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A convenient location for an inner urban freight terminal

Bachelor Thesis

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Place, Date



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Abstract

This thesis seeks to identify an optimal location for an inner urban freight terminal, prioritizing operational efficiency and mitigating urban impacts. It conducts a comprehensive analysis of factors crucial to the selection process. The study evaluates transportation infrastructure, including road networks and proximity to major hubs, ensuring accessibility and connectivity. Zoning regulations are examined to comply with land use policies. Proximity to customers and markets is considered to optimize delivery routes and minimize costs. Environmental impact is assessed, targeting air and noise pollution, traffic congestion, and sustainable practices. Adequate infrastructure and facilities, such as land availability and utilities, are evaluated. Collaborative opportunities with stakeholders are explored to enhance operations. Future growth and expansion potential are also accounted for, examining economic trends and development plans. By analyzing transportation infrastructure, zoning regulations, customer proximity, environmental impact, infrastructure, collaboration, and future growth, this thesis aims to identify a convenient location for an inner urban freight terminal.

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1. Introduction

1.1. Problem statement

The current urban population growth in Ulaanbaatar is resulting in a continuous increase in the demand for goods and freight traffic within the city. However, the existing freight transportation system is facing significant challenges that hinder its efficiency, safety, and sustainability. These challenges include traffic congestion, inadequate infrastructure, spatial limitations, and environmental concerns. To address these issues and optimize the freight transportation system, it is crucial to identify the most optimal location for a freight transport terminal in Ulaanbaatar.

The problem statement of this thesis revolves around two main aspects: (1) identifying the optimal freight transport terminal location and (2) understanding the urban freight transportation problems and the factors causing difficulties in freight transportation within Ulaanbaatar.

Firstly, the problem is to determine the most optimal location for a freight transport terminal in Ulaanbaatar. This involves assessing various factors such as accessibility, proximity to major transportation corridors, land availability, and environmental considerations. The optimal terminal location will play a vital role in streamlining goods distribution, reducing traffic congestion, and improving overall logistics efficiency within the city.

Secondly, there is a need to identify and analyze the urban freight transportation problems specific to Ulaanbaatar. This includes investigating the challenges faced by freight transportation stakeholders, such as logistics providers, shippers, and local authorities. Factors contributing to difficulties in freight transportation, such as traffic congestion, inadequate infrastructure, spatial limitations, and environmental concerns, need to be thoroughly examined. Understanding these problems will help in formulating effective solutions and strategies to address them.

By addressing these research questions, this thesis aims to contribute to the enhancement of urban freight transportation in Ulaanbaatar. The findings will provide valuable insights and recommendations for policymakers, urban planners, and logistics operators to optimize freight transportation, improve urban logistics efficiency, and promote sustainable urban development. Ultimately, this research seeks to create a more efficient, resilient, and environmentally friendly freight transportation system that can effectively meet the growing demands of Ulaanbaatar's urban population.

1.2. Aim of the study

The aim of this study is to explore the possibility of identifying the most optimal freight transport terminal location in Ulaanbaatar city, considering the challenges and demands posed by the current urban population growth. Additionally, the study seeks to identify and analyze the urban freight transportation problems specific to Ulaanbaatar, as well as the factors that contribute to difficulties in freight transportation within the city. By achieving these objectives, the study aims to provide valuable insights and recommendations to enhance the efficiency, safety, and sustainability of urban freight transportation in Ulaanbaatar.

1. Identify the most optimal freight transport terminal location: The primary objective of this study is to determine the most suitable location for a freight transport terminal within Ulaanbaatar city. This involves assessing a range of factors, including accessibility, proximity to transportation corridors, available land, and environmental considerations. The identification of an optimal terminal location will facilitate the efficient movement of goods, reduce traffic congestion, and improve overall logistics performance in the city.
2. Identify urban freight transportation problems: The study aims to identify and analyze the specific urban freight transportation problems in Ulaanbaatar. This includes exploring issues such as traffic congestion, inadequate infrastructure, spatial limitations, and environmental concerns that affect the efficiency and sustainability of freight transportation. By understanding these problems, the study aims to provide a comprehensive overview of the challenges faced by stakeholders involved in freight transportation within the city.
3. Study factors causing difficulties in freight transportation: In addition to identifying the problems, the study aims to investigate the factors contributing to difficulties in freight transportation in Ulaanbaatar. This entails examining various elements, such as traffic patterns, road conditions, regulatory frameworks, logistical constraints, and environmental impacts. Understanding these factors will enable the study to provide insights into the root causes of the challenges and lay the foundation for developing effective solutions.

Through a comprehensive analysis of these aspects, the study aims to contribute to the development of strategies and recommendations that can enhance the efficiency, safety, and sustainability of urban freight transportation in Ulaanbaatar. The findings of this research will be valuable for policymakers, urban planners, logistics operators, and other stakeholders involved in the planning and management of freight transportation systems. Ultimately, the study aims to support the establishment of an optimized and sustainable freight transport infrastructure in Ulaanbaatar that can cater to the increasing demands of the urban population and promote economic growth and development in the city.

2. Literature review

2.1 Introduction to Urban Freight Terminal

The growing urbanization and globalization of economies have resulted in increased freight transportation demands within cities. Urban freight terminals play a crucial role in facilitating the efficient movement of goods in urban areas, ensuring the timely delivery of products to businesses and consumers. These terminals serve as essential hubs for consolidating, sorting, and distributing freight, helping to alleviate traffic congestion, reduce emissions, and enhance the overall sustainability of urban logistics systems.

An urban freight terminal, also known as a distribution center or logistics hub, is a specialized facility located within or in close proximity to an urban area. It serves as an intermediary point between long-haul freight transportation and the final delivery of goods within the city. The primary function of an urban freight terminal is to facilitate the transfer and management of freight from large trucks or trains to smaller vehicles that are better suited for last-mile delivery.

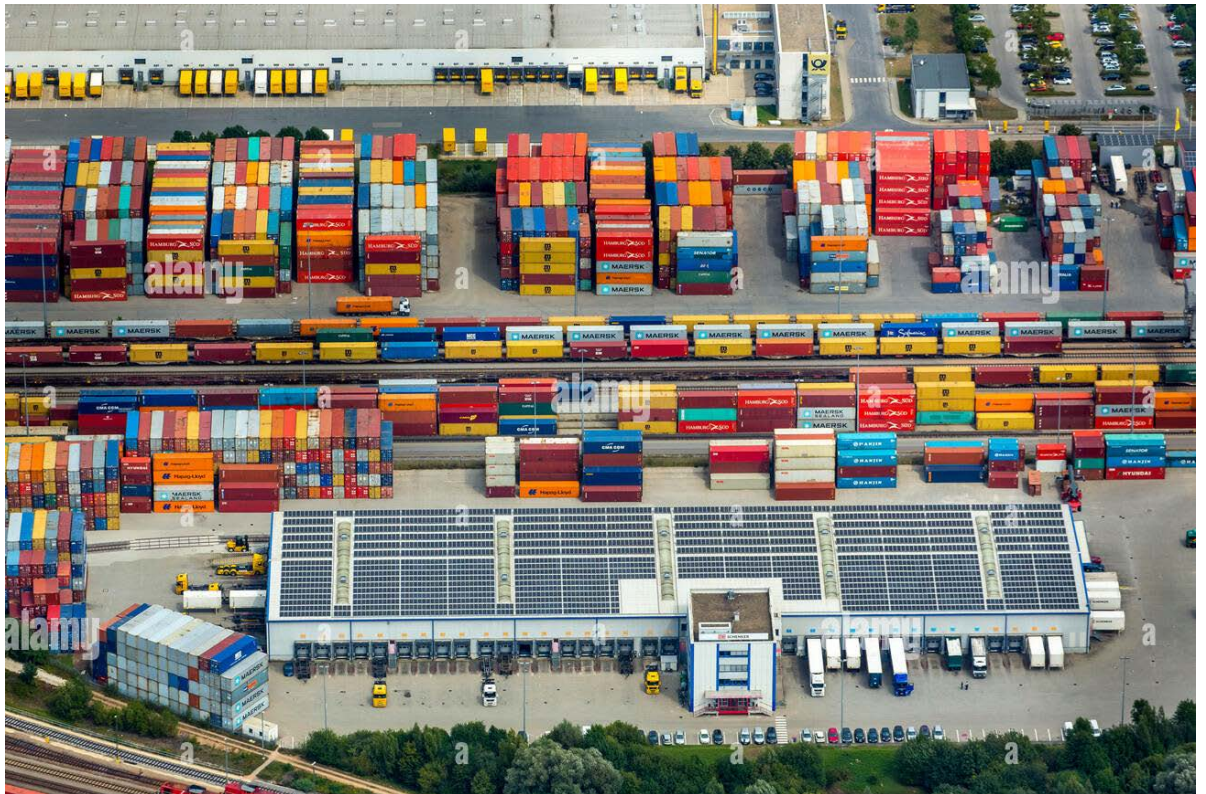
Urban freight terminals typically possess several key features to optimize the efficiency and effectiveness of freight operations. These features may include:

1. **Location:** Urban freight terminals are strategically positioned near major transport corridors and industrial zones to minimize travel distances and optimize accessibility.
2. **Size and Capacity:** These terminals vary in size, ranging from small consolidation centers to large-scale logistics hubs. The capacity is determined based on the volume of freight handled and the specific requirements of the urban area.
3. **Modal Integration:** Urban freight terminals facilitate the integration of different transportation modes, including road, rail, and potentially waterways, to enable seamless transfers and interconnectivity between long-haul and urban freight movements.
4. **Cross-Docking and Sorting:** These terminals often incorporate cross-docking facilities, where goods are transferred directly from incoming vehicles to outgoing

vehicles, minimizing the need for storage and reducing handling time. Sorting operations help organize goods based on their destination and delivery routes.

