



Review article

Changing institutional landscape and transportation development in Dhaka, Bangladesh

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ABSTRACT

Cities in the global south, constrained by limited resources, face challenges in delivering efficient transportation infrastructure and services to support their rapidly growing urban populations. Dhaka, serves as an example, as it grapples with the increasing demand driven by population growth, exacerbated by factors like land and resource scarcity, as well as intricate geopolitical dynamics. Despite the construction of a metro rail and other similar mass transit options, Dhaka continues to face difficulties in meeting the increasing transportation demand, posing a persistent challenge. Multiple institutions, including a coordination authority, are working to provide improved transportation services by implementing diverse strategic approaches focusing on infrastructure development, and formulating policies aimed at facilitating better mobility and accessibility. Over the past fifty years, the institutional arrangement and roles within the transportation system have changed. This study examines the institutional arrangements and how they have evolved, along with reviewing transportation development policies during this period. The findings indicate the involvement of multiple organizations in the city's transportation system performing distinct activities— administrative, coordinating, legislative, regulatory, construction and management, and law enforcement. These authorities often encounter challenges fulfilling their responsibilities stemming from differences in vision, organizational structure, jurisdiction and most notably, lack of coordination, resulting in ineffective infrastructure development and duplicated activities. To improve the transportation system, this study recommends better equipping the existing coordinating authority and expanding its jurisdiction to include other institutions. This approach aims to enhance coordination and address the challenges faced by Dhaka's transportation system, ultimately facilitating improved mobility and accessibility for the city's growing population.

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1. Introduction

Contemporary urbanization, economic and technological growth greatly relies on transportation systems, which serves as a vital link between human activities and space, impacting various socio-economic, political, and technological factors across different spatial scales [1,2]. The role of transportation in urban development is well-studied in the literature [3–6], and these studies consistently highlighted the significance of a well-organized transportation system for fostering the growth and economic development of any urban area [7–9]. From the literature, it is well established that achieving efficiency in transportation requires the interconnection of several elements, including stakeholders, available technologies, multi-modality, legislative policies, planning processes, and control strategies [10,11].

The planning, operation, and control of transportation systems present convoluted and challenging tasks involving various actors, such as ministries, departments, and agencies at different administrative levels, each with distinct goals and characteristics [11–13]. This institutional fragmentation, coupled with the diffused nature of authority and jurisdiction, power and resource asymmetry, and interrelationships among multi-levels of government, creates coordination challenges and integration issues among the institutions responsible for transportation management [12,14,15]. Insufficient coordination among these fragmented institutions gives rise to a range of problems, including project delays, cost overruns, undesired projects, and activity duplications [13,14,16]. This underscores the significance of integrating these agencies in decision-making and implementation processes toward achieving an efficient and sustainable transportation system [17,18]. Therefore, a thorough examination of all institutions associated with the transport system is imperative to warrant effective coordination, which constitutes the primary motivation of our study [19–21].

Dhaka, the capital of Bangladesh, is experiencing significant challenges in its urban transportation planning, leading to an ungovernable and constantly deteriorating situation [22,23]. With a population of over fifteen million, the city experiences immense daily travel demand, leading to various problems such as traffic congestion, extended and uncertain delays, subpar public transport services, inadequate comfort, pedestrian insecurity, and worsening air pollution [24,25]. The city's existing ground transportation network (~7% of the total built-up area), well below the set planning standards (~25%) to support the huge number of city residents, is struggling to handle the increasing pressure from both motorized and non-motorized traffic, each with unique attributes [26]. Several authorities and agencies are operating in Dhaka city to plan, manage, control, and implement these massive and extensive transport infrastructures and heterogeneous modalities. Even though all these institutions operate with a similar, shared objective to improve the quality of the services provided by the existing transportation system, the coordination (or any such arrangements to ensure coordination) among these institutions is minimal, resulting in significant obstacles in implementing effective policies to address the mounting challenges [27,28]. Thus, this research is particularly interested in answering the following research questions: 1) what is the current institutional arrangement of transport authorities in Dhaka city? 2) how has this institutional landscape evolved? 3) Which policies have been instrumental in guiding transportation development in Dhaka city in the past fifty years?

The transportation system in Dhaka city suffers greatly from a lack of coordination among different authorities. Prior to 1983, the Bangladesh Road Transport Authority (BRTA) was the only institution responsible for managing transportation affairs and addressing urban transportation issues in the city. The first initiative to collect information about transport services demand and infrastructure to deliver the services was undertaken in the early 1990s by the Government with financial support from the World Bank [29]. The proposals from that study led to the formation of an independent authority to coordinate transport-related activities in Dhaka city and a Strategic Transport Plan (STP) for the city. Since then, as the transportation patterns in the city have changed, the city's transportation institutions and policies have undergone constant evolution, now operating within a complex polycentric governance framework.

In practice, every transport agency in Bangladesh independently develops and implements its plans without consulting or adhering to standards set by other agencies. This lack of coordination serves as the primary cause of construction delays, duplicated efforts, and other issues within the transport sector. For instance, inadequate coordination and conflicts among responsible authorities, along with design issues, led to a doubling of costs in the Bus Rapid Transit (BRT) project [30]. Considering these complex problems of Dhaka City's transportation system, it is imperative to establish appropriate policies and institutional arrangements that address both short- and long-term challenges, thereby progressing toward a sustainable and efficient transport system [24,31].

