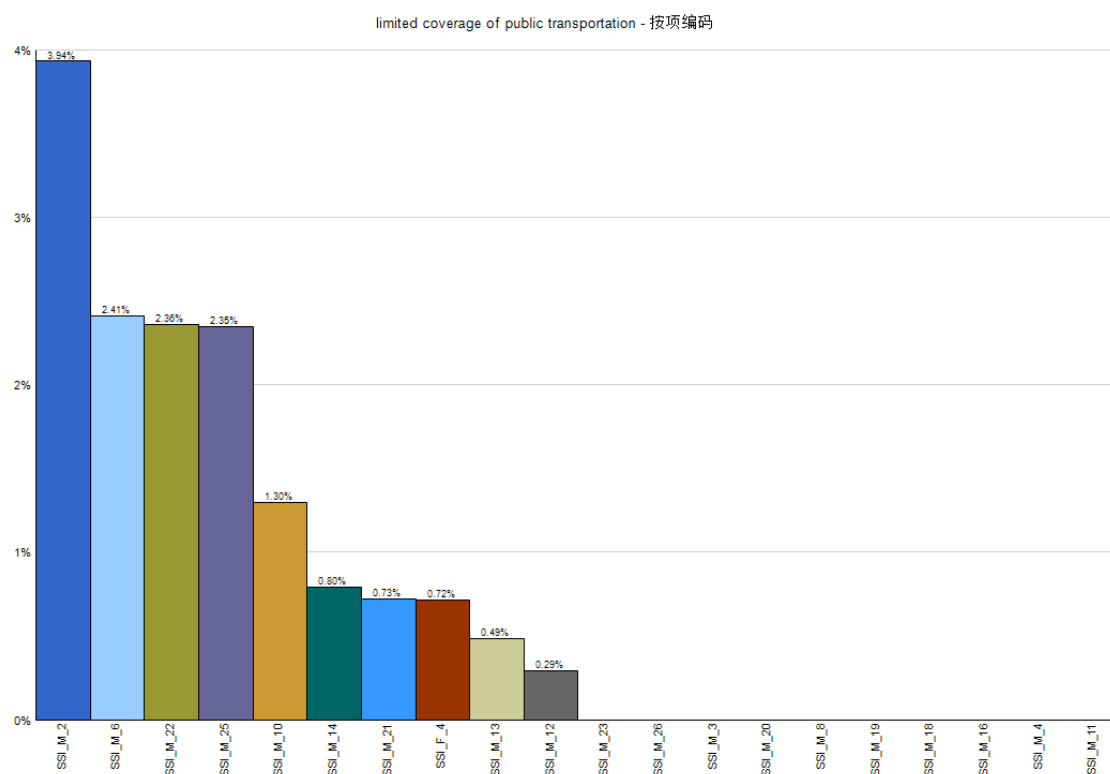
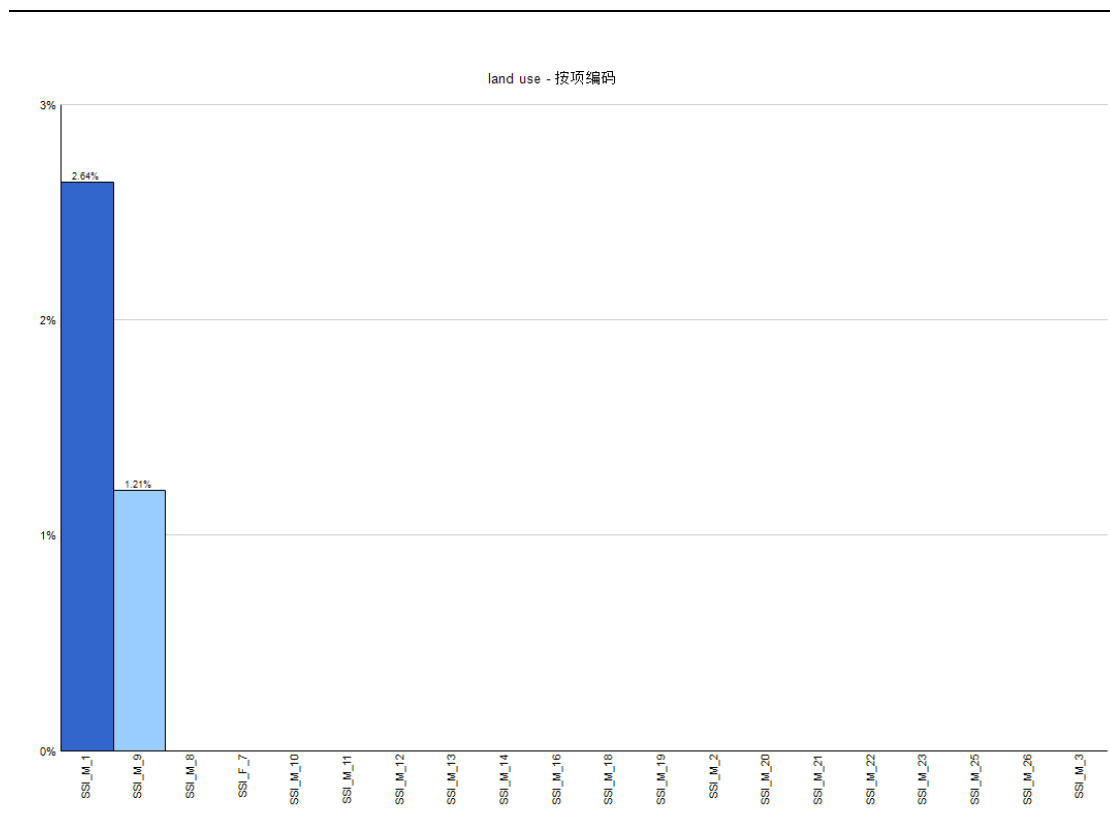


