International Journal of Multidisciplinary Research and Modern Education (IJMRME)
International Peer Reviewed - Refereed Research Journal, Website: www.crystalpen.in
Impact Factor: 7.315, ISSN (Online): 2454 - 6119, Volume 11, Issue 2, July - December, 2025

ANALYSIS THE FACTORS AFFECT THE INFRASTRUCTURE DEVELOPMENT OF URBAN AREA - A CASE STUDY OF DHAKA CITY

Samira - Binte - Saif
Islami Bank Bangladesh, Dhaka, Bangladesh

Cite This Article: Samira - Binte - Saif, "Analysis the Factors Affect the Infrastructure Development of Urban Area - A Case Study of Dhaka City", International Journal of Multidisciplinary Research and Modern Education, Volume 11, Issue 2, July - December, Page Number 144-154, 2025.

Copy Right: © Crystal Pen Publication, 2025 (All Rights Reserved). This is an Open Access Article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

DOI: https://doi.org/10.5281/zenodo.17528278

Abstract:

Bangladesh is the most promising developing country of the world. The capital of Bangladesh is Dhaka city which is eleventh biggest mega city in the entire world. Dhaka is an over populated city in the world. The profile of Dhaka city detect the route of its infrastructure development through rapid urbanization which turn it's to become a mega city. There are some factors that affect the infra structure development of Dhaka city such as political, economic, social technology, environment, population, safety and legal issues. The major challenges of Dhaka city is the rapid growth of population and unplanned urbanization. The prime issues of Dhaka city that hampered its infrastructure developments are poor transportation system, insufficient sanitation system, lack of electricity, insufficient water supply system, poor waste management system, improper housing system etc. The research found that population density; sex ratio, literacy rate, transportation system, road, bridge, number of household and many other factors affect the infrastructure development of Dhaka city.

Key Words: Urban, Development, Dhaka City, Factors, Challenges, Impact, Infrastructure Development

Introduction:

A city's infrastructure is basically constituted of its population, water system, transport system, railway, electricity, wastewater system, roads and bridge, park, hospitals etc. These facilities are required for urban areas to serve their residential and non-residential inhabitants. The Dhaka city becomes increasingly urbanized. Now this city has a major demand for well organized and viable eco-friendly urban infrastructure development. The urban infrastructure development of Dhaka city covers a vast span of section comprising transportation, housing, population density, electricity, telecommunication, sanitation, literacy rate etc. Some crucial social, economic and legal factors affect the infrastructure development of Dhaka city. This research analysis the impact of various factors that affect the rapid urbanization of Dhaka city .In this research the author also address the complex troubles of the infrastructure development of Dhaka city. Here the author also focus on process of making of Dhaka city more vibrant and operative.

Research Objectives:

- To identify the factors that affect the infrastructure development of Dhaka city.
- To investigate the impact of various factors that affect the infrastructure development of Dhaka city.
- To evaluate the challenges of infrastructure development of Dhaka city.

Literature Review:

Urban structure of a country comprise of drinking water, sanitation, sewage systems, electricity and gas distribution, urban transport, primary health services and environment regulation.

Urban infrastructure development of a city cover an extensive span of section / part incorporating transportation, recreation, water supply, energy and housing. Although this expeditious urbanization display a set of multiplex obstacles/problem that ought to be addressed to make certain towns and urban areas endure lively/vigorous and serviceable.

Urban or rural infrastructure is the fundamental facilities / utilities and convenience that assists the standard of life of the natives and inhabitants. Generally governments as well as civil society organizations work jointly to expand and keep up a country's infrastructure, generating an essential part in the construction industry.

There are some factors affect the infrastructure development of urban and rural areas such as political, economic, social, technology , legal, environmental and safety.

Dhaka city has experienced haphazard and unconstrained growth .This city also face quick speed of urbanization. As a consequences the city has a scarcity of some basic facilities such as lack of electricity, inefficient transportation, lack of water and sanitation facilities. Taking in to account upgrading the infrastructure development of Dhaka city in a balanced way the government of Bangladesh has classify sophisticated method to poverty alleviation .This method has underscored that the local governance of Bangladesh ought to generated concurrently with urban infrastructure.

For the third phase of the Urban Governance and Infrastructure Improvement Project (UGIIP-3) of Dhaka city in 2014 OFID expanded a US$40m loan. The Asia Development Bank has co-financed with the UGIIP-3. This project objective is to develop governance and the infra structure development of Dhaka city. The UGIIP-3 project has worked to manage urbanization of Dhaka city in an unsegregated an all-inclusive way. Apart from developing urban infrastructure at first this project make certain that righteous administration implementation are initiated within the city of Dhaka. In order to execute, control and carry on the fundamental urban utilities along elevate capability, balanced development is established at the community level.

According to Shafiqul Islam Akand, UGIIP's project director, "UGIIP-3 is the latest initiative to improve urban development through governance and capacity building". He also told that, "The project has enabled the municipalities to establish strong linkages among their citizens for delivering improved services."