A comprehensive understanding of the evolution and organizational arrangements of transport institutions, along with the underlying policy frameworks, is crucial for fostering effective coordination among these entities. Existing studies focused on the transportation system in Dhaka city have primarily focused on specific aspects such as congestion [24,24,32,33], eco-efficiency, and emission [31,34,35], multi-modality [24,36], travel behavior [37,38], performance evaluation [25], and transport sustainability [31, 39]. However, there is a notable gap in the literature regarding the analysis of the dynamic nature of transportation institutions and policies. This paper makes one of the first attempts to examine the institutional arrangement in Dhaka city's transport sector since independence in 1971 and how they are performing their devoted functions and interacting with each other. At the same time, it also explored the studies and regulatory frameworks during this period and provided a concise summary of these studies. We only considered road transportation for this study purpose. Therefore, water transportation, railway, and air transportation were not considered at any point in this study.

2. Methodology

For our study, we primarily focused on the policy documents and other relevant documents available from different institutions. Since a cursory online search did not provide much information on the institutional arrangement in the transportation sector in Dhaka city, we focused on institutional survey to identify the institutions and policies enforced in Dhaka city's transportation sector. We

contacted the Dhaka Transport Coordination Authority (DTCA) to access their library records on transportation policies and other relevant resources. Once we were allowed to access their library records, we reviewed the published studies and paper documents in the archives and libraries in DTCA. Since there were not many published records from academic and scientific journals, we also performed an expert survey to locate relevant works. We contacted and interviewed personnel's who are either currently working or previously worked in the transportation-related organizations in Dhaka city. These experts either worked with DTCA in any of the transportation development activity plans or now working in different aspects of metro rail or bus rapid transit program. Their opinions and previous works guided us in finalizing the list of authorities working in Dhaka city's transportation sector. The survey and overall study were approved by Urban and Rural Planning Discipline, Khulna University. Based on our literature search, expert-opinion, and institutional survey, we finalized the list of policies based on the following criteria-i) whether the record is publicly available, ii) focused primarily on Dhaka city, iii) the document is legally accepted and available to the institutions as a regulatory document. If any policy document's full text was not available for us to review, we did not consider that in this study. We also did not include any ongoing projects or policies pending approval from appropriate authorities. A general workflow diagram for this study is shared in Fig. 1.

3. Existing transportation scenario in Dhaka City

Dhaka, as one of the most densely populated cities, home to approximately half of Bangladesh's urban population [22,40]. Remarkably, it has consistently ranked among the top ten most unlivable cities in the [Global Livability Ranking report](#) for the last decade (2011–2021) [41,42]. Despite the rapidly growing urban population and high urbanization rate, the city is not serving its inhabitants the required amenities to the desired level [43]. The existing transportation system, primarily road transportation dependent, is a critical bottleneck for the city's growth. Such high density in the city with limited habitable land and inadequate infrastructures results in massive congestion and limits the transport system's ability to provide adequate mobility for the users. Rapid urban population growth and mixed urban land-use patterns also generated substantial travel demand and numerous transport problems in Dhaka city [22,29,43,44]. It has resulted in accessibility deterioration, lowered quality of service, compromised safety and comfort, and operational efficiency. However, since Dhaka is the administrative, commercial, and cultural capital of Bangladesh, the entire nation suffers from these problems.

The road networks in Dhaka encompass approximately seven percent (7%) of the city's total built-up area. The overall length of the transportation network in the city is approximately 3,000 km [25]. On a typical workday, the residents of the city undertake over 21 million trips, with public buses and rickshaws being the primary modes of transportation [45,46]. Even though the nature of the city's transportation modes is labeled as "multi-modal," it is estimated that more than two-thirds of the motorized vehicles operating during peak hours are private vehicles [25]. However, regardless of the total share, the city streets share a diverse modal split-around 30% non-motorized vehicles, approximately 45% private vehicles, and only about 10% public buses [26]. Remarkably, this small share of public buses carries more than 75% of all passengers. Although Dhaka's transportation network is not extensive, it does have a well-connected bus service with 152 routes within the metropolitan area [25,26]. The city's streets are consistently congested with vehicles, experiencing gridlock for most of the day and night [47]. This extreme congestion results in increased travel times and reduces the commercial speed of the vehicles, ultimately leading to a decline in the overall functionality of the transportation system. However, it is alarming that the entire system operates without any supervisory authorities or guiding outlines or government incentives [22,25].