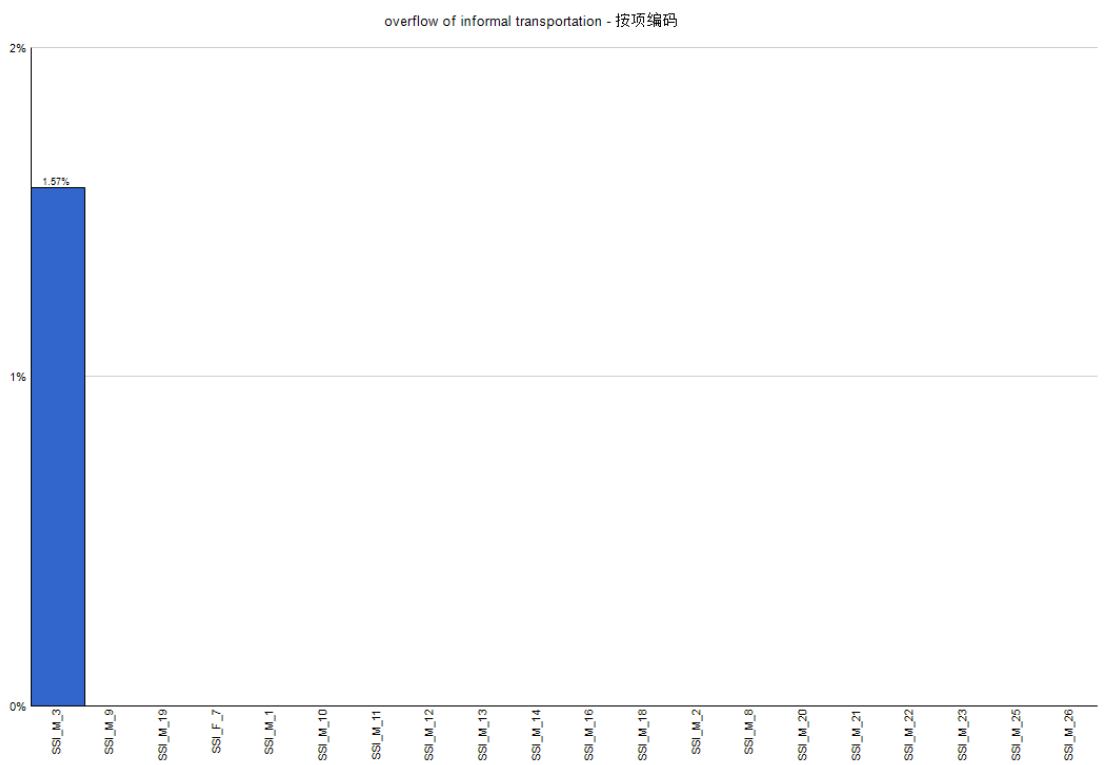
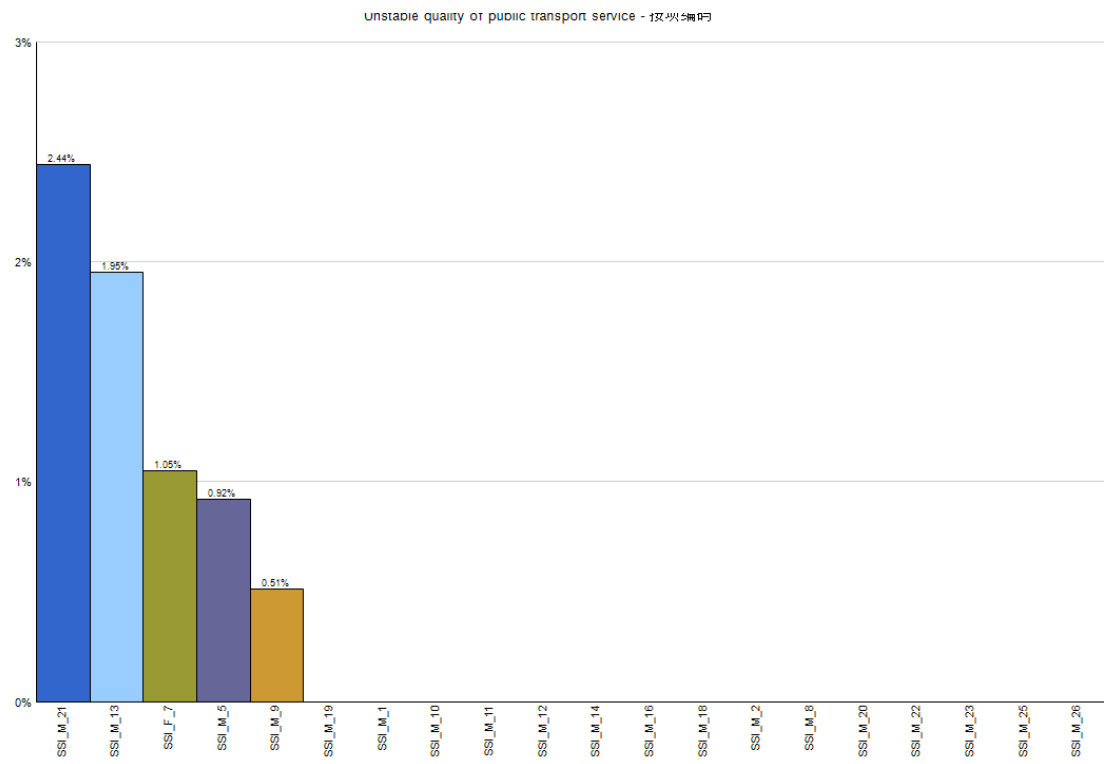