Population of Dhaka City:

Dhaka is the capital of Bangladesh is one of the rapid growing maga city in the world. Dhaka city is estimated to be one of the world's largest metropolises by 2025, along with Tokyo, Mexico City, Shanghai, Beijing and New York City. In Dhaka city

most the population are rural migrants, including climate refugees. In this year (2024) the estimated population of Dhaka city is 23,935,652.In the year 1950 the population of Dhaka was 335,760.Dhaka as grown by 726,036 in the last year. The population growth rate of Dhaka city is 3.13%. These population estimates and projections come from the latest revision of the UN World Urbanization Prospects.

Size of Household:

Dhaka is a mega city, and has a population of 10.2 residents as of 2022, and a population of over 22.4 million residents in Dhaka Metropolitan Area. It is widely considered to be the most densely populated built-up urban area in the world. Household size refers to the average number of household members. The average household size in rural areas of Bangladesh collected from HIES 2022 survey is 4.30. It is greater than that of urban areas in all of the survey years. Household size in urban areas of Bangladesh found from the survey is 4.18.Household size in Dhaka city at present is 4.14, in 2015 the household size is 4.87 in Dhaka.

The Urban Agglomerations of Dhaka City:

The average annual urban growth rate for 1991-2019 of Dhaka city is as high as 8%. Alarmingly, its outskirts are sprawling badly, with a rate of 43% for the same period (Roy and Sowgat, 2021). The built-up areas in the outskirts of Dhaka expanded by 234 km2 between 1991 and 2019, compared to about 116 km2 in the city. Dhaka is one of the most densely populated areas in the world, with a density of 23234 people per square kilometer within a total area of 300 square kilometers. Because of rapid urbanization Dhaka city face some challenges such as high percentages of people living in slums, high cost of living and dominance of the informal sector, inadequate basic services (especially water, sanitation and energy), unplanned urban and pre-urban expansion, social and political conflict over land etc.

Urbanizationof Dhaka City:

Scarcity of pure drinking water and clean water supply is a major challenge Dhaka city. Maximum inhabitants of Dhaka city do not have access to it.Mega city and capital Dhaka is one of the most densely populated areas in the world. In this city average more than 23,000 people live on each square kilometer. Which indicates that individual living space is limited in Dhaka city. The informal settlement rate is very high in Dhaka city; the individual living space is very small in informal settlement. In maximum of the Dhaka city three quarters of households live in one single room. Extra three thousand square kilometers of land would be needed in order to develop the Dhaka residents with adequate and affordable housing. Bangladesh achieve independence from Pakistan in 1971, since that time this country has a huge young population. Now the forty percent of urban population of Bangladesh are children.

Balanced Capitalize of Infrastructure Development:

Infrastructure development is a prime driver for gaining long term economic benefits. Infrastructure development promoting aggregate demand and facilitating the betterment of economic activity. The giant infrastructure development target set by Bangladesh's Perspective Plan 2041 (PP41). There is a gigantic amount of financing required to achieve this plan. There are seven of the eight mega projects of Dhaka city - Padma bridge, Padma bridge rail link, Dhaka mass rapid transit line-6 (Metro Rail), Chattogram-Cox's Bazar rail link, Rooppur nuclear power plant, Matarbari 1200MW coal-fired power plant and the Payra deep sea port are extremely crucial to the country's economic growth and hence the infrastructure development. It is expected that the Mega-projects like MRT-6 and the Dhaka Elevated Expressway are redefining urban living in Dhaka, a city of 20 million people. The Bangladesh government realized this and identifieded PPP initiatives as a significant source of infrastructure funding in the near future. In order to attain everlasting funding of large infrastructure projects, the PP41 will look for to intensely fortify the PPP strategy with competent workforce and identify required lawful and stimulus matters to draw international - funding from most suitable sources.

Urban Infrastructure Data of Dhaka City:

There are some major infrastructure development project of Dhaka city. One prime trans formative project is Dhaka Metro Rail. Which is the Dhaka city's first current urban rail transport network. The MRT-6 has a US$2.8bn project. The source of fund is obtained by the Japan International Co-operation Agency and the Bangladeshi government. Another major infrastructure project of Dhaka city is the 47-km Dhaka elevated expressway. This elevated expressway connect the northern and southern parts of the city .It is expected that this express way are reduced the traffic jams during the rush hours .This project cost is US$1.2bn. Another big infrastructure project is Padma bridge, it is a US$3bn project. This bridge connecting Dhaka with the rest of the country. The government of Bangladesh is also planning to build a 227-km express railway connecting Dhaka with Chittagong. This is a US$6bn project. It is expected that this express railway would uplift export growth by connecting the Dhaka city with the main port city.