Benefits:

- The establishment of urban freight terminals brings several benefits to urban areas:
- **Congestion Reduction:** By providing a centralized location for freight transfers, urban freight terminals help reduce the number of large trucks and delivery vehicles on city streets, alleviating traffic congestion and improving overall traffic flow.
- **Environmental Sustainability:** Efficient goods consolidation and last-mile delivery operations at urban freight terminals can contribute to reduced fuel consumption and lower greenhouse gas emissions, supporting environmental sustainability goals.
- **Improved Efficiency:** The streamlined operations at urban freight terminals enhance supply chain efficiency by minimizing dwell times, optimizing inventory management, and ensuring reliable and timely delivery of goods.
- **Safety and Security:** Centralized freight handling facilitates enhanced security measures, ensuring proper inspection and monitoring of goods, reducing the risk of theft, and enhancing safety within the urban logistics network.



2.2 Factors Influencing Freight Terminal Location

The selection and location of freight terminals play a crucial role in optimizing the efficiency and effectiveness of urban freight transportation systems. The decision regarding the placement of freight terminals involves considering various factors that influence their functionality, accessibility, and integration within the broader transportation network. Understanding these factors is essential for identifying the most optimal locations for freight terminals in urban areas like Ulaanbaatar. This section of the literature review examines key factors that influence freight terminal location decisions.

1. Accessibility and Proximity to Transportation Corridors:

One of the primary considerations in freight terminal location is accessibility and proximity to transportation corridors. Freight terminals should be strategically located in close proximity to major transportation arteries, such as highways, rail lines, and ports. This facilitates efficient connectivity with regional and national freight networks, reducing transportation costs and improving supply chain efficiency. The proximity to transportation corridors allows for seamless transfer of goods between different modes of transport, enabling efficient intermodal operations.

2. Land Availability and Cost:

The availability of suitable land for constructing freight terminals is a critical factor. Freight terminals require sufficient space to accommodate storage facilities, loading docks, parking areas, administrative offices, and potentially other auxiliary services. The availability and cost of land play a significant role in determining the feasibility and economic viability of establishing a freight terminal. Factors such as land use regulations, land prices, and the availability of appropriate infrastructure and utilities should be considered when assessing potential terminal locations.

3. Market Demand and Customer Proximity:

Freight terminal location decisions are influenced by market demand and customer proximity. Terminals should be situated in close proximity to areas with high concentrations of customers and businesses. By locating terminals near major commercial and industrial centers, transportation distances can be minimized, reducing travel time and costs. Proximity to customers also enables faster response times, improved service levels, and increased customer satisfaction.

4. Infrastructure and Facilities:

The availability of adequate infrastructure and facilities is crucial for efficient freight terminal operations. This includes well-designed and maintained roadways leading to and from the terminal, ample truck parking spaces, proper loading and unloading equipment, and efficient handling and storage facilities. Terminals should also have sufficient capacity to handle anticipated growth in freight volumes and accommodate different types of cargo, including specialized facilities for perishable goods or hazardous materials.

5. Environmental Considerations:

Freight terminal location decisions are increasingly influenced by environmental considerations. Minimizing the environmental impacts of freight transportation, such as emissions and noise pollution, is a priority in urban areas. Locating terminals away from sensitive residential areas helps mitigate noise disturbances. Furthermore, implementing sustainable design practices, incorporating green technologies, and promoting energy

efficiency and renewable energy sources in terminal operations are factors to consider when selecting terminal locations.

6. Regulatory and Planning Constraints:

Regulatory and planning constraints, such as zoning regulations, land-use policies, and environmental regulations, can influence terminal location decisions. Compliance with local regulations is essential for obtaining necessary permits and approvals. Additionally, ensuring compatibility with existing land-use patterns and urban development plans is important for the seamless integration of freight terminals into the urban fabric. Collaboration with local authorities and stakeholders during the planning process helps address any regulatory or planning constraints.

By considering these factors, stakeholders can identify the most optimal locations for freight terminals in Ulaanbaatar. The integration of these factors into the decision-making process enhances the efficiency, accessibility, and sustainability of urban freight transportation systems. It enables improved connectivity, reduced congestion, minimized environmental impacts, and overall better logistics performance. Careful consideration of these factors contributes to the development of well-integrated and functional freight terminal infrastructure, ultimately supporting the economic development and livability of the city.

2.3 Urban Freight Terminal Problems and Challenges

Urban freight terminals, which serve as important nodes in the urban logistics network, face various problems and challenges that can hinder their efficient operation and integration within the urban environment. These challenges can impact the overall effectiveness and performance of the freight transportation system. This section of the literature review explores some of the key problems and challenges associated with urban freight terminals.

Limited Space:

Limited space poses several problems that need to be addressed to ensure the successful operation of the terminal:

1. **Land Constraints:** Urban areas often face scarcity of available land, making it challenging to find suitable sites for the construction and operation of a freight terminal. The limited availability of land may restrict the size and capacity of the terminal, potentially impacting its ability to handle growing freight demands.
2. **Competition for Land Use:** Urban areas are characterized by various competing land uses, including residential, commercial, and recreational spaces. Allocating land for an urban freight terminal requires careful consideration and negotiation with other stakeholders to ensure minimal disruption and conflicts with existing land uses.
3. **Infrastructure Requirements:** Freight terminals necessitate specific infrastructure components, such as storage facilities, loading docks, and parking areas for trucks. Limited space constraints may hinder the provision of adequate infrastructure within the terminal, potentially leading to congestion, inefficiencies, and compromised safety.
4. **Access and Circulation:** Limited space can impact access and circulation within the terminal and its surrounding areas. Inadequate space for maneuvering trucks, turning radii, and queuing areas can result in congestion, delays, and operational bottlenecks. It is crucial to optimize the layout and design of the terminal to maximize the utilization of available space and ensure smooth and efficient traffic flow.
5. **Expansion and Future Growth:** Anticipating future growth and expansion of the urban freight terminal is vital. Limited space may restrict the terminal's ability to accommodate increasing freight volumes and evolving logistical requirements. Planning for future expansion, either through land acquisition or vertical

development, is essential to address long-term growth needs and prevent potential capacity limitations.

Accessibility and Connectivity:

a convenient location for an urban freight terminal involves considerations of accessibility and connectivity. There are several key accessibility and connectivity challenges associated with urban freight terminals that need to be addressed for efficient and effective freight transportation:

1. **Proximity to Industrial and Commercial Areas:** The location of the urban freight terminal should be strategically chosen to ensure easy access to industrial and commercial areas. Placing the terminal in close proximity to these areas reduces transportation distances and costs, streamlines supply chains, and improves overall operational efficiency.
2. **Connectivity to Transportation Networks:** An essential aspect of a convenient location for an urban freight terminal is its connectivity to transportation networks. The terminal should have direct access to major roads, highways, and, if applicable, railway lines. This facilitates the seamless movement of goods within the city and beyond, ensuring efficient connections with regional and national transportation systems.
3. **Last-Mile Connectivity:** Last-mile connectivity refers to the final leg of goods delivery from the terminal to the destination. It is crucial to establish effective last-mile connectivity solutions, such as well-designed distribution networks, reliable local transport options, and efficient delivery routes. This ensures that goods can reach their intended destinations in a timely and cost-effective manner, minimizing congestion and delays.
4. **Intermodal Connectivity:** To enhance the efficiency and sustainability of urban freight transportation, intermodal connectivity plays a vital role. This involves seamless transfers of goods between different modes of transport, such as trucks, railways, and waterways. The location of the urban freight terminal should allow for easy intermodal connectivity, enabling the use of multiple transportation modes to optimize the transportation process and reduce environmental impacts.
5. **Addressing Traffic Congestion:** Urban areas often face significant traffic congestion, which can pose challenges for freight transportation. It is crucial to consider the potential impact of terminal operations on traffic flow and implement measures to mitigate congestion. This may involve scheduling deliveries during

off-peak hours, adopting intelligent transportation systems, and coordinating with local authorities to optimize traffic management around the terminal area.