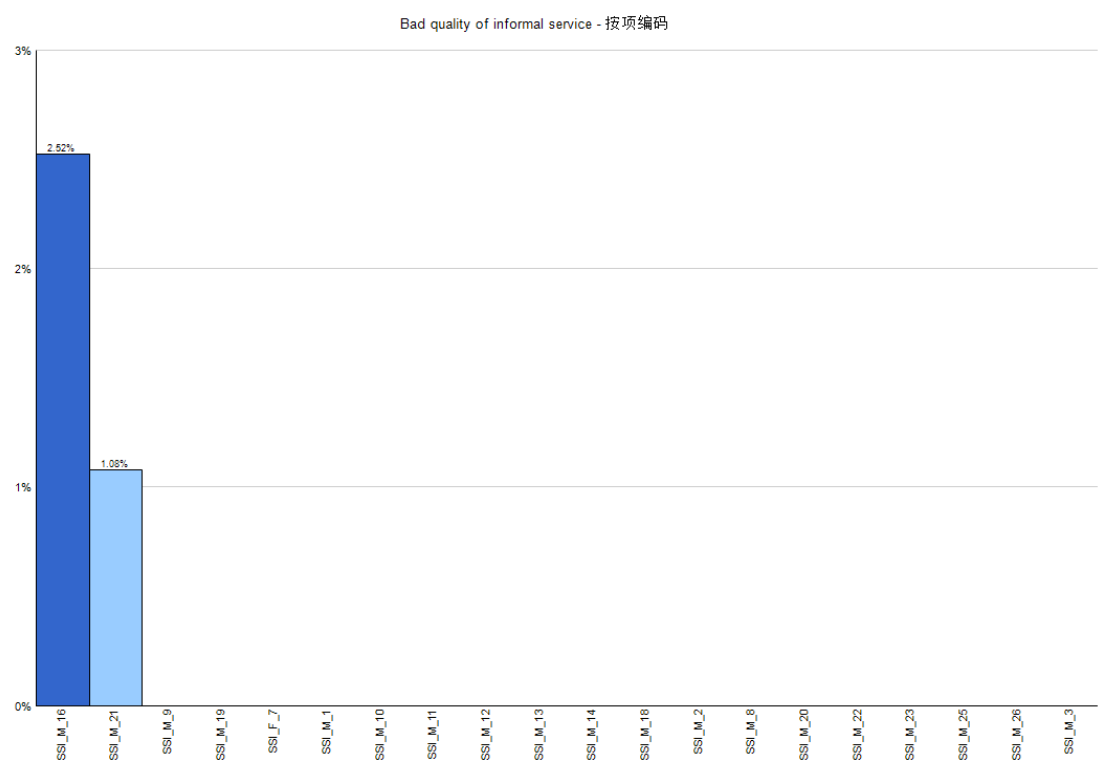
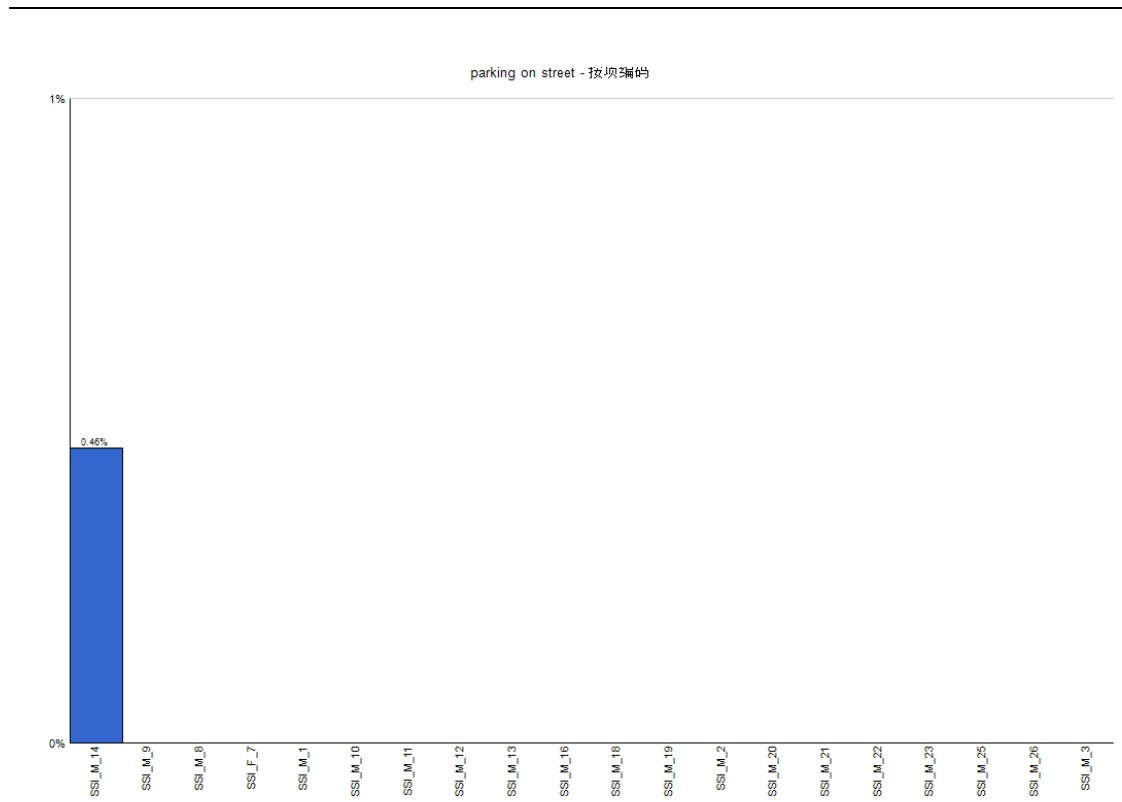


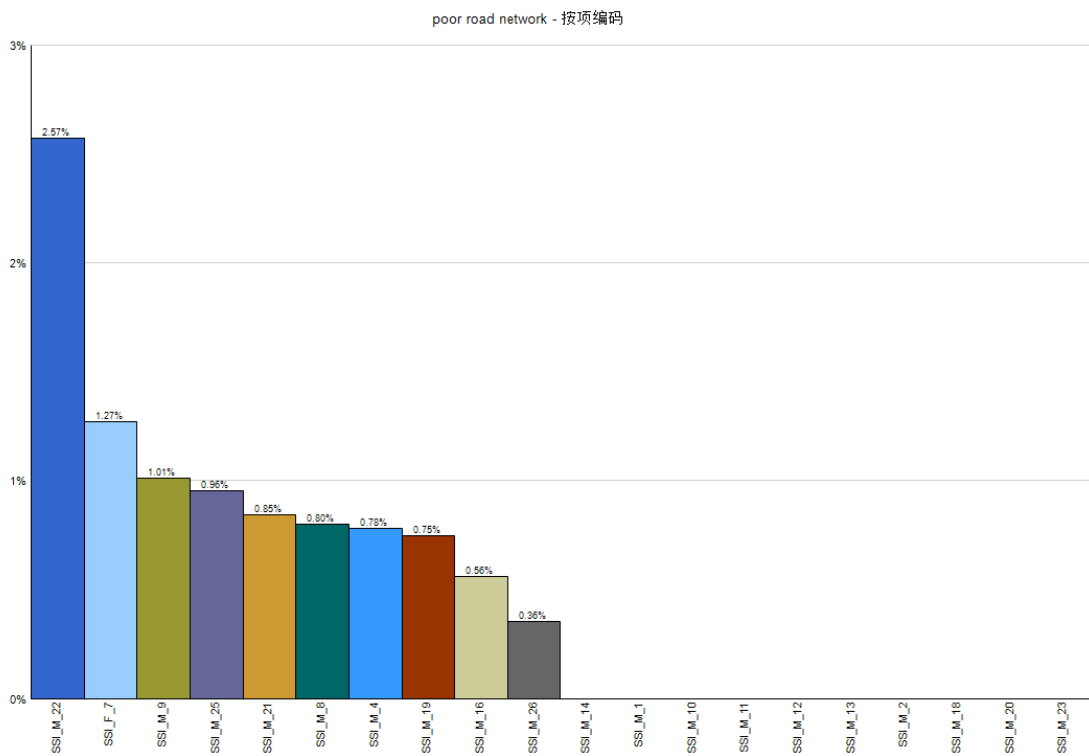