The Impact of Urbanization of Dhaka City:

The mega city Dhaka has experienced rapid growth in urban infrastructure development .There are many international multilateral donors, Bangladeshi government and PPPs are the source of fund of these urban infrastructure development. The Dhaka city together with the country at large will experience a long period of urbanization. At present in Bangladesh forty percent people live in towns. By 2050 Dhaka is likely to be the third-biggest city in Asia with an estimated 35m people, according to the UN. Much of the urbanization of Dhaka city will occur usually together with relatively will be assist by infrastructure connecting of Dhaka city; which cause a large portion of the income and employment of Bangladesh with the rest of the country. Development of the physical infrastructure of Dhaka in the near future will diminish obstruction to output growth as well as lessen the prime hindrance on the economic growth. Which will stimulate more distant migration into Dhaka and raise its population. The government of Bangladesh is conscious of the infrastructure development of Dhaka city is emergency. Proper infrastructure development has maintain the high growth rate and maintain the international value chain. We hope the completion of these projects of Dhaka city in the coming years to improve connectivity and tends to a robust growth. It is expected that most of the big public infrastructure projects will only become operational by 2022.As a consequence reduction in economic cost .In the mean time standard of life the citizen of Dhaka become poor and stressful. Again the ongoing issue of air pollution of Dhaka city will be raised by large-scale construction work in various parts of the city.

Challenges in Urban Infrastructure Development of Dhaka City:

- Population Growth: It the most serious challenges in urban infrastructure development of Dhaka city. The population of Dhaka city is increasing rapidly. Dhaka City is experiencing an invasion of inhabitants, which cause to overcrowding, intensify pressure on resources, and burden on prevailing infrastructure.
- Aging Infrastructure: Dhaka city is struggling with aging infrastructure which requires up keep, rebuilt, or substitution. There are many aging roads, bridges, and utility systems in Dhaka city lead to safety risks and inhibit economic growth.
- Environmental Sustainability: The Urban development of Dhaka city frequently accelerate environmental deterioration, together with air and water pollution and deforestation. Harmonizing the need for infrastructure with environmental protection is a major challenge of Dhaka city.
- Traffic Congestion: In Dhaka city the increase in vehicle ownership contributes to traffic congestion, accelerating longer commute times, expands emissions, and diminish the standard of life for inhabitants.
- Limited Resources: In Dhaka city municipal budgets are often fixed, producing it challenging to finance large-scale infrastructure projects.
- Resilience to Natural Disasters: Dhaka city is vulnerable to natural disasters such as hurricanes, earthquakes, and floods. Expanding strong infrastructure that can resist and retrieve from these circumstances is crucial.

Data Collection Method & Data Source:

Here the researcher collected data from various International journal and some organization of Bangladesh. Data is collected from different secondary data source. In this research data is collected by secondary data collection method. The data is collected from local news reports, the economist intelligence report, Power Cell Bangladesh, SREDA Bangladesh, BBS Estimated from UN, Bangladesh National Budget etc.

Hypothesis:

On the ground of the above discussion it is clear that various factors affect the infrastructure development of Dhaka city. Hence the research formulated thirty two hypothesis regarding factors affect urban infrastructure development of Dhaka city. The hypothesis (H) of the research is mentioned below:

- H1: Total population has no impact on total household of Dhaka city.
- H2: Density of population has no impact on the household size of Dhaka city.
- H3: Density of population has no impact on the play ground of Dhaka city.
- H4: Density of population has no impact on the park of Dhaka city.
- H5: Density of population has no impact on the markets of Dhaka city.
- H6: Literacy Rate has no impact on the Land use and land cover change of Dhaka city.
- H7: Sectoral Projects allocation of ADP has no impact on the Density of population of Dhaka city.
- H8: Estimated project cost has no impact on the Density of population of Dhaka city.
- H9: Literacy Rate has no impact on the number of hospital/clinic of Dhaka city.
- H10: Literacy Rate has no impact on the density of population of Dhaka City.
- H11: Sex ratio has no impact on the Average trip length per day (KM) of Dhaka city.
- H12: Literacy Rate has no impact on the park of Dhaka city.
- H13: Sex ratio has no impact on the size of house hold of Dhaka city.
- H14: Estimated project cost has no impact on population growth rate of Dhaka city.
- H15: Population growth rate has no impact on number of bridge and culvert construction.
- H16: There is no significant relationship exists between person trips per day and type of transport system.
- H17: There is no significant relationship exists between passenger travel per day through walking and passenger travel per day through not walking.
- H18: Person trips per day has no impact on number of of bridge and culvert construction.
- H19: Passenger-km per day has no impact on the type of land use and land cover change of Dhaka.
- H20: Person trips per day has no impact on the type of land use and land cover change of Dhaka.
- H21: There is no significant relationship exists between type of power plant construction project and capacity.
- H22: Population growth has no impact on Capacity of power plant in Dhaka City.
- H23: There is no significant relationship exists between type of technology and Renewable Energy Installed Capacity.
- H24: Population growth Renewable Energy Installed Capacity has no impact on the Renewable Energy Installed Capacity in Dhaka City.
- H25: There is no significant relationship exists type of sector and of projects of ADP.
- H26: Population growth has no impact on the Sectoral Projects allocation of ADP in Dhaka City.
- H27: There is no significant relationship exists between Avg annual growth of year 2015 and Avg annual growth of year 2040.
- H28: Prices and exchange rates Avg annual growth has no impact on the Population growth in Dhaka City.
- H29: Population density has no impact on electricity.
- H30: Population size has no impact on roads & bridges.
- H31: Population density has no impact on telecommunication system.
- H32: Population size has no impact on railways.