6. **Accessibility for Sustainable Modes of Transport:** Promoting the use of sustainable modes of transport, such as electric vehicles or bicycles, is an important aspect of urban freight transportation. The terminal location should provide infrastructure and facilities that support the use of these sustainable modes, including charging stations for electric vehicles or designated lanes for cyclists.

Addressing these accessibility and connectivity challenges requires a comprehensive approach that involves collaboration among stakeholders, including urban planners, transportation authorities, freight operators, and local communities. By considering and overcoming these challenges, a convenient location for an urban freight terminal can be identified, leading to improved accessibility, enhanced connectivity, and more efficient freight transportation in urban areas.

Environmental Impact:

Urban freight terminals can have both positive and negative environmental impacts. It is essential to consider these impacts when planning and operating such terminals to minimize their environmental footprint. Some of the environmental impacts associated with urban freight terminals are as follows:

1. **Air Pollution:** The movement of trucks and vehicles to and from the terminal can contribute to air pollution through the emission of greenhouse gases, particulate matter, and other pollutants. This can lead to poor air quality and have detrimental effects on human health and the environment.
2. **Noise Pollution:** Urban freight terminals often involve the handling and loading/unloading of goods, which can generate significant noise levels. This can result in noise pollution, disrupting the surrounding residential and commercial areas and impacting the quality of life for nearby residents.
3. **Land Use and Habitat Loss:** Constructing and operating a freight terminal requires land, which may lead to the conversion of natural or agricultural areas. This can result in habitat loss, fragmentation, and disruption of ecosystems, affecting local biodiversity and ecological balance.
4. **Traffic Congestion:** Urban freight terminals attract a large volume of trucks and vehicles, leading to increased traffic congestion, especially during peak hours. This

not only hampers the efficiency of goods movement but also contributes to increased fuel consumption, emissions, and travel times, negatively impacting air quality and overall transportation system performance.

5. **Waste Generation:** Freight terminals often generate significant amounts of waste, including packaging materials, pallets, and other related items. Proper waste management practices are essential to minimize the environmental impact of waste disposal and ensure effective recycling or proper disposal of waste materials.

To mitigate these environmental impacts, several strategies can be implemented:

1. **Sustainable Transport:** Promoting the use of cleaner and more fuel-efficient vehicles, such as electric or hybrid trucks, can help reduce emissions and air pollution. Encouraging the use of alternative modes of transport, such as rail or waterways, for long-haul freight can also minimize the environmental impact of urban freight terminals.
2. **Efficient Operations and Logistics:** Implementing efficient logistics practices, such as consolidation of goods and optimized delivery routes, can reduce the number of trips and minimize congestion and emissions. Utilizing advanced technology and data-driven solutions for route planning and scheduling can further enhance operational efficiency.
3. **Noise Mitigation Measures:** Implementing noise barriers, acoustic insulation, and restricting terminal operations during sensitive hours can help mitigate the noise pollution generated by urban freight terminals.
4. **Sustainable Infrastructure:** Designing terminals with green infrastructure elements, such as rainwater harvesting systems, solar panels, and energy-efficient lighting, can reduce the environmental impact of the terminal and promote sustainability.
5. **Collaboration and Stakeholder Engagement:** Engaging with local communities, environmental groups, and relevant stakeholders in the planning and operation of urban freight terminals can foster collaboration, ensure transparency, and identify measures to address environmental concerns effectively.

Land Use Conflicts:

an urban freight terminal often encounters land use conflicts, which refer to the competing interests and demands for land within urban areas. These conflicts can create several

challenges and problems that need to be addressed to ensure the successful establishment and operation of a freight terminal:

1. **Zoning and Land Regulations:** Urban areas have specific zoning regulations and land use plans that designate areas for specific purposes such as residential, commercial, industrial, and recreational use. Identifying suitable land for a freight terminal within the designated industrial or commercial zones while adhering to land regulations can be a challenge. Conflicting land use designations may require negotiations and amendments to zoning regulations.
2. **Community Opposition:** The establishment of a freight terminal can face opposition from local communities due to concerns about noise pollution, increased traffic, air pollution, and visual impact. Balancing the needs of the freight terminal with the interests and well-being of the surrounding community is crucial to mitigate conflicts and gain community acceptance.
3. **Environmental Considerations:** Urban freight terminals can have environmental impacts, such as increased emissions, noise pollution, and disruption to natural habitats. Ensuring that the terminal location minimizes adverse environmental effects, or implementing mitigation measures, is essential to address environmental concerns and prevent conflicts with environmental regulations and advocacy groups.
4. **Spatial Constraints:** Urban areas often face limited available land, which can result in spatial constraints for locating a freight terminal. Finding a suitable site that meets the operational requirements of a terminal, such as sufficient space for storage, loading/unloading areas, and infrastructure, while considering the existing land use patterns can be challenging.
5. **Infrastructure Compatibility:** Compatibility with existing infrastructure, such as road networks, utilities, and transportation systems, is crucial for the efficient operation of a freight terminal. Identifying a location that aligns with existing infrastructure and ensuring that necessary infrastructure upgrades or modifications can be made to support the terminal's operations may require careful planning and coordination with relevant authorities.
6. **Multi-Purpose Land Use:** Some potential terminal locations may be suitable for multiple land uses, such as mixed-use developments or urban regeneration projects. Balancing the demand for alternative land uses with the need for a freight

terminal can lead to conflicts and require negotiations to find a mutually beneficial solution.

Addressing land use conflicts requires a comprehensive approach that involves stakeholder engagement, collaboration, and careful urban planning:

1. **Stakeholder Engagement:** Engaging with local communities, residents, businesses, and interest groups early in the planning process is crucial. This allows for open communication, addressing concerns, and finding common ground to minimize conflicts and gain support for the freight terminal.
2. **Integrated Land Use Planning:** Considering the broader urban planning context and coordinating with urban planners and authorities can help identify suitable locations that align with long-term land use objectives and minimize conflicts with other land uses.
3. **Environmental Impact Assessment:** Conducting thorough environmental impact assessments to identify potential environmental risks and implementing mitigation measures is essential. This ensures compliance with environmental regulations and addresses concerns raised by environmental advocacy groups.
4. **Collaborative Decision-Making:** Collaborating with relevant stakeholders, including local government, community representatives, and businesses, to make informed decisions regarding the terminal location. Considering the perspectives and interests of all stakeholders can help identify compromise solutions and minimize conflicts.
5. **Adaptive Planning:** Implementing adaptive planning and flexibility in terminal design and operations to accommodate changing land use patterns and evolving urban dynamics. This allows for adjustments and modifications to address future conflicts that may arise.

By addressing land use conflicts effectively, a convenient location for an urban freight terminal can be selected that balances the needs of freight transportation with the interests of the community, environment, and broader urban development goals.

Operational Efficiency:

An urban freight terminal involves numerous operational efficiency problems and challenges that need to be addressed to ensure smooth and effective terminal operations. Some of the key challenges in achieving operational efficiency include:

1. **Traffic Congestion:** Urban areas are often plagued by heavy traffic congestion, which can significantly impact the efficiency of freight terminal operations. Increased congestion can result in delays, longer travel times, and decreased productivity. Developing strategies to mitigate congestion, such as implementing efficient traffic management systems, optimizing delivery schedules, and considering off-peak hours for freight movement, is crucial to enhance operational efficiency.
2. **Last-Mile Delivery:** The last-mile delivery stage, which involves transporting goods from the terminal to their final destination within the urban area, presents unique challenges. The fragmented nature of urban environments, traffic restrictions, and limited access to certain areas can hinder the efficiency of last-mile deliveries. Exploring innovative solutions like micro-depots, urban consolidation centers, and alternative delivery methods (e.g., drones or cargo bikes) can help optimize last-mile delivery operations and improve efficiency.
3. **Warehousing and Storage Constraints:** Urban freight terminals often face limitations in terms of available warehouse and storage space. Insufficient storage capacity can lead to congestion, inefficient goods handling, and increased costs. Maximizing the utilization of available warehouse space through innovative storage solutions, such as vertical storage systems or shared warehousing arrangements, can enhance operational efficiency.
4. **Intermodal Connectivity:** Ensuring seamless intermodal connectivity between different modes of transport is critical for operational efficiency. Integrating rail, road, and waterway connections with the terminal can enhance the efficiency and flexibility of freight transportation. However, challenges related to coordinating schedules, transshipment processes, and infrastructure compatibility may arise and need to be carefully addressed to achieve optimal intermodal connectivity.
5. **Technology Integration:** Embracing technological advancements is essential for improving operational efficiency in urban freight terminals. Implementing intelligent transportation systems, real-time tracking and monitoring tools, automation, and digital platforms can streamline operations, optimize resource allocation, and

enhance overall efficiency. However, the integration of technology may require investments, staff training, and addressing potential cybersecurity concerns.