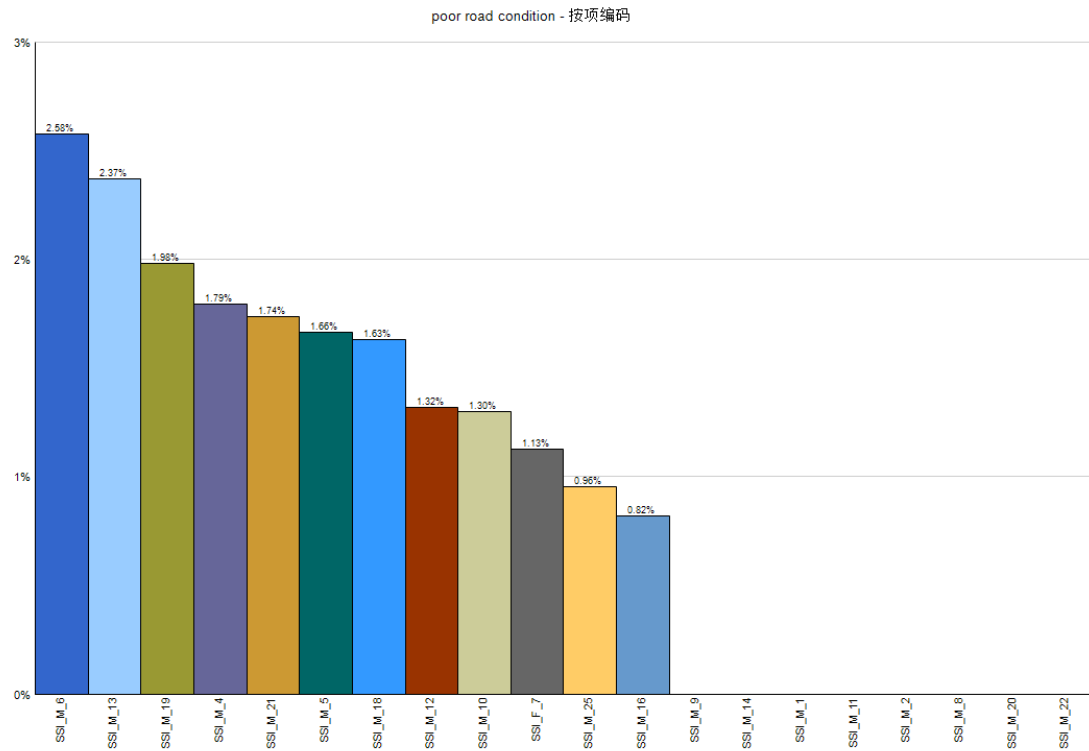


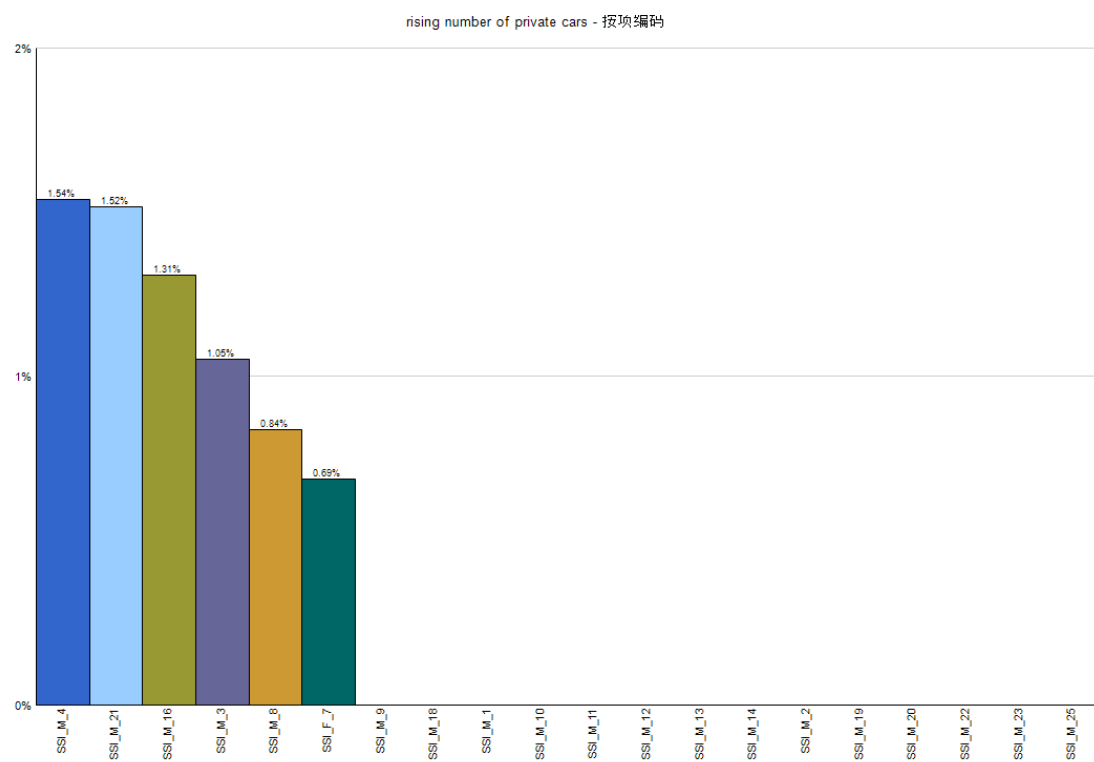