Data Analysis:

Here the author used independent t test, Chi-Square test, Pearson R test for data analysis purposes.

Table 1: Demographic characteristics of mega city Dhaka

Year	Total HH	Population	Density	Sex Ratio(M/F)	Literacy Rate	HH Size	Growth Rate (%)
1951	NA	411279	4815	165	--	6.4	--
1961	127710	718766	5796	154	--	5.6	--
1974	341167	2068353	6156	137	--	6.1	11.15
1981	527311	3440147	8547	139	48.1	6	5.22
1991	1088378	6487459	4795	126	57	5.4	6.55
2001	1920682	9672763	7055	125	65.1	4.6	4.08
2011	3232683	14509100	10484	113	67.3	4.1	--
2016	4550000	18200000	11910	--	--	4.0	--
Total	11787931	55507867	59558	959	237.5	42.2	27

Note: HH=Households, Derived from BBS; Estimated from UN.

Table 2: Year wise Population growth rate of Dhaka city

Year	Population	Growth Rate (%)
2015	17597000	3.62
2016	18234000	3.62
2017	18894000	3.62
2018	19578000	3.62
2019	20284000	3.61
2020	21006000	3.56
2021	21741000	3.50
2022	22478000	3.39
2023	23210000	3.26
2024	23936000	3.13

Source: SREDA Bangladesh

Table 3: The key demographic and urban features of Dhaka City corporation area

Description	DNCC	DSCC	Total
Area	83km^2	45^2	127km^2
Number of ward	36	57	93
Population	3957302	2288812	6246114
Population Density	47886/km^2	50862/km^2	49182/km^2
Holdings	172254	122780	295034
Markets	43	78	121
Community Centre	13	36	49
Park	42	27	69
Play Ground	55	09	64
Public Toilet	37	28	65
Hospital / Clinic	239	193	432
Annual budgets (2015-2016)	$USD(M) 202	$USD(M) 263	$USD(M) 465

Source: Bhattacharjee and Khan [11]; DNCC [12]; DSCC [34]
DNCC: Dhaka North City Corporation
DSCC: Dhaka South City Corporation

Hypothesis Testing:

H1: Total population has no impact on total household of Dhaka city.
Here the author used independent t test,
The calculated t value= 5262.124
If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis, Total population has no impact on total household of Dhaka city is reject or not true. So total population has a significant impact on total household of Dhaka City.
H2: Density of population has no impact on the household size of Dhaka city.
Here the author used independent t test,
The calculated t value=-0.3572.70
In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted, so the density of population has no impact on the household size of Dhaka city.
H3: Density of population has no impact on the number of play ground of Dhaka city.
Here the author used independent t test,
The calculated t value= 419.08
If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis, density of population has no impact on the play ground of Dhaka city is rejected. The Density of population has a significant impact on the number of play ground of Dhaka city.
H4: Density of population has no impact on the number of park of Dhaka city.
Here the author used independent t test,
The calculated t value= 419.08

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis, density of population has no impact on the park of Dhaka city is rejected. So density of population has a significant impact on the number of park of Dhaka city.

H5: Density of population has no impact on the number of markets of Dhaka city.

Here the author used independent t test,

The calculated t value= 414.31

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis, density of population has no impact on the markets of Dhaka city is rejected. So Density of population has an impact on the number of markets of Dhaka city.

H6: Literacy Rate has no impact on the number of public toilet of Dhaka city .

Here the author used independent t test,

The calculated t value= 13.21

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis, Literacy Rate has no impact on the public toilet of Dhaka city is rejected. So Literacy Rate has a significant impact on the number of public toilet of Dhaka city.

H7: Density of population has no impact on the Sectoral Projects allocation of ADP of Dhaka city.

Here the author used independent t test,

The calculated t value= 389.96

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis, Density of population has no impact on the Sectoral Projects allocation of ADP of Dhaka city is rejected or not true. So Density of population has a significant impact on the Sectoral Projects allocation of ADP of Dhaka city.

H8: Density of Population has no impact on the estimated project cost of Dhaka city.

Here the author used independent t test,

The calculated t value= 423.13

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis, density of Population has no impact on the estimated project cost of Dhaka city is rejected or not true. So Density of Population has a significant impact on the estimated project cost of Dhaka city.

H9: Literacy Rate has no impact on the number of hospital/clinic of Dhaka city.

Here the author used independent t test,

The calculated t value= -56.96

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So Literacy Rate has no impact on the number of hospital/clinic of Dhaka city is true.