The current condition of the transportation system is in such a bad state that the average vehicle speed has lowered down to 7 km

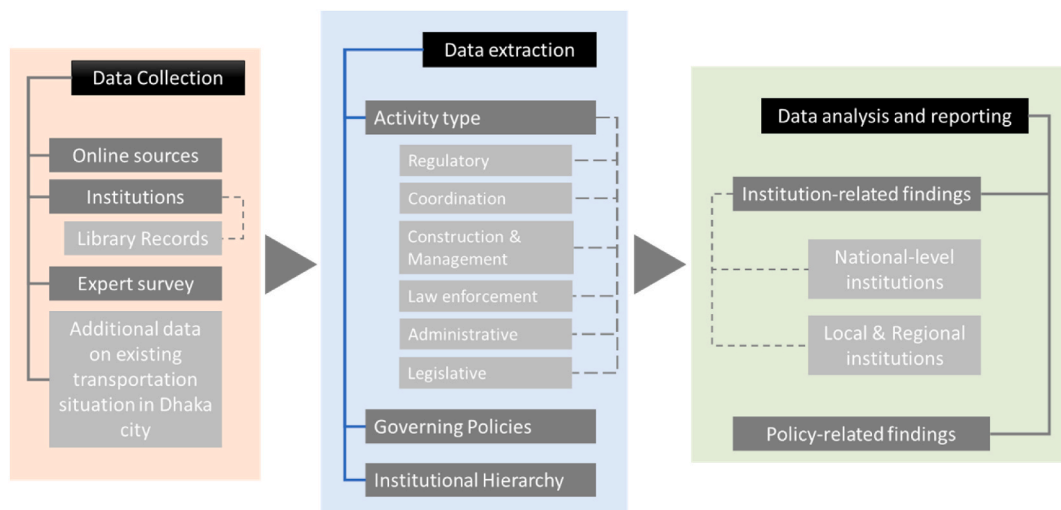


Fig. 1. Workflow diagram (from data collection through data analysis) for this study.

per hour, which is as slow as the average walking speed and projected to be 4 km per hour by 2035 [26,32,48]. It is estimated that Dhaka's traffic congestion is causing about 3.2 million business hours loss every day. These working hours are equivalent to a loss of 2.68 billion USD per year, which is more than half of the entire annual development budget [24,26,32,49]. The same analysis accused the mixture of high and low-speed vehicles in the street for this. However, in recent years, several mass rapid transit options are under implementation in the city. The Strategic Transportation Plan (STP) for Dhaka city initially introduced the concept of mass rapid transit options with the aim of improving the performance of the existing system [50]. After undergoing various modifications, the city is preparing to introduce its first metro rail in 2023 [51,52].

4. Result

4.1. Institution involved in transportation sector in Dhaka City

From our review, we found several institutions at different levels are working in the transportation sector of Dhaka city. We found four ministries and ten organizations that contribute or share activities in this area. We also found a series of policy documents and studies that determine these organizations' responsibilities and determine what development will take place. We grouped these organizations into six categories based on their core responsibilities and involvement in the transportation development of the city (Fig. 2). We broadly classified the activities into six categories (a. Regulation, b. Coordination, c. construction and management, d. Law-enforcement, e. Administrative role, and f. Legislation (organizations under this category is shown in the outer orbit of Fig. 2) and then assigned the institutions to each of these activity. We considered the primary transportation-related activity if any institution has multiple roles.



Fig. 2. Institutions involved with transportation-related activities in Dhaka city. Most inside bands represent the core activities of the institution in the system. The next band is the agencies and authorities connected to those responsibilities. The third band from the core indicates the policies under which these agencies operate currently. The most outer band indicates the ministry to which these authorities belong. We only reported the agencies and ministries that are connected to the road transportation system. (Abbreviations used: DTCA- Dhaka Transport Coordination Authority; MVO- Motor Vehicle Ordinance; GO- Government Order; MRA- Metro Rail Act; BRT- Bus Rapid Transit; DMC- Dhaka Metropolitan Corporation; LGA- Local Government Act; DMP- Dhaka Metropolitan Police; TED- Traffic Engineering Department; RAJUK- Rajdhani Unnayan Kartripakkho; MoHPW- Ministry of Housing and Public Works; MoLGRDC- Ministry of Local Government Rural Development Cooperation).

4.1.1. Regulatory authorities

From the review, we found two organizations that actively contribute to the regulatory functions of the transportation sector in Dhaka city- Bangladesh Road Transportation Corporation (BRTC) and Bangladesh Road Transportation Authority (BRTA). A critical similarity among these three organizations is that their jurisdiction is not limited to Dhaka city(). Instead, they are responsible for performing the same task all over the country [53,54]. BRTC, a semi-autonomous organization operating under the Ministry of Road Transportation and Bridges (MoRTB), is the oldest transportation-related organization in Bangladesh (established back in 1961, before the independence of Bangladesh) [55]. BRTC primarily focuses on providing a quality passenger service through the bus service it operates on intra-city and inter-city routes. However, it also helps the government with bus services for the public service employees, school bus services, bus services for women inside Dhaka city [56].

Over the years, BRTC shared some of its initial responsibilities with BRTA, which has been operating under the same ministry since 1988 to control, streamline, and enforce discipline in road transport to ensure the safe and smooth operations of the same. BRTA has a vital role in Dhaka city's transportation development and operation despite its nationwide jurisdiction and operations. It authorizes and oversees the route permit provision, vehicular registration, driver's license issuance and determines a rationale fare for both the operators and passengers [55]. BRTA is also responsible for monitoring the city's bus service (The Motor Vehicle Ordinance, 1983, (Ordinance no. LV of 1983), section 54). However, lack of resources and inadequate workforce and logistics support is causing a significant backlog in the responsibilities BRTA was supposed to perform. A deficient license issuing system and inefficient institutional practices also resulted in a considerable number of fake licenses. In most cases, these fake license owners do not have proper driving training and knowledge of traffic rules and regulations [25,57].