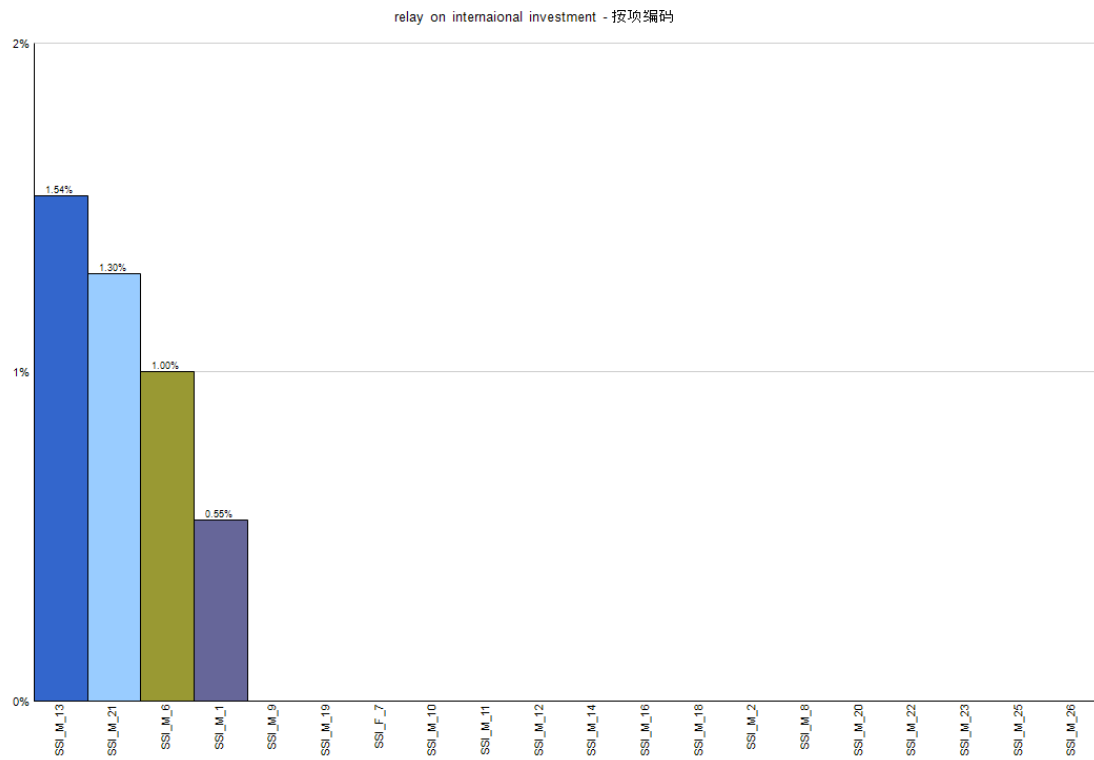


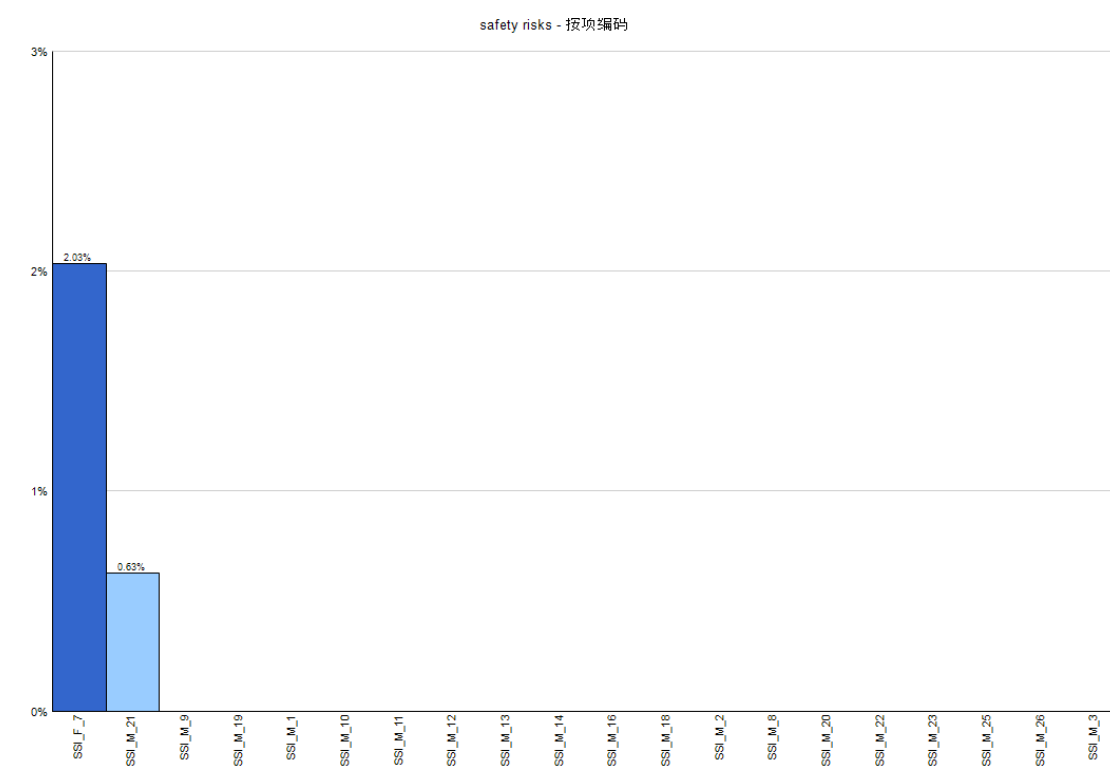