H10: Literacy Rate has no impact on the density of population of Dhaka City.

Here the author used independent t test,

The calculated t value= -418.92

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So Literacy Rate has no impact on the density of population of Dhaka City is true.

H11: Sex ratio has no impact on the Average trip length per day (KM) of Dhaka city.

Here the author used independent t test,

The calculated t value= 50.02

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis Sex ratio has no impact on the Average trip length per day (KM) of Dhaka city is rejected. So Sex ratio has a significant impact on the Average trip length per day (KM) of Dhaka city.

H12: Literacy Rate has no impact on the number of park of Dhaka city.

Here the author used independent t test,

The calculated t value= 10.47

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis Literacy Rate has no impact on the park of Dhaka city is rejected. So Literacy Rate has an impact on the number of park of Dhaka city.

H13: Sex ratio has no impact on the size of house hold of Dhaka city.

Here the author used independent t test,

The calculated t value= -3590.72

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So Sex ratio has no impact on the size of house hold of Dhaka city is true.

Table 4: Numerous Infrastructure projects will be completed in 2021-2025

Project	**Estimate Cost Us$ bn**	**Projected Timeline**
Karnaphuli underwater tunnel	1.2	2017-2021
Rampal coal power project	5.0	2017-2022
Padma multipurpose bridge	3.7	2009-2022
Chattogram -Cox’s bazar railway link	2.1	2018-2022
Dhaka Elevated expressway	1.2	2011-2022
Dhaka-Chattogram Express railway	1.4	2018-2022
Matarbari power plant	4.5	2014-2023
Dhaka metro rail	2.8	2012-2024
Padma rail link	4.6	2016-2024

Poppur nuclear power plant	12.7	2017-2024

Source: local news Reports: The economist intelligence report

H14: Population growth rate has no impact on estimated project cost of Dhaka city.

Here the author used independent t test,

The calculated t value= -0.41620826

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So Population growth rate has no impact on estimated project cost of Dhaka city is true.

Table 5: Bridges and Culvert area of Bangladesh (Between 2009 and 2020)

Location	**Areas**
Meters of bridges and culverts constructed in rural areas.	321322
Meters of bridges and culverts constructed in urban areas	13833

Source: SREDA Bangladesh

Table 6: Population growth in Dhaka City in inter-census periods:

Period	**Average Annual Population Growth (%)**
1931-41	5.18
1941-51	1.28
1951-61	4.19
1961-74	9.32
1974-81	9.94
1981-91	8.70
1991-2001	4.91

Source: Jahan and Oda (2000) and (Thomas Brinkhoff, 2007)

H15: Population growth rate has no impact on number of bridge and culvert construction.

Here the author used independent t test,

The calculated t value=-1.5415

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So Population growth rate has no impact on number of bridge and culvert construction is true.

Table 7: Modal split of trips in Dhaka Metropolitan Area

Mode	**Person Trips Per Day**		**Average Trip Length Per Day (KM)**	**Passenger-Km Per Day**	
	Considering Walking (%)	**Not Considering Walking (%)**		**Considering Walking (%)**	**Not Considering Walking (%)**
Car	4.00	10.50	10.4	10.12	11.94
Bus	10.20	27.00	13.5	33.82	39.88
Auto rickshaw	5.80	15.20	12.8	18.28	21.56
Rickshaw	13.30	35.00	4.3	14.00	16.52
Others	4.70	12.30	7.5	8.56	10.1
Walk	62.00	-	1.0	15.21	-
Total	100.00	100	4.1	100.00	100.00

Source: Developed by the authors from Alam and Habib (2003)

Table 8: Observed Value

Criteria	**Type of Transport**						
Person trips per day	Car	Bus	Auto Rickshaw	Rickshaw	Others	Walk	Total
Considering walking (%)	4.00	10.20	5.80	13.30	4.70	62.00	100
Not considering walking (%)	10.50	27.00	15.20	35.00	12.30	0	100
Average trip length per day (KM)	10.4	13.5	12.8	4.3	7.5	1.0	49.5
Total	24.9	50.7	33.8	52.6	24.5	63	249.5

Source: Formulated by Author

H16: There is no significant relationship exists between person trips per day and type of transport system of Dhaka city.

Here the author used chi square test,

The calculated Chi- square value is= 121.909

Degrees of Freedom= (3-1)*(6-1) =10

At 0.05 level of significance and 10 degrees of freedom the table value of Chi square value is=18.307

So chi square cal>chi square table

.So the null hypothesis, there is no significant relationship exists between person trips per day and type of transport system of Dhaka city is rejected. So there is a significant relationship exists between person trips per day and type of transport system of Dhaka city.

H17: Passenger travel per day through walking has no impact on passenger travel per day through not walking.

Here the author used independent t test,

The calculated t value=-0.56

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So Passenger travel per day through walking has no impact on passenger travel per day through not walking is true.