4.1.2. Coordinating authority

Dhaka Transport Coordination Authority (DTCA) is the designated entity responsible for coordinating all the activities in the transport sector in Dhaka city [58]. DTCA, earlier known as the DTCCB, was established after the Dhaka Integrated Transport Study (DITS) described the transportation environment in Dhaka as "Chaotic with chronic traffic congestion, lack of traffic management, conflicts of jurisdiction, and poor coordination among agencies" [46]. The main recommendation of the DITS was to establish an organization that will not only coordinate among different organizations but will also focus on implementing mass transit options for the public. Based on that recommendation, the Greater Dhaka Transport Planning and Coordination Board (GDTPCB) was established in 1997 to carry out transport planning and coordination activities within the Greater Dhaka area (Dhaka Metropolitan Area (DMA), Gazipur, Savar, Narayanganj). The GDTPCB was renamed as Dhaka Transport Coordination Board (DTCB) in 2001. DTCB was responsible for developing the first Strategic Transport Plan (STP) for Dhaka [50]. They were also responsible for advising and coordinating different agencies for implementing the recommendations in STP in the following years.

The vision behind DTCCB's establishment was to enable efficient mobility of the people and freights through the planning of an integrated multimodal, safe, and environment-friendly strategies [58]. It was envisioned to take an advisory role to develop an integrated and safe transportation system for Dhaka city and make necessary arrangements to achieve that purpose by developing a strategic plan. Although DTCCB has developed the said Strategic plan (STP, 2005, revised in 2015 (RSTP 2015)), even after 15 years of the establishment, the DTCCB has not yet been able to perform the functions properly-mainly the absence of appropriate legal coverage and institutional capacity [59]. That is why the government has approved reorganizing and strengthening the DTCCB, and renamed it to DTCA with more legal authority [46,59]. DTCA is now working with the same vision and mission to ensure a better transportation situation in Dhaka city. The ongoing Bus Rapid Transit (BRT), Mass Rapid Transit (MRT), and Elevated Expressway (EE) projects are some of the recent examples of DTCA's emphasis on mass transit development in Dhaka city [60,61].

4.1.3. Construction and management authorities

The Roads and Highways Department (RHD) was established in 1962, even before Bangladesh was an independent country [62]. With jurisdiction all over the country, RHD is responsible for the construction and maintenance of the major road and bridge network. So far, they have constructed 20,878 km of roads and 18,258 bridges all over Bangladesh [45]. As these infrastructures are significantly important for national economic growth, this places a great responsibility on RHD. Inside Dhaka, RHD does not perform any other activity other than maintaining the national highways crossing through the city.

In contrast, the Local Government Engineering Department (LGED) is another national organization function within Dhaka city [63]. LGED is responsible for developing transportation infrastructures in rural areas and provides technical support for transportation development where necessary, regardless of urban-rural classification. However, in recent years, LGED is carrying out multiple large-scale transportation infrastructure development projects inside Dhaka city. At the same time, they are responsible for developing bus terminals and construction and maintenance of minor roads within the city. However, even though they build the terminals, it is beyond their jurisdiction to maintain and oversee the terminal after the construction. Although the mission and vision are different, two new agencies are also working in the construction and management of transportation infrastructure in Dhaka city. The Dhaka Mass Transit Company Limited (DMTCL) is responsible for implementing the ongoing metro rail projects in Dhaka city [64]. As the government emphasizes providing more reliable, fast, and environment-friendly public transit modes to the residents, DMTCL is working to construct these mass transit projects. With a similar motivation, Dhaka Bus Rapid Transit Company Limited (Dhaka BRT) is working to construct the Bus Rapid Transit (BRT) routes, which are designed to complement the vision of the metro rail system [65].

4.1.4. Administrative authorities

Dhaka city is divided into two city corporations (North and South), who are responsible for all the administrative works for their respective jurisdiction [66,67]. The Transportation and Engineering Department (TED) in both the city corporations are operational

Table 1

Transportation institutions, their responsibilities and contribution to the transportation development in Dhaka city.