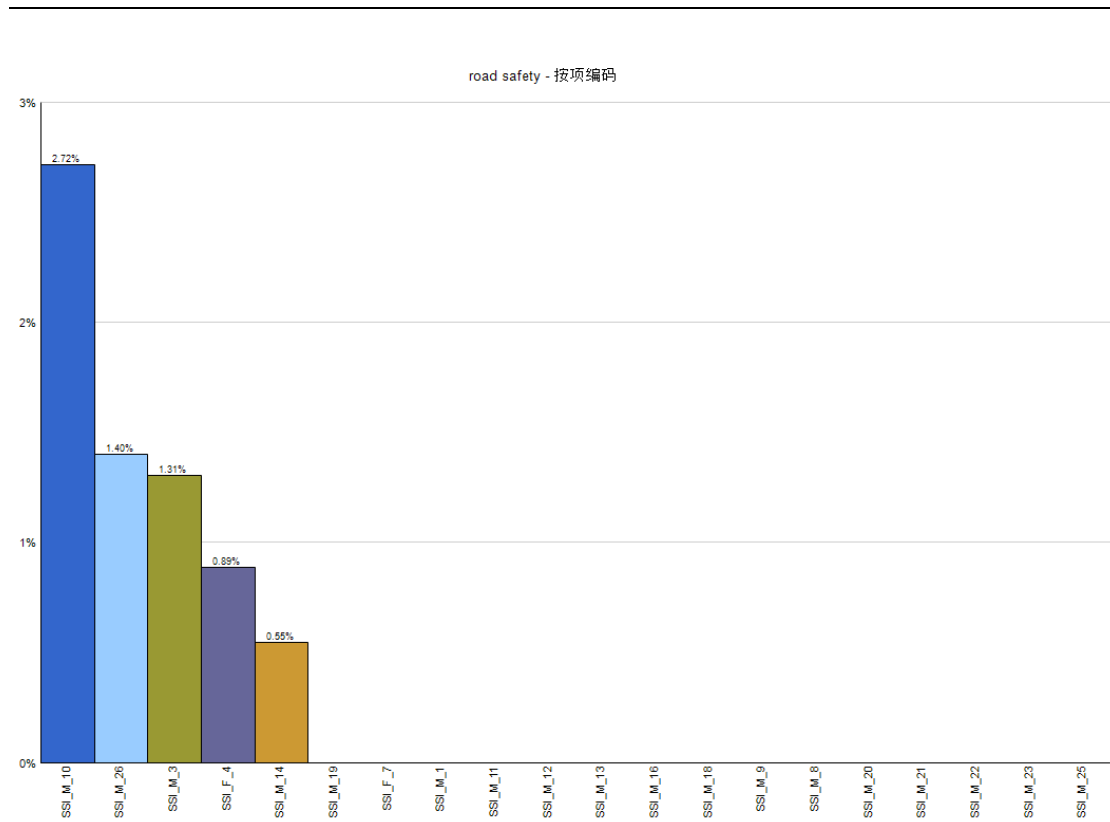


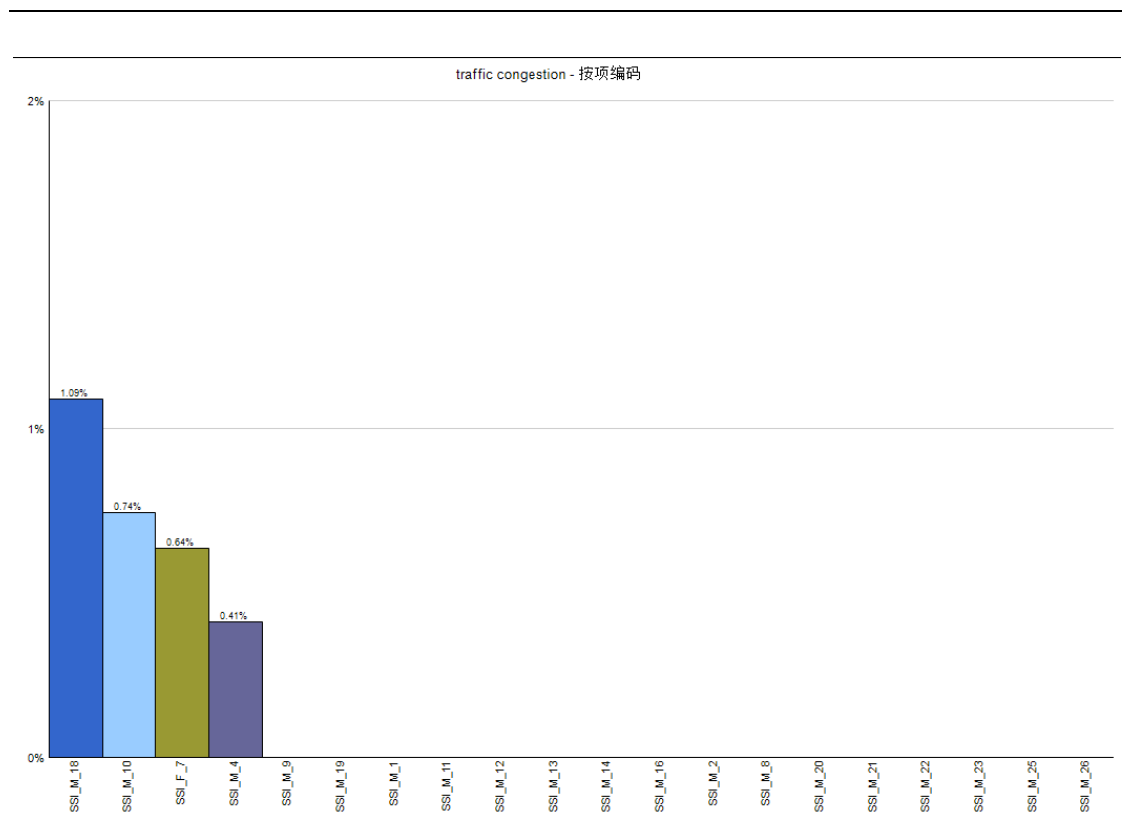