6. **Collaboration and Stakeholder Engagement:** Efficient terminal operations require collaboration and engagement among various stakeholders, including freight operators, local authorities, logistics providers, and customers. Effective coordination, information sharing, and mutual understanding of roles and responsibilities can help address operational challenges, streamline processes, and enhance overall efficiency.

To overcome these operational efficiency problems and challenges, it is crucial to adopt a holistic approach that considers integrated solutions, collaboration, and the use of innovative technologies. Continuous monitoring, evaluation, and adaptation of operational strategies are also essential to ensure ongoing efficiency improvements in response to evolving urban dynamics and freight demands.

By addressing these challenges and implementing appropriate measures, a convenient location for an urban freight terminal can achieve higher operational efficiency, leading to cost savings, reduced congestion, improved customer satisfaction, and a more sustainable freight transportation system.

Security and Safety:

An urban freight terminal brings forth various security and safety challenges that need to be addressed to ensure the protection of goods, infrastructure, and personnel. Some of the key security and safety challenges associated with urban freight terminals include:

1. **Theft and Pilferage:** Urban areas may be prone to theft and pilferage due to their dense population and increased opportunities for criminal activities. Goods stored at the terminal or during transit can be targets for theft. Implementing robust security measures such as surveillance systems, access control, and secure storage facilities can help mitigate the risk of theft and pilferage.
2. **Vandalism and Sabotage:** Urban freight terminals are vulnerable to acts of vandalism and sabotage that can cause damage to infrastructure, equipment, or goods. Ensuring adequate security measures, such as perimeter fencing, intrusion detection systems, and well-trained security personnel, can help deter and respond to such incidents effectively.

3. **Cybersecurity:** With the increasing reliance on digital systems and technology in freight operations, cybersecurity becomes a critical concern. Urban freight terminals may be exposed to cyber threats, including unauthorized access, data breaches, and disruption of operations. Implementing robust cybersecurity measures, regularly updating software and hardware, and educating staff on cybersecurity best practices are essential to protect terminal operations from cyber risks.
4. **Occupational Safety:** The safety of terminal personnel, including employees, truck drivers, and visitors, is of paramount importance. Urban freight terminals may involve activities such as loading/unloading, material handling, and operating heavy machinery, which pose inherent safety risks. Implementing proper safety protocols, providing adequate training, and maintaining a safe working environment are essential to prevent accidents and ensure the well-being of personnel.
5. **Fire and Hazardous Materials:** Urban freight terminals may handle hazardous materials or goods susceptible to fire hazards. Adequate fire safety measures, including fire suppression systems, fire-resistant construction, and proper handling and storage protocols, should be in place to minimize the risk of fire incidents and protect personnel, goods, and infrastructure.
6. **Emergency Preparedness and Response:** Urban freight terminals should have well-defined emergency response plans and procedures to address potential security threats, accidents, or natural disasters. Conducting regular drills, training staff in emergency response protocols, and establishing communication channels with local emergency services are critical for effective response and mitigation of risks.
7. **Compliance with Regulatory Requirements:** Urban freight terminals must comply with relevant security and safety regulations, including local, national, and international standards. Adhering to these regulations helps ensure that adequate security measures are in place and that safety protocols are followed to protect personnel, goods, and the surrounding environment.

Addressing security and safety challenges requires a comprehensive approach that involves a combination of physical security measures, cybersecurity measures, safety protocols, staff training, and ongoing risk assessments. Collaboration with local law enforcement agencies, emergency services, and relevant regulatory bodies is also essential to create a secure and safe operating environment for urban freight terminals. By addressing these challenges effectively, the terminal can operate with enhanced security, protect valuable assets, and safeguard the well-being of personnel and the surrounding community.

2.4. Future of Urban Freight Terminals

The future of inner urban freight terminals holds significant potential for transforming the way goods are transported and distributed within cities. As urbanization continues and e-commerce grows, the demand for efficient, sustainable, and streamlined freight operations becomes increasingly critical. Here's a comprehensive overview of the anticipated developments and trends shaping the future of inner urban freight terminals.

One of the primary drivers of change is the pressing need for sustainable and green solutions. Urban areas face significant environmental challenges, including congestion, air pollution, and carbon emissions. To address these issues, inner urban freight terminals will likely adopt cleaner technologies and practices. Electric vehicles (EVs) are expected to play a crucial role, with the deployment of electric trucks and vans for last-mile deliveries. Moreover, initiatives such as low-emission zones and the use of alternative fuels like hydrogen or biofuels will contribute to reducing the carbon footprint of freight operations.

Another key aspect is the optimization of last-mile delivery. With the exponential growth of e-commerce, the focus on efficient and timely delivery has intensified. Inner urban freight terminals will evolve to become centralized hubs that consolidate shipments and coordinate last-mile deliveries. By consolidating goods from multiple sources and utilizing advanced routing algorithms, these terminals can minimize traffic congestion, reduce delivery times, and improve the overall efficiency of urban logistics.

Automation and robotics will also revolutionize inner urban freight terminals. Automated sorting systems, robotic loaders, and autonomous vehicles are expected to be increasingly employed to streamline operations and reduce reliance on manual labor. These technologies enhance efficiency, accuracy, and productivity, leading to faster processing times and reduced operational costs. Furthermore, autonomous delivery robots or drones might be utilized for short-distance deliveries, ensuring quicker and more flexible service.

Data-driven logistics will play a pivotal role in optimizing inner urban freight terminal operations. Real-time data on traffic patterns, demand forecasting, and route optimization will enable terminals to make informed decisions and respond dynamically to changing conditions. Advanced analytics and artificial intelligence (AI) will assist in predicting demand, optimizing routes, and improving overall resource allocation, resulting in enhanced efficiency and reduced environmental impact.

Collaboration and shared spaces will become vital to overcome the limitations of space in urban areas. Inner urban freight terminals may adopt collaborative models where logistics providers and stakeholders share facilities and resources. By pooling infrastructure, including warehousing, cross-docking, and distribution facilities, the utilization of space can be maximized, leading to cost savings and improved operational efficiency. Additionally, sharing data and collaborating with various stakeholders, such as retailers, transport companies, and local authorities, will foster more integrated and coordinated freight operations.

Multimodal connectivity is another critical aspect that inner urban freight terminals will prioritize. Seamless integration of different transportation modes, including rail, waterways, and cycling infrastructure, will enable efficient transfer of goods between different legs of the journey. By promoting intermodal connectivity, terminals can reduce reliance on road transport and mitigate congestion while also enhancing the sustainability and resilience of urban freight networks.

Urban planning and policy considerations will shape the future of inner urban freight terminals. Governments and city authorities will likely implement regulations and zoning policies to balance freight movement with other urban priorities such as reducing congestion, improving air quality, and enhancing livability. Collaborative planning efforts between urban planners, transportation authorities, and logistics stakeholders will be essential to design integrated and sustainable freight systems that align with the broader urban development goals.

In conclusion, the future of inner urban freight terminals holds immense promise in revolutionizing urban logistics. By adopting sustainable practices, leveraging automation and robotics, harnessing the power of data, promoting collaboration, enhancing multimodal connectivity, and aligning with urban planning priorities, these terminals can become efficient, environmentally friendly, and economically viable components of the urban freight landscape. Through these advancements, inner urban freight terminals will contribute to creating greener, more livable cities while facilitating seamless and efficient movement of goods.