Ministry	Organization Name	Establishment Year	Jurisdiction	Responsibilities	Contribution	Institution Category
Ministry of Road Transport and Bridges (MoRTB)	Dhaka Transport Coordination Authority (DTCA)	Established as DTCB in 1998, renamed to DTCA in 2012	6 Districts- Dhaka, Gazipur, Narayanganj, Munshiganj, Manikganj, Narsingdi	<ul style="list-style-type: none"> Develop and construct mass transit system as part of an integrated public transport network Plan, coordinate and approve recommended transport projects and provide advice and guidance to other agencies 	<ul style="list-style-type: none"> Metro Rail Act 2015 Bus Rapid Transit (BRT) Act 2016 Bangladesh Urban Transport Authority (BUTA) Act Draft Metro Rail Policies 2016 Draft Parking Policy 	Coordinating Authority
	Bangladesh Road Transport Authority (BRTA)	January 1988	Whole Bangladesh	<ul style="list-style-type: none"> Vehicle registration and driving license issuance Route permits for buses Collecting road fees and taxes Negotiating with commercial vehicle operators 	<ul style="list-style-type: none"> National Land Transport Policy, 2004 Bangladesh Road Transport Acts 2017 Ride Sharing Service Guideline 2017 Guidelines regarding electric vehicle registration 	Regulatory Authority
	Bangladesh Road Transport Corporation (BRTC)	February 1961. Assumed current name in 1971	Whole Bangladesh	<ul style="list-style-type: none"> Increase passenger transport facilities Introduce modern vehicles to the fleet Create skilled manpower in the transport sector. Build a reliable transport system and play a role in the socio-economic development of the country. 	<ul style="list-style-type: none"> Bus Services in National and International Routes Dedicated Bus Service for the Women and Educational institutions Truck Service around the country 	Regulatory Authority
	Dhaka Bus Rapid Transit Company Ltd (Dhaka BRT)/ (DBRTCL)	July 2013	Greater Dhaka city	<ul style="list-style-type: none"> To implement fast, affordable, safe, comfortable, environment friendly, universally accessible, high-capacity bus based modern public transport network system 	<ul style="list-style-type: none"> North section of BRT line 3 is under construction The detailed design of south section of BRT line 3 is also completed 	Construction and management authorities
	Dhaka Mass Transit Company Limited (DMTCL)	June 2013	Greater Dhaka city	<ul style="list-style-type: none"> For planning, surveying, designing, financing, construction, operation and maintenance of Mass Rapid Transit (MRT) or Metrorail to reduce traffic congestion and improve the environment 	<ul style="list-style-type: none"> Dhaka Mass Rapid Transit Development Project (Line-1 to 6) 	Construction and management authorities
Ministry of Local Government, Rural Development and Cooperatives (MoLGRDC)	Roads and Highways Department (RHD)	1962	Whole Bangladesh	<ul style="list-style-type: none"> Continuous development of the Road Network throughout the country 	<ul style="list-style-type: none"> Existing 22,418.95-km network. 	Construction and management authorities
	Dhaka North City Corporation (DNCC)	1983 (Divided into two parts in 2012)	Dhaka City	<ul style="list-style-type: none"> Construction & Maintenance of the public spaces and amenities around the city 	<ul style="list-style-type: none"> Environmental and Social Assessment of Construction of Warehouse in DNCC under Urban Resilience Project Preparation of road excavation policy of Dhaka South City Corporation Taxation Rules 	Administrative authorities
	Dhaka South City Corporation (DSCC)					

(continued on next page)

Table 1 (continued)

Ministry	Organization Name	Establishment Year	Jurisdiction	Responsibilities	Contribution	Institution Category
Ministry of Housing and Public Works (MoHPW)	Rajdhani Unnayan Katripakkha (RAJUK)	1956 (renamed in 1987)	Dhaka City	<ul style="list-style-type: none"> Preparation of Strategic Plan, Structure Plan, Detailed Area Plan, Master Plan for Dhaka city and provide and maintain transportation infrastructure in Dhaka city 	<ul style="list-style-type: none"> Municipal Corp. Rules-1986 Detailed Area Plan (DAP) Private Housing Project Land Development Rule, 2004 Imarat Nirman Bidhimala' 1996 Dhaka Mahanagar Building (Construction, Development, Protection and Removal) Rule, 2008 	Administrative authorities
Ministry of Home Affairs (MoHA)	Dhaka Metropolitan Police (DMP)	February 1976	Dhaka Metropolitan Area	<ul style="list-style-type: none"> Application of traffic policies, traffic regulation and improvement of street environment for the users and traffic law enforcement inside Dhaka Metropolitan Area 	<ul style="list-style-type: none"> Law enforcement and side-walk clearance for the metro rail and BRT projects 	Law enforcement authorities

and related to administration. They are associated with the infrastructure maintenance, planning, and monitoring of supporting transport infrastructure to make services available. Functions of the city corporations are manifold-maintain and develop city streets, traffic signals and streetlights, construction and improvement of bridges/culvert and footpath and foot over-bridges, setting up, and maintenance of traffic signals at all critical intersections, non-motorized vehicle (rickshaw) licenses issuance, rickshaw driver's licenses, construction and maintenance of bus terminals and parking spaces [46,59]. Traffic Engineering is the mandated responsibility of TED. But due to institutional incapacity and lack of resources and logistics, they can hardly do anything and thus, become ineffective. The city corporation is performing traffic engineering duties without having proper knowledge and any supporting technical studies. As a result, the actions are not always appropriate and sustainable and create unwanted consequences for the people.

On the other hand, Rajdhani Unnayan Katripakkha (RAJUK) works with a vision very similar to the city corporations to bring welfare to the residents. Founded in 1987, RAJUK plays a similar role in the transportation sector as the city corporations except that they are entitled to prepare structure plan, strategic plan, master plan, and detailed area plans, which eventually guides the city's development [68]. The structure plan (the current one from 2015 to 2035) has a separate transportation development strategy with a vision to establish a sustainable road network for the metropolitan area [69]. The expectation is that it would provide access for the growing urban concentrations to the urban center itself and connect the center with potential growth areas [59]. However, RAJUK cannot enforce its development proposals in these plans with inadequate institutional capacity and support. Additionally, they are more focused on ensuring proper development regulations and accommodations for the rapidly growing urban population, which keeps the transportation focus on the backseat.