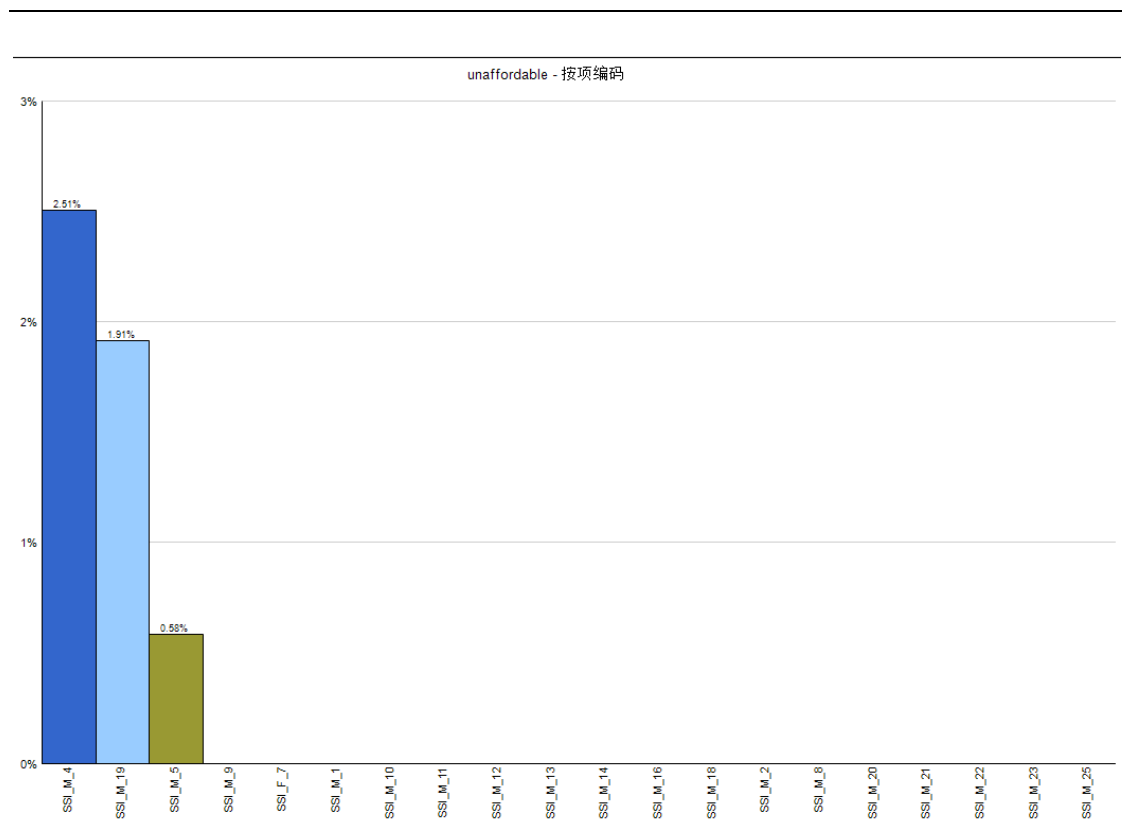












Appendix 5: result from N-vivo (Freetown)

These results reflect the proportion of this issue mentioned by the respondents in the overall interviews.