2.5 Existing Freight Terminals

Ulaanbaatar has several transportation hubs and logistics centers that serve as key nodes in the movement of goods. These hubs include:

- Ulaanbaatar Railway Station Freight Terminal: This freight terminal is a major hub for rail freight transportation, facilitating the distribution of goods across the city and beyond.
- Chinggis Khaan International Airport Cargo Terminal: As the main international airport in Mongolia, Chinggis Khaan International Airport has a dedicated cargo terminal for air freight operations, connecting Ulaanbaatar to global trade networks.
- Bayankhoshuu Freight Terminal: Located in the Bayankhoshuu district, this freight terminal serves as a distribution center for local and regional cargo transportation.
- Khan-Uul District Freight Terminal: Situated in the Khan-Uul district, this freight terminal provides warehousing and storage facilities, supporting the movement of goods within the city.

2.6. Regulations

Freight terminals worldwide are subject to various regulations aimed at ensuring the safe and efficient movement of goods and compliance with specific standards. These regulations are established at international, regional, and national levels to govern terminal operations. The International Maritime Organization (IMO) sets standards for maritime transportation, including cargo handling at ports and terminals, through initiatives such as the International Ship and Port Facility Security (ISPS) Code. The International Civil Aviation Organization (ICAO) establishes guidelines for cargo handling at airports and air cargo terminals, focusing on aviation safety. The World Customs Organization (WCO) develops international standards and best practices for customs administrations, covering customs procedures and processes at freight terminals to facilitate trade. Additionally, the European Union (EU) has specific regulations pertaining to freight terminals and logistics operations within its member states, addressing infrastructure, environmental standards, safety, and security measures. National and local jurisdictions also have their own regulations, encompassing zoning, environmental impact assessments, safety standards, and labor laws. Researchers studying freight terminal locations should consider these regulations to ensure compliance and address any relevant regulatory considerations. Understanding and adhering to the applicable regulations are essential for the successful establishment and operation of freight terminals worldwide, as they promote safety, security, environmental sustainability, and efficient trade facilitation.

In Mongolia, freight terminals are governed by a specific regulation and requirement known as MNS 5832:2007. This regulation establishes standards and guidelines for the design, construction, and operation of freight terminals within the country. MNS 5832:2007 aims to ensure the efficient and safe handling of goods and compliance with prescribed criteria.

The regulation covers various aspects of freight terminal operations, including infrastructure requirements, layout design, equipment standards, safety measures, and environmental considerations. It provides guidelines for the planning and design of freight terminal facilities, taking into account factors such as accessibility, storage capacity, and handling equipment.

MNS 5832:2007 also emphasizes the importance of adhering to relevant national laws and regulations concerning customs, security, labor, and environmental protection. It serves as a framework to ensure that freight terminals in Mongolia meet specific quality and operational standards.

For researchers, stakeholders, and industry professionals involved in the planning, establishment, or operation of freight terminals in Mongolia, it is crucial to familiarize themselves with MNS 5832:2007. Complying with these standards helps to ensure that freight terminals meet the required criteria, promoting safety, efficiency, and environmental responsibility.

By following MNS 5832:2007, stakeholders can contribute to the establishment and operation of well-regulated and compliant freight terminals in Mongolia, thereby facilitating the smooth movement of goods and supporting the country's logistics and trade activities.

3. Methodology

3.1. Population growth in Ulaanbaatar

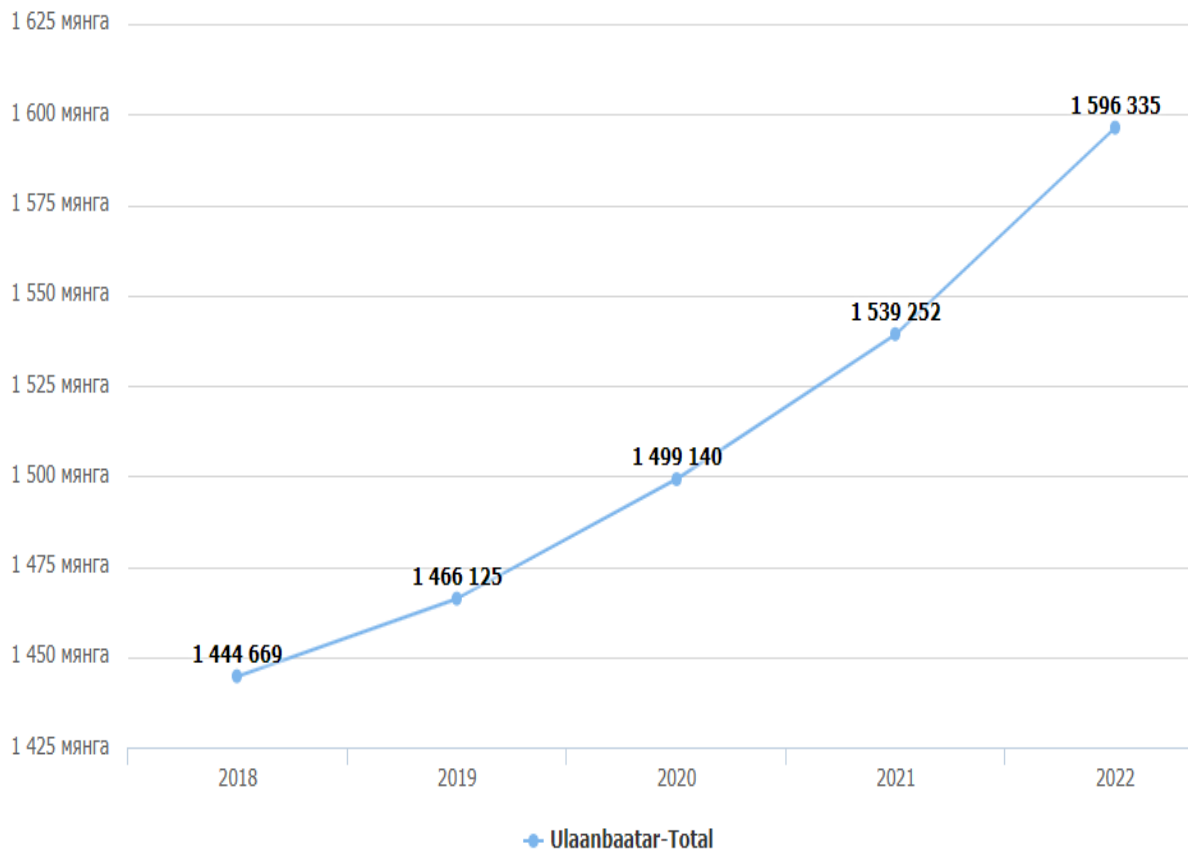
The relationship between population growth and urban freight terminals is significant as it directly impacts the demand for efficient logistics and distribution systems within urban areas. As a city's population increases, so does the need for goods and services, leading to increased freight transportation and distribution requirements.

Population growth in urban areas often results in higher consumer demand, prompting the need for a well-connected and accessible network of freight terminals. These terminals serve as crucial nodes in the supply chain, facilitating the movement of goods from distribution centers to businesses and end consumers within the city.

A growing population puts pressure on existing freight infrastructure and may lead to increased congestion and inefficiencies in the transportation system. To address this, urban planners and logistics professionals must consider the location and capacity of freight terminals strategically. They need to identify areas that can efficiently handle the increasing volume of goods while minimizing the impact on traffic flow and the surrounding urban environment.

Moreover, population growth patterns can influence the placement of urban freight terminals. They are often situated in close proximity to densely populated areas to minimize transportation distances and enhance last-mile delivery capabilities. By strategically locating freight terminals near population centers, logistics providers can improve delivery times, reduce transportation costs, and enhance overall supply chain efficiency.

Understanding the relationship between population growth and urban freight terminals is crucial for urban planning, infrastructure development, and logistics optimization. By aligning freight terminal locations with population growth patterns, cities can create sustainable and efficient distribution networks that meet the evolving needs of their residents while reducing congestion and environmental impacts.



According to this 5 year historical data :

In 2018, the population of Ulaanbaatar city was recorded as 1,444,669.

By 2019, the population had increased to 1,466,125, indicating a growth of approximately 21,456 individuals.

The upward trend continued in 2020, with the population reaching 1,499,140, representing an increase of around 33,015 people compared to the previous year.