4.1.5. Law enforcement authorities

None of the organizations mentioned above are empowered and have legal provisions to enforce the rules and regulations in the transportation sector. Dhaka Metropolitan Police (DMP) is authorized to control traffic movement and enforce traffic rules and regulations in the city [59]. The DMP divided the entire metropolitan area into four traffic divisions, headed by a Deputy Commissioner (DC)- East, West, North, and South. Each division is further divided into zones based on the geographical area. Assistant Police Commissioner (APC) is the head of each zone. The DMP (traffic) is responsible for-ensuring smooth traffic flow every day; taking actions against traffic violations; enhancing the comfort of the pedestrians and passengers; taking measures to reduce road accidents; providing safe and uninterrupted movement to nationally significant personnel, and collecting fines imposed for a traffic violation and deposit the same to the treasury. The Police Commissioner, DMP, is Chairman of the Dhaka Metropolitan Regional Transport Committee (DMRTC), and the four DC (Traffic) are the essential members [46]. The DMP plays a dominant role in regulating the public transport system in the city and strongly influences the formulation of public transport policy, planning, and other development activities.

4.1.6. Legislative authorities

All the organizations reported in the prior five categories work under a ministry that determines the scope of these organizations' work and jurisdiction. The Ministry of Road Transportation and Bridges (MoRTB) is the center of all the transportation-related activities all over the country, including Dhaka city. DTCA, BRTA, RHD- all belong directly under this ministry. However, even with an

entire ministry for transportation, other ministries are also working in this sector. The Ministry of Railway, for example, is responsible for overseeing and maintaining any rail-related activities. In contrast, there are two separate ministries for water-transportation-related issues-the Ministry of Water transport and the Ministry of Shipping. However, these are not the only ministries that are involved in Dhaka city’s transportation geography. The Ministry of Home Affairs (MoHA) oversees the Dhaka Metropolitan Police that is responsible for any law-enforcement activities. LGED works under the Ministry of Local Government, Rural Development and Cooperatives (MLGRDC) to ensure transportation infrastructure development all over Bangladesh. Despite the similar nature of their works, RAJUK and the city corporation do not work under the same ministry. RAJUK works under the Ministry of Housing and Public Works (MoHPW), whereas the city corporations belong to the MoLGRDC. Due to this multi-ministry involvement in similar works, transportation development, and related works often face a bureaucratic delay and result in a lengthy legal process from plan preparation to adoption to implementation (see Table 1 for jurisdictions and responsibilities of each of these entities).

We provided a list of these organizations with their respective ministries, jurisdiction, and key roles in Dhaka city’s transportation development in Table 1. Although we reported and connected each institution to one responsibility only, they often go beyond that specific responsibility. However, as these are not documented under their mission statement, we did not consider those activities.

The organizations working in Dhaka city’s transportation sector can be further classified based on their scale and level of activities (Fig. 3). Some of these institutions are working beyond the city area at a more national scale transportation planning and management (i.e., BRTA, RHD, BRTC, LGED etc.). These national-level organizations are more focused on the regulations and policies, and interconnectedness of different cities and growth centers. On the contrary, regional and local level institutions emphasize infrastructure development and regular maintenance works. For example, RHD is responsible for constructing and maintaining the highway system and major roads in the country. In contrast, LGED focuses on developing transportation infrastructure in rural Bangladesh and building bus terminals within the city. The issuance of driving licenses and route permits and fare determination is the responsibility of BRTA, whereas planning and maintaining the public transport system is the duty of BRTC. All these organizations are responsible for the same activities at the national level and at the city level. All these above-stated institutions work under different ministries, which also serve the whole nation. Although RHD and DTCA belong to the same ministry as BRTA and BRTC, they perform a different role than those two. RHD focuses more on construction and structural improvement. DTCA, on the other hand, is the authority entitled to coordinate and look after everything related to urban transportation in Dhaka city [59,70,71]. The presence of multiple organizations performing similar activities is creating mismanagement of resources and, at times, reducing the system’s performance.

4.2. Policy and regulatory provisions in the past 50 years

The number of studies on Dhaka city’s transport system is increasing rapidly as the city is struggling to keep pace with the growing urban population (Table 2). The Greater Dhaka Metropolitan Area Integrated Transport Study (DITS) (1991–1993) was the first attempt by the government that examined the transportation services and infrastructure demand to ensure essential services for the citizens [59]. The study reported the importance of an immediate action plan for the effective management of the existing system. As the need for sustainable investment in the transportation sector was growing, the government, with the World Bank funding, followed up this project with the Dhaka Urban Transport Project (DUTP). This project was completed in two separate phases- Phase one ended in 1998, and phase two started after that with reference to the first phase. Both projects aimed at outlining detailed plans for transportation systems improvement in the city. The recommendations from these projects were focused on public bus operations,