H18: Person trips per day has no impact on number of bridge and culvert construction.

Here the author used independent t test,

The calculated t value= -0.604.33

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So the null hypothesis Person trips per day has no impact on number of bridge and culvert construction is true.

Table 9: Land use and land cover change of Dhaka city (1990-2020)

Year	**1990**		**2000**		**2010**		**2020**	
Land Use Type	**Area (Acres)**	**Area (%)**	**Area (Acres)**	**Area (%)**	**Area (Acres)**	**Area (%)**	**Area (Acres)**	**Area (%)**
Built-up	33590.3	44.5	39693.1	52.6	45165.1	59.8	45340.1	60.1
Open Land	26325.8	34.9	25436.0	33.7	20526.6	27.2	22844.0	30.3
Wetland	15563.0	20.6	10350.0	13.7	9787.4	13.0	7295.0	9.7

Source: Hossain (2022)

H19: Passenger-km per day has no impact on the type of land use and land cover change of Dhaka.

Here the author used independent t test,

The calculated t value= -2.9980

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So, Passenger-km per day has no impact on the type of land use and land cover change of Dhaka is true.

H20: Person trips per day has no impact on the type of land use and land cover change of Dhaka.

Here the author used independent t test,

The calculated t value= -2.9976

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So Person trips per day has no impact on the type of land use and land cover change of Dhaka is true.

Table 10: Ongoing power plant construction project (as of June 2022)

	Power Plants	Renewable Energy	Capacity (MW)
Public	9	3	4339
Joint venture	3	1	3793
Private	9	10	5225
Total	21	14	13387

Source: Power Cell, Bangladesh

H21: Population growth has no impact on the type of power plant of Dhaka city.

Here the author used independent t test,

The calculated t value= -2.195

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So the null hypothesis Population growth has no impact on the type of power plant of Dhaka city is true.

H22: Population growth has no impact on Capacity of power plant in Dhaka City.

Here the author used independent t test,

The calculated t value= -1.73

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So the null hypothesis Population growth has no impact on Capacity of power plant in Dhaka City is true.

Table 11: Renewable Energy Installed Capacity of Bangladesh

Renewable Energy Installed Capacity			
Technology	**Off-grid (MW)**	**On-grid (MW)**	**Total (MW)**
Solar	351.82	307.73	659.55
Wind	2	0.9	2.9
Hydro	0	230	230
Biogas	0.69	0	0.69
Biomass	0.4	0	0.4
Total	354.91	538.63	893.54

Source: SREDA, Bangladesh

H23: Population density has no impact on Renewable Energy Installed Capacity.

Here the author used independent t test,

The calculated t value=8.22

.So the null hypothesis, Population density has no impact on Renewable Energy Installed Capacity is rejected .So Population density has a significant impact on Renewable Energy Installed Capacity.

H24: Population growth has no impact on the Renewable Energy Installed Capacity in Dhaka City.

Here the author used independent t test,

The calculated t value= -1.64

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So the null hypothesis Population growth has no impact on the Renewable Energy Installed Capacity in Dhaka City is true.

Table 12: Sectoral allocation under ADP 2021-2022

Sector	**Projects in ADP**	**Share (%) ADP**
Transport & Communication	290	27.4
Energy	83	20.4
Housing	188	10.5
Education	117	10.3

Health	65	7.7

Source: Bangladesh National Budget 2021-2022

H25: Population density has no impact on the Sectoral Projects allocation of ADP in Dhaka City.

Here the author used independent t test,

The calculated t value= 8.3432

.So the null hypothesis, Population density has no impact on the Sectoral Projects allocation of ADP in Dhaka City is rejected So Population density has an impact on the Sectoral Projects allocation of ADP in Dhaka City.

H26: Population growth has no impact on the Sectoral Projects allocation of ADP in Dhaka City.

Here the author used independent t test,

The calculated t value=-3.95

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So the null hypothesis, population growth has no impact on the Sectoral Projects allocation of ADP in Dhaka City is true.

Table 13

Key Assumption:	**2015**	**2040**	**Avg. Annual Growth**
GDP(Billion $US)	222	879	5.7%
GDP per head($US)	1381	4459	4.8%
Population(000s)	160996	197134	0.8%
Urban Population(%of total)	34.3%	47.6%	1.3%
Population density(person per km^2)	1237	1514	0.8%

Source: 2015 prices and exchange rates Avg annual growth shows average annual charge in urban share of population.

H27: There is no significant relationship exists between Avg annual growth of year 2015 and targeted annual growth of year 2040.

Here the author used Pearson R test, r= 0.94

So there is a strong positive relationship exists between Avg annual growth of year 2015 and targeted annual growth of year 2040.

H28: Prices and exchange rates Avg annual growth has no impact on the Population growth in Dhaka City.

Here the author used independent t test,

The calculated t value= 5.65

If our chi-square calculated value is greater than the chi-square critical value, then we reject our null hypothesis. So the null hypothesis, Prices and exchange rates Avg annual growth has no impact on the Population growth in Dhaka City is rejected. So Prices and exchange rates Avg annual growth has a significant impact on the Population growth in Dhaka City.