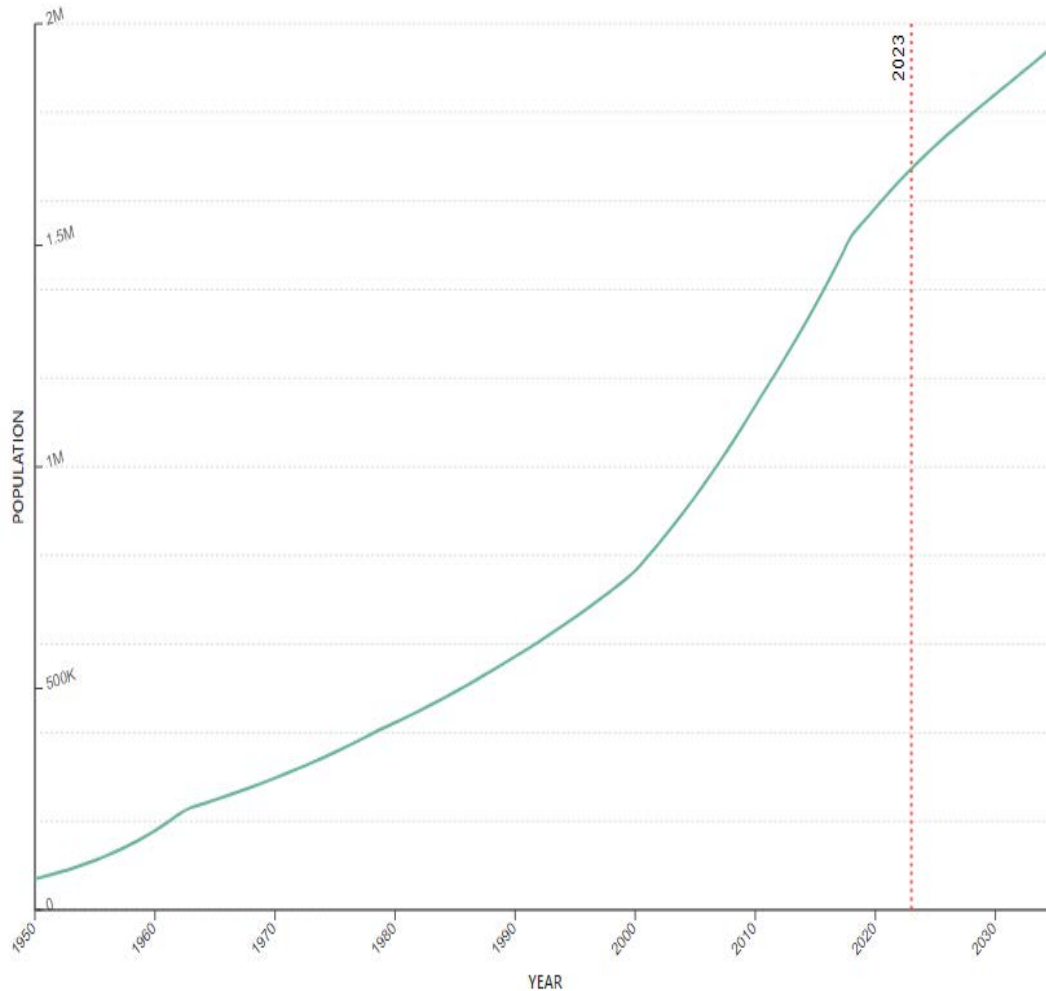
In 2021, the population of Ulaanbaatar city experienced further growth, reaching 1,539,252, signifying a rise of approximately 40,112 individuals.

The most recent data from 2022 indicates that the population of Ulaanbaatar city reached 1,596,335, reflecting a significant increase of approximately 57,083 people compared to the previous year.

These population figures illustrate a consistent pattern of growth in Ulaanbaatar city over the five-year period. The city's population has been steadily increasing, indicating the

ongoing urbanization and attractiveness of Ulaanbaatar as a center for economic opportunities and employment.

Ulaanbaatar Population 2023



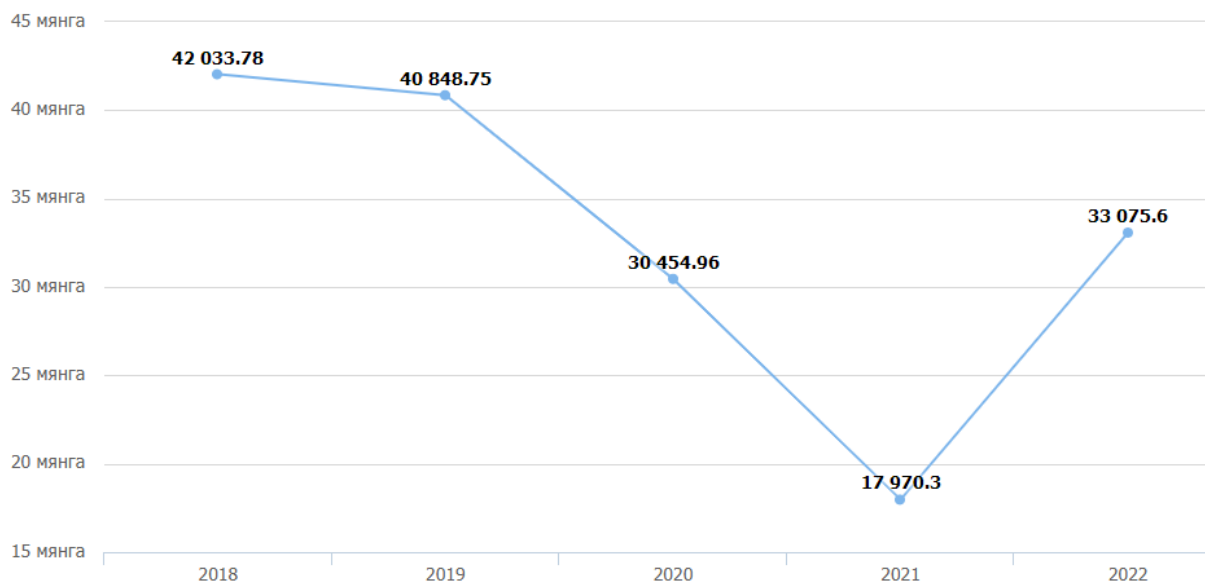
According to the latest revision of the UN World Urbanization Prospects, it is projected that the population of Ulaanbaatar, the capital city of Mongolia, may reach approximately 1,952,460 by the year 2035. These population estimates and projections are based on a comprehensive analysis of various factors and trends.

The UN World Urbanization Prospects utilize historical population data, fertility rates, mortality rates, and migration patterns to generate population projections for cities around the world. In the case of Ulaanbaatar, these projections suggest a significant growth in population over the next decade and a half.

The population growth in Ulaanbaatar city has important implications for various sectors, including transportation and logistics. The increasing number of residents results in higher demands for goods and services, necessitating efficient freight transportation and distribution systems. This population growth further underscores the need for well-planned urban freight terminals and logistics infrastructure to support the smooth movement of goods within the city and its surrounding areas.

3.2. Road transportation

Road freight is the transport of goods from one location to another (a place of loading and a place of unloading) by means of motor vehicles via a road network. Commercial road freight transport is the transport of goods on a business basis by logistics companies or forwarders.



Over the past five years, road freight transport in the given region has exhibited fluctuations influenced by various factors, most notably the impact of the COVID-19 pandemic. Analyzing the historical data provides insights into the trends and challenges faced by the road freight industry during this period.

In 2018, road freight transport recorded a total of 42,033 tonnes, indicating a substantial volume of goods being transported by road. This signifies the importance of road transport in facilitating trade and commerce within the region. The figures suggest a robust logistics network and a high demand for road freight services.

By 2019, the total tonnage slightly decreased to 40,848 tonnes, representing a marginal decline in road freight transport. While the decrease may be attributed to various factors, such as changes in market demand or economic conditions, it is important to note that the decline was relatively small, indicating a relatively stable road freight sector during that year.

However, in 2020, the road freight transport industry faced significant challenges due to the outbreak of the COVID-19 pandemic. The total tonnage dropped to 30,454 tonnes, representing a substantial decline compared to the previous year. The pandemic led to widespread disruptions in supply chains, trade restrictions, and reduced economic activities, resulting in a decreased demand for road freight services. Lockdowns, travel restrictions, and reduced consumer spending all contributed to the decline in tonnage.

The impact of the pandemic continued in 2021, with road freight transport experiencing a further decline. The total tonnage fell sharply to 17,970 tonnes, reflecting the ongoing challenges faced by the transportation industry. The COVID-19 pandemic situation persisted, causing continued disruptions to the supply chains and economic activities. The decline in tonnage highlights the severity of the pandemic's impact on road freight transport.

However, in 2022, road freight transport began to rebound, with the total tonnage increasing to 33,075 tonnes. This recovery suggests a positive trend and potential for growth in the sector. As restrictions eased and economic activities resumed, there was an increase in demand for road freight services. The upward trend in tonnage indicates a gradual recovery from the adverse effects of the pandemic.

The relationship between road freight transport and freight terminals is crucial for optimizing the efficiency of the transportation system. Freight terminals serve as key nodes in the supply chain, facilitating the transfer, consolidation, and distribution of goods. During periods of higher road freight transport volume, freight terminals play a vital role in handling and managing the increased flow of goods. They provide facilities for storage, sorting, and consolidation, allowing for efficient transfer and distribution of goods to their final destinations.