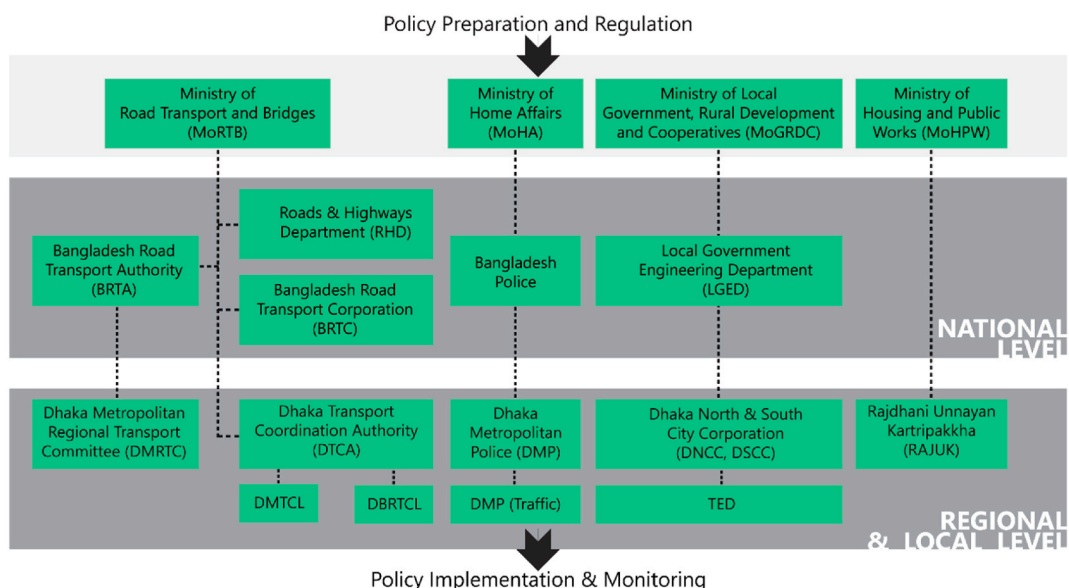


Fig. 3. Activity level of different institutions working with transportation in Dhaka city.

Table 2
Previous studies on Transport System of Dhaka City.

Study/Project Title	Year of Completion	Involved Authority
Dhaka Integrated Transport Study (DITS)	1991–93	PPK Consultants Pty Ltd, Australia; Delcan International Corporation, Canada; GoB
Dhaka Urban Transport Project (DUTP) I	1997–99	The World Bank; DTCA
Bus Route Franchising Study	2003	DTCA
Strategic Transport Plan (STP)	Drafted 2004; Approved 2009	DTCB; MoRTB
Dhaka Urban Transport Project (DUTP) II	1999–2005	The World Bank; DTCA
Study on Bus Operation in Dhaka City	2007	DTCA
Dhaka Urban Transport Network Development Study (DHUTS)- Phase I	2010	JICA; DTCA
Greater Dhaka Sustainable Urban Transport Project	2010	RHD
Dhaka Urban Transport Network Development Study (DHUTS)- Phase II	2011	JICA; DTCA
Feasibility study and other study regarding MRT line 6, BRT line 3, Dhaka Elevated Expressway	2010–2014	JICA; DTCA; SUNJIN; TransTech; ALG
Dhaka Bus Network Regulatory Reform and Implementation Study	2015	DTCA; ALG
Revision of Strategic Transport Plan (RSTP)	2015	JICA; DTCA
Sustainable Urban Transport Index (SUTI) for Dhaka, Bangladesh	2018	UNESCAP, RHD

pedestrian and non-motorized transport routes, infrastructure relevant issues, and addressing the broad context of environmental problems and enhanced management and enforcement capabilities of DNCC, DSCC, DMP, and BRTA. The recommendations from DUTP lead to the preparation of a Strategic Transport Plan (STP) for Dhaka city.

The STP was an outcome to address the need for a long-term, coordinated land-use and transport plan for greater Dhaka over the next twenty years [50]. It developed urban transport policies and institutional capacity building proposals for the Dhaka metropolitan area [45,46]. The recommendations from STP laid the foundation for all the later attempts by all the institutions in the city. For example, the studies on Bus Route Franchising or Dhaka Urban Transport Network Development Study (DHUTS). These studies elaborated on the scope and scalability of STP. The DHUTS came up with the idea of implementing the mass transit proposal from STP [59]. In contrast, the Bus Route Franchising Study is to support and enhance the current public transport capacity [46]. The STP was revised in 2015 for a twenty-year-long project from 2015 to 2035 that includes a proposal for Mass Rapid Transit (MRT), Bus Rapid Transit (BRT), Ring Roads, Radial Roads, expressways, transportation hubs for Dhaka City [45]. The BRT projects is implemented by Dhaka BRT which is likely to be functional from mid-2023 (Adhikary, 2022). The MRT projects are executed by DMTCL which is being implemented in three phases and expected to be functional by the end of 2023 (Islam, 2022).

Recently, the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) developed Sustainable Urban Transport Index (SUTI) to analyze the overall performance of the transport sector. The index included ten indicators comprising social, economic, and environmental dimensions of sustainable urban transport [72]. The index perspicuously identified the city's transportation system's gaps and failings but did not provide any specific recommendations or policy guidelines.