Table 14

Sectors	**X Plan (Amt. Exp)**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**Total X1Plan**	**Share (%)**
1. Electricity	291850	81954	101553	126380	158017	198611	666525	
a. Centre	102463	37508	43469	49989	57631	66420	255316	38.31
b. States	97553	20978	29729	41357	56670	76960	225097	33.80
c. Private	91834	23168	28355	35034	43726	55228	185512	27.83
2. Roads & Bridges	144892	51822	54789	59200	68370	79971	314152	
a. Centre	71534	18318	19446	20673	22618	26304	107359	34.17
b. States	66354	17534	15150	15880	20613	24815	100000	31.83
c. Private	7004	15970	17193	19618	25140	28852	106792	33.99
3. Telecommunication	103365	31375	38134	48593	61646	78690	258499	
a. Centre	49013	13525	14037	16061	17728	19401	80753	31.25
b. Private	54352	17850	24098	32532	43918	59289	177686	68.75
4. Railways (incl. Mrts)	119658	34225	40964	49525	60393	76701	261807	
a. Centre	108950	25925	31176	37974	46685	59693	201453	76.95
b. States	10402	1575	1788	1979	2170	2489	10000	3.82
c. Private	307	6725	8000	9572	11537	14519	50354	19.23

Source: SREDA Bangladesh

H29: Population density has no impact on electricity.

Here the author used independent t test,

The calculated t value=-0.52

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So the null hypothesis Population density has no impact on electricity is accepted or true.

H30: Population size has no impact on roads & bridges.

Here the author used independent t test,

The calculated t value= 3.13

.So the null hypothesis, Population size has no impact on roads & bridges is rejected. So Population size has an impact on roads & bridges.

H31: Population density has no impact on telecommunication system.

Here the author used independent t test,

The calculated t value=-5.80

In that case, a negative t-value would not cause rejection of the null hypothesis. So the null hypothesis is accepted. So the null hypothesis Population density has no impact on telecommunication system is true.

H32: Population size has no impact on railways.

Here the author used independent t test,
The calculated t value=3.14
.So the null hypothesis, Population size has no impact on railways is rejected. So Population size has an impact on railways of Dhaka city.

Discussion & Analysis:

- The research found that total population has a significant impact on total household of Dhaka City. So if the total population increased the total number of household is also increased. The research showed that the density of population has no impact on the household size of Dhaka city. Which indicate that there is discrimination exists among the size of household in Dhaka city? In Dhaka some house hold is very large in number and some household have small size of family member.
- The research found that density of population has a significant impact on the number of play ground of Dhaka city. So if the density of population increased the number of play ground is decreased.
- The author disclosed that density of population has a significant impact on the number of park of Dhaka city. The density of population of Dhaka is very high and the number of park is very low.
- The research found that the density of population has an impact on the number markets of Dhaka city. In Dhaka the density of population is high and the number of market is also increased.
- The research disclosed that the literacy rate has a significant impact on the number of public toilet of Dhaka city. In Dhaka city the literacy rate is average and the number of public toilet is very low.
- The research showed that density of population has a significant impact on the Sectoral Projects allocation of ADP of Dhaka city. In Dhaka city the density of population is increased rapidly. The Sectoral Projects allocation of ADP mainly focus on the transport system of Dhaka city, then the percentage of energy. The sectoral project allocation of Dhaka city is very low in housing, education and health sector.
- The research disclosed that the density of Population has a significant impact on the estimated project cost of Dhaka city. In Dhaka city the density of population is very high. The estimated project is high in Rampal coal power project .Then the estimated project cost is high in Matarbari power plant and rail link of Dhaka city. But the estimated project cost is not sufficient according to the density of population of Dhaka city.
- The research showed that Literacy Rate has no impact on the number of hospital/clinic of Dhaka city is true. In Dhaka city the literacy rate is average and the number of hospital of hospital/clinic is also average.
- The research found that the literacy rate has no impact on the density of population of Dhaka City is true. In Dhaka city the literacy rate is average and the density of population is very high. So literacy rate has no impact on the density rate of Dhaka city.
- The research showed that sex ratio has a significant impact on the Average trip length per day (KM) of Dhaka city. In Dhaka city the sex ratio is high, this ratio influence the average trip length per day of Dhaka city.
- The research disclosed that literacy Rate has an impact on the number of park of Dhaka city. In Dhaka city the literacy rate is average and the number of park is low.
- The paper showed that sex ratio has no impact on the size of house hold of Dhaka city is true. The author found that various households have different sex ratio in Dhaka.
- The researcher reveal that population growth rate has no impact on Estimated project cost of Dhaka city is true. In Dhaka city the population growth rate is high. The high growth rate of population not influenced the estimated project cost of Dhaka city.
- The research showed that the population growth rate has no impact on number of bridge and culvert construction is true. In Dhaka city the population growth rate is high; this high growth rate of population not influenced the number of bridge and culvert construction of Dhaka city.
- The research found that there is a significant relationship exists between person trips per day and type of transport system of Dhaka city. In Dhaka city the type of transports are bus, car, rickshaw, auto rickshaw etc. The people of Dhaka mainly used bus for their transportation. For short distance travel the people of Dhaka used rickshaw or auto rickshaw. Maximum people of Dhaka are walking to perform their short distance travel.
- The research found that passenger travel per day through walking has no impact on passenger travel per day through not walking/used vehicle is true. In Dhaka city 62% of people are walking in order to reach their destination. Other people used transport for travel in Dhaka city. So walking people are not influenced the non walking people in Dhaka city. In high road and pavement people are made movement through walking and through vehicle.
- The paper showed that person trips per day has no impact on area of bridge and culvert construction is true. In urban area of Bangladesh the area of bridge and culvert is low, because here the number of river, canal or pond is very low. So person trips per day are not depend on the area of bridge and culvert in Dhaka.
- The research revealed that the passenger-km per day has no impact on the type of land use and land cover change of Dhaka city is true.
- The research found that population growth has no impact on the type of power plant of Dhaka city is true.
- The paper proved that population growth has no impact on Capacity of power plant in Dhaka City is true.
- The research found that the population density has a significant impact on Renewable Energy Installed Capacity. In Dhaka city the density of population is very high, this high density of population is influenced the renewable energy installed capacity of Dhaka city. Because high volume of people consume more energy.
- The research found that population growth has no impact on the Renewable Energy Installed Capacity in Dhaka City is true. In Dhaka city the population growth rate is high but which is not influenced the renewable energy installed capacity.