Conversely, during periods of lower road freight transport volume, such as experienced during the COVID-19 pandemic, freight terminals may experience reduced activity. However, they still play a crucial role in managing the limited freight flow, optimizing operations, and preparing for the potential rebound in the future.

As road freight transport is expected to rise based on the recent trend, freight terminals will likely experience an increase in demand. It becomes essential to assess and adapt freight terminal infrastructure, capacity, and operational processes to efficiently handle the projected volume of goods. Upgrading facilities, implementing advanced technologies, and optimizing logistical processes can help freight terminals meet the changing demands of the road freight industry.

Furthermore, close collaboration between road freight transport operators and freight terminals is vital for effective supply chain management. Clear communication, information sharing, and coordinated efforts between these stakeholders can enhance the overall efficiency and reliability of the road freight transportation network.

In conclusion, the historical data of road freight transport over the past five years demonstrates the impact of various factors, including the COVID-19 pandemic, on the industry. Fluctuations in tonnage reflect the challenges faced during the pandemic, while the recent recovery indicates a positive trend for the road.

3.3. Traffic congestion

Traffic congestion and urban freight terminals are closely related due to the impact of congestion on the movement of goods within a city. Here are some key points regarding their relationship:

Traffic Congestion: Traffic congestion refers to the excessive volume of vehicles on roads, resulting in slower speeds, longer travel times, and reduced efficiency of transportation networks. Congestion is often a common problem in densely populated urban areas, including cities like Ulaanbaatar.

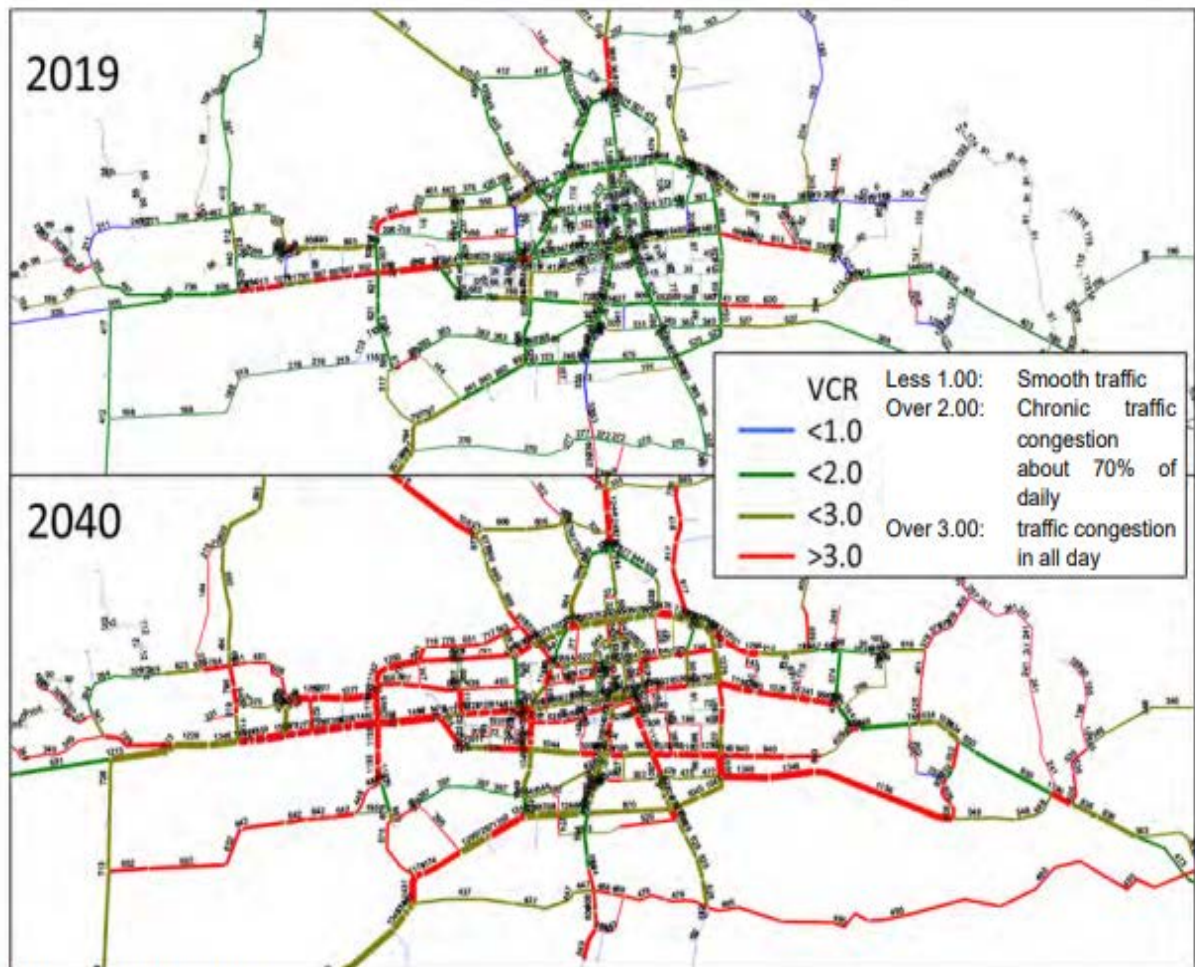
Impact on Freight Transportation: Traffic congestion directly affects freight transportation within urban areas. As traffic slows down and travel times increase, it becomes more challenging for freight vehicles to navigate the city efficiently and deliver goods on time. Congestion can lead to delays, increased transportation costs, and reduced productivity for freight operators.

Delivery Time Reliability: Reliable delivery times are crucial for efficient logistics and supply chain operations. Traffic congestion can significantly impact the reliability of

delivery times for freight vehicles. Delays caused by congestion can disrupt schedules, leading to late deliveries and potential penalties for businesses relying on timely transportation of goods.

Environmental Implications: Traffic congestion also has environmental implications, such as increased emissions and air pollution. Freight vehicles stuck in traffic for longer durations contribute to higher fuel consumption and emissions, impacting air quality and environmental sustainability.

JISA (Japan International Cooperation Agency) conducted a data collection study on transportation infrastructure development in Ulaanbaatar, Mongolia in 2022. The study aimed to gather information regarding the city's transportation infrastructure, including roads, public transportation systems, and traffic patterns. The data collected likely included traffic flow, congestion levels, road conditions, public transportation usage, and other relevant factors. The study aimed to provide valuable insights for improving transportation infrastructure and addressing any issues or challenges in Ulaanbaatar's transportation network.



Source: JICA Study Team

Figure 4.2 Demand Forecast Results in 2019 and 2040

Locating an urban freight terminal near the center of a city offers several advantages:

- **Proximity to Market and Customers:** Being located near the city center places the freight terminal in close proximity to businesses, retailers, and customers. This reduces the distance and time required for goods to reach their final destinations, enabling faster and more efficient deliveries.
- **Reduced Last-Mile Delivery Costs:** The central location of the freight terminal reduces the distance and complexity of last-mile delivery, which is often the most expensive and time-consuming part of the supply chain. With shorter distances to travel, transportation costs and delivery times can be minimized.

- **Accessibility and Connectivity:** Central areas of a city typically have well-developed transportation infrastructure, including major roads, highways, and public transportation networks. Locating a freight terminal near the city center ensures easy access to these transportation routes, facilitating the movement of goods and enhancing connectivity with suppliers, customers, and other logistics hubs.
- **Efficient Urban Distribution:** A central freight terminal allows for efficient distribution within the urban area. It serves as a hub for consolidating and redistributing goods, enabling efficient use of vehicles and reducing the number of individual deliveries. This helps to optimize routing, minimize traffic congestion, and improve overall urban freight efficiency.
- **Enhanced Service Flexibility:** Being located near the center of the city provides opportunities for additional services and value-added offerings. The proximity to customers allows for more convenient pick-up and drop-off options, as well as the possibility of offering services such as express deliveries, same-day deliveries, or specialized handling.
- **Synergy with Urban Development:** Locating a freight terminal near the city center aligns with urban planning and development objectives. It supports the concept of sustainable and compact cities by reducing the need for long-distance transportation, promoting mixed land-use development, and minimizing the environmental impact associated with freight movements.
- **Collaboration and Partnerships:** A central freight terminal encourages collaboration and partnerships among logistics providers, retailers, and other stakeholders. Being in close proximity fosters cooperation, information sharing, and joint initiatives to improve logistics efficiency, sustainability, and customer service.
- **Economic Benefits:** A centrally located freight terminal can generate economic benefits for the city, such as job creation, increased business opportunities, and improved trade and commerce. It can attract businesses, logistics companies, and related industries, contributing to local economic growth and development.