One of the major issues with law enforcement in Bangladesh is that there are multiple regulatory policies, laws, acts, or ordinances in each sector, which eventually makes the enforcement troublesome. Several statutory provisions are there in the transport sector as well (in Dhaka city). It started with the Motor vehicles ordinance, 1983, and the latest one in the list is the Road Transportation Act, 2018. The Motor Vehicle Ordinance, 1983, was meant to regulate traffic throughout the country. However, one limitation of the law was that it was only applicable to motor vehicles. There was no provision for traffic congestion issues or issues regarding non-motorized vehicles (NMVs). This problem was covered to some extent at that time by the Dhaka Metropolitan Police Ordinance, 1976. It had provisions against NMVs through a small amount of monetary fine for traffic control. However, this provision is not adequate nowadays as the maximum penalty is only BDT 10 (USD 0.12), which is insignificant now. Traffic Control and Public Vehicle By-laws, 1973 was formulated, but it was away from enforcement [73].

5. Discussion and conclusion

Despite being a rapidly growing and one of the most densely populated megacities around the world, the number of studies on Dhaka city's transportation system is minimal (only 183 studies indexed in Web of Science on this topic (keyword: transport* AND "Dhaka") and only 10 with the keywords in title.) Compared to any other megacities this number is quite low- New York has more than 2700 studies on this topic, London more than 2300 and Tokyo over 800 indexed studies. Additionally, we did not find any prior studies that examined the institutional arrangements involved in the transportation system. This study is one of the first studies to review the institutional arrangements in the transportation sector in Dhaka city. We examined the institutions based on their role in the city's transportation-related activities, the existing policies under which these organizations are operating, and reviewed the issues they encounter in implementing their agendas. These institutions shape the city's existing transportation geography and decide how future development will take place in the future. As Dhaka city's transportation-related institutions are convoluted and involved multiple, multilevel stakeholders, it is crucial to understand their relation, how these institutions work under what policy directions, and examine the issues they face in working side by side.

The infrastructure and management required to serve the rapidly growing urban population are extraordinary, especially regarding

transportation. With limited resources and a wide array of agencies and organizations working without any or minimum coordination among each other, it is even more difficult. Findings from this study suggested a similar state in Dhaka city. With multiple ministries, government, and quasi-government agencies working in the same sector with virtually nonexistent coordination, the city's transportation system is underserving the need for its residents. More than four ministries are directly involved in the city's road transportation-related activities through eight agencies/authorities working under these ministries. These agencies at times share the same responsibilities that lead to duplication of activities. This issue with repeated work is reported at least fifteen years back, and there were financial consequences for this back then. However, it is still very much happening, and that is evident from the same infrastructure development projects undertaken by different organizations. As these organizations are under various ministries, many of the works they do are not shared to their counterpart in other ministries, hence the duplication. This lack of coordination reduces the efficiency of the transportation development initiatives in Dhaka. At the same time, a number of organizations that operate inside Dhaka city are also working at the national level. As a result, their works' standard does not always conform with the local development standards and that creates face off situations between the development authorities, the construction agencies, and the city corporations.

One of the most important aspects to consider while planning for a city's transportation system is recognizing and involving all the stakeholders in the planning process and sustainably plan for the future [74,75]. Any sustainable transportation system should aim at providing all their residents access to the system by reducing the inequalities and increased mobility through it [76]. Previous studies informed that political goodwill and integration among different organizations working with the same motivation results in an efficient system, even in a developed country like Bangladesh [77]. However, as it is ubiquitous in developing countries to have a weak institutional setup and complexities in the governance system, it is rather bleak to pursue a holistic approach in policy formulation, planning, and coordinated action by multiple agencies [75,78].

The Government needs to play the central role to enable the authorities to work as a coordinated entity working with the common goal of public welfare. The DTCA Act, 2012, already establishes DTCA as that coordinating authority. However, the reality is something different. There are plenty of examples where it is evident that there is a lack of coordination between the authorities working in the transportation sector. To improve the productivity and accessibility of the system, these authorities need to work together, and the political parties need to provide enough support [79,80]. Enabling DTCA as the sole coordinator and decision-maker under the guidance of MoRTB should be the first step to improve the institutional mismatch. Following that, other authorities working in multiple scales and levels should be retracted from working in Dhaka city, and others should be working under the supervision of DTCA to make sure everything is synchronized. However, the problem with this is the lack of resources and workforce of DTCA. The authority should start working on capacity building and collaborate with their donor agencies for resource accumulation [44]. Without self-dependency and autonomy, this solution will not be sustainable in the long run. This is important in making the system efficient and critical for ensuring accessibility of the users [80,81].

Additionally, these organizations have substantial opportunities to develop a practical framework and environment for the authorities to work side by side. However, that will require some legislative guidelines from their parent ministries. But this framework could ensure the autonomy of the institutions and be instrumental in preparing and executing national policy frameworks at all levels – national, regional, and local. Globally, the United Nations is promoting sustainable development goals. The integration of all the authorities under one umbrella will support the transport system to align their future growth in the same direction. This study did not consider any ongoing and proposed changes in the transportation policies. There are scopes for future studies to explore the institutional arrangements and prepare a conceptual framework to tie the new and specialized institutions established for metro rail and rapid transportations to the already existed ones discussed in this paper.

Author contribution statement

All authors listed have significantly contributed to the development and the writing of this article.

Data availability statement

Data included in article/supplementary material/referenced in article.

Additional information

No additional information is available for this paper.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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