- The research showed that population density has an impact on the Sectoral Projects allocation of ADP in Dhaka City. In Dhaka city the population density is very high, this highly densely population influenced the Sectoral Projects allocation of ADP.
- The research proved that the population growth has no impact on the Sectoral Projects allocation of ADP in Dhaka City is true. Dhaka has a high population growth rate which not affect the Sectoral Projects allocation of ADP.
- The research showed that there is a strong positive relationship exists between Avg annual growth of year 2015 and targeted annual growth of year 2040.
- The research found that prices and exchange rates avg annual growth has a significant impact on the Population growth in Dhaka City .In Dhaka city the population growth rate is high. The high growth rate of population influenced the prices and exchange rates avg annual growth. The population growth rate is high the prices and exchange rates avg annual growth is also high.
- The research found that the population density has no impact on the electricity. Dhaka is a most densely area, but the density of population not influenced the electricity production.
- The research found that the Population size has an impact on roads & bridges. Dhaka city has a big population size; the vast population impacts the roads and bridges adversely.
- The research showed that the population density has no impact on telecommunication system. In Dhaka city the population density is very high but which is not influenced the telecommunication system.
- The research found that population size has an impact on railways of Dhaka city. Dhaka has a big population; the huge population adversely affect the railway system of Dhaka city.

Conclusion:

According to the Global Competitiveness Index, 2019, the National Perspective Bangladesh has placed 105th out of 141 countries. In respect of infrastructure Bangladesh has occupied 114th which is the bottom ground among South Asian countries. The Dhaka city is the most densely urban region of Bangladesh. The Dhaka city holds 35% economy of Bangladesh. Today the infrastructure development of Dhaka city is a burning question to all the citizens and government of Bangladesh. The infrastructure development of Dhaka city cover an extensive span of section/part incorporating transportation, recreation, water supply, energy and housing. There are various political, economic, social factors affect the infrastructure development of Dhaka city. If we consider the roads of Dhaka city, we see that the main roads of Dhaka city are standard, but the if we examine the entirety of the city's infrastructure then we found, there is a lack of foot paths , year-long digging ,disorganized mass transport facilities, broken of internal roads etc indicate hardly any upgrade.

The research found that there are many complex challenges of urban infrastructure development of Dhaka city. Again the infrastructure development of Dhaka city is affected by its large population, high density of population, literacy rate, household size, lack of proper planning, transport system etc. The government of Bangladesh, urban planners and civil engineers would work together in order to analysis the impact of the factors and take proper steps to minimize the adverse impact of the factors on infrastructure development of Dhaka city.

Recommendation & Implementation:

- Smart Urban Planning: Bangladesh government and other NGO would carrying out extensive urban planning that ensure sustainable population growth, green spaces, public transportation, and mixed-use development. By implementing this approach we can reduce many infrastructure challenges of Dhaka city.
- Innovative Transportation: Recommending sustainable means of transportation such as public transit, cycling lanes, and pedestrian-friendly streets can diminish traffic congestion and improve air quality of Dhaka city.
- Green Infrastructure: Including green infrastructure, for instance green roofs, permeable pavements, and urban forests, can alleviate the environmental impact of urbanization in Dhaka city at the same time upgrading urban adaptability and