According to this forecast, in 2040 traffic congestion is getting heavier in the center of the city. It is possible to locate an urban freight terminal in an expanding area of the city. When selecting a suitable location for the terminal, considerations should be given to factors such as accessibility, connectivity, proximity to major transportation routes, and the projected growth patterns of the city. Placing the terminal in an expanding area has several advantages:

- **Proximity to Growth Areas:** By locating the terminal in an expanding area, it can be positioned closer to new residential and commercial developments. This proximity allows for more efficient and timely deliveries to these growing areas, reducing the need for long-distance transportation and minimizing congestion in the central parts of the city.
- **Infrastructure Development Opportunities:** As the area expands, there may be opportunities for infrastructure development, including the construction of new roads, bridges, and transportation hubs. These developments can enhance the connectivity of the terminal, improving access to major transportation routes and facilitating the movement of goods in and out of the terminal.
- **Future-Proofing:** Placing the terminal in an expanding area ensures that it is well-positioned to serve the needs of the growing population and businesses in the future. It allows for the integration of future urban planning initiatives and infrastructure projects, supporting the efficient movement of goods as the city continues to expand.
- **Reduced Congestion in Central Areas:** By locating the terminal in an expanding area, it helps distribute freight flows away from the congested central parts of the city. This can contribute to a more balanced distribution of traffic and reduce congestion in the core areas, improving overall traffic flow and minimizing disruptions to urban life.
- **Economic Development Opportunities:** The establishment of an urban freight terminal in an expanding area can also stimulate economic development in that region. It can attract businesses, create employment opportunities, and support local industries. The terminal can act as a catalyst for further growth and development in the surrounding areas.

However, it is essential to conduct thorough feasibility studies and consider the long-term implications of locating the terminal in a specific area. Factors such as land availability,

environmental impact, and community engagement should be carefully assessed to ensure the terminal's successful integration into the expanding city.

4. Result

After analyzing the available data and information, it has been determined that a convenient location for an urban freight terminal in Ulaanbaatar city would be at least 10 kilometers from the city's center in the western direction or near the main road to Nalaikh. The selection of these locations is based on several factors that have been taken into consideration.

Firstly, the population of Ulaanbaatar city is steadily increasing, and the city is experiencing expansion due to its high population density. As the city continues to grow, the demand for efficient freight transportation and logistics services becomes increasingly important. By locating the freight terminal outside the city center but within a reasonable distance, it allows for easier access to major transportation routes while minimizing the impact on densely populated areas.

Locating the urban freight terminal near the main road to Nalaikh offers strategic advantages. The road provides a direct link to other major highways and facilitates efficient transportation of goods to and from the terminal. This location also allows for potential future expansion of the terminal as the city continues to develop and expand in that direction.

While it is acknowledged that locating the terminal closer to the city center could offer certain benefits in terms of proximity and reduced transportation distances, there are inherent disadvantages that need to be considered. The city center is prone to traffic congestion, and placing a freight terminal in such an area could exacerbate the congestion issues, resulting in delays and increased costs. Additionally, the proximity to densely populated areas may lead to environmental impacts such as noise pollution and increased emissions.

Considering these factors, a balance needs to be struck between proximity to the city center and the efficient functioning of the freight terminal. The selected locations provide

a compromise between accessibility and minimizing potential negative impacts on the urban environment.

It is important to note that as the city of Ulaanbaatar continues to expand, future adjustments and revisions to the location of the urban freight terminal may be necessary. Regular monitoring of population growth, transportation infrastructure development, and urban planning initiatives should be undertaken to ensure the ongoing efficiency and effectiveness of the selected terminal locations.

In conclusion, based on the analysis of the available data and information, a convenient location for an urban freight terminal in Ulaanbaatar city would be at least 10 kilometers from the city's center in the west or near the main road to Nalaikh. These locations strike a balance between accessibility and minimizing potential negative impacts associated with locating closer to the densely populated city center. However, ongoing monitoring and evaluation should be conducted to ensure the continued suitability of these locations as the city evolves and expands.

5. Discussion

Firstly, the discussion centers around the significance of population growth and urban expansion in Ulaanbaatar city. With an increasing population and high population density, it is crucial to establish efficient freight transportation and logistics services. The selected locations for the urban freight terminal take into account the city's expanding nature, ensuring accessibility to major transportation routes while minimizing the impact on densely populated areas. This strategic approach aligns with the objective of facilitating seamless goods movement to meet the growing demands of the city.

Another important aspect to discuss is the trade-off between proximity to the city center and the potential disadvantages associated with it. While locating the urban freight terminal closer to the city center may offer advantages in terms of reduced transportation distances and improved accessibility, it is essential to consider the drawbacks. The analysis acknowledges that the city center is prone to traffic congestion, which could impede the efficiency of freight transportation. Additionally, placing the terminal in densely populated areas may give rise to environmental concerns such as increased noise pollution and emissions. Therefore, the decision to position the terminal at least 10 kilometers from the city center or near the main road to Nalaikh demonstrates a careful balance between proximity and the need to mitigate potential negative impacts.

Moreover, the discussion should address the future expansion and adaptability of the selected terminal locations. As the city continues to grow and evolve, it is vital to regularly monitor population trends, transportation infrastructure developments, and urban planning initiatives. This ensures that the chosen locations remain efficient and effective in meeting the evolving needs of Ulaanbaatar city. Flexibility and periodic reassessment of the terminal locations will be crucial in accommodating future changes and maintaining optimal freight logistics operations.

Furthermore, it is pertinent to discuss the efficiency of the chosen locations in relation to the overall urban freight system. While locating the terminal near the main road to Nalaikh offers strategic advantages, it is important to consider the connectivity and integration of the terminal within the broader freight network. Efficient access to major transportation

routes, including highways and railway connections, will enhance the terminal's functionality and its ability to facilitate smooth goods movement not only within Ulaanbaatar but also regionally and nationally.

In addition, the discussion should touch upon the potential economic impacts of the chosen terminal locations. Establishing a convenient urban freight terminal can foster economic growth and development by improving the flow of goods and enhancing supply chain efficiency. The selected locations, while considering the potential disadvantages, aim to support economic activities by providing easy access to transportation networks and facilitating trade and commerce.

Overall, the discussion highlights the importance of identifying a convenient location for an urban freight terminal in Ulaanbaatar city that takes into account population growth, urban expansion, proximity to major transportation routes, and mitigating potential negative impacts. It emphasizes the trade-offs associated with locating the terminal closer to the city center and acknowledges the need to strike a balance between proximity and efficient goods movement while considering environmental concerns. The discussion also underscores the significance of ongoing monitoring, adaptability, and integration within the broader freight network to ensure the long-term effectiveness and sustainability of the chosen terminal locations as the city continues to evolve and grow. By considering these factors, policymakers and stakeholders can make informed decisions regarding the optimal location of the urban freight terminal to support the city's economic development and enhance its logistics capabilities.

6. Conclusion

In conclusion, this study has examined the selection of a convenient location for an urban freight terminal in Ulaanbaatar city, taking into account various factors such as population growth projections, historical data, road transport statistics, and traffic congestion trends.

Based on the analysis of population growth projections and historical data, it is evident that the population of Ulaanbaatar city is steadily increasing. This population growth, coupled with the city's expanding nature, necessitates the establishment of an efficient freight transportation system. The selected locations for the urban freight terminal, situated at least 10 kilometers from the city center in the west or near the main road to Nalaikh, are well-suited to accommodate this growth and expansion.

Moreover, the analysis of road transport statistics from the past five years indicates the importance of considering traffic congestion trends. Placing the freight terminal outside the city center helps mitigate potential traffic congestion issues that could hamper the efficiency of goods movement. By strategically locating the terminal away from densely populated areas, the negative impact on traffic flow and transportation times can be minimized.

Furthermore, the projection of future traffic congestion reinforces the need for a convenient location for the urban freight terminal. As the city continues to grow and urbanization intensifies, traffic congestion is expected to worsen. Therefore, placing the terminal in areas that allow for smoother transportation flows, such as the selected locations near the main road to Nalaikh, can help alleviate congestion and ensure more efficient goods movement.

However, it is important to note that the selection of terminal locations is not without its challenges. While locating the terminal closer to the city center may offer certain advantages in terms of proximity, it also presents potential disadvantages such as increased traffic congestion and environmental impacts. By choosing locations that strike

a balance between accessibility and minimizing negative impacts, the efficiency of the urban freight terminal can be maximized.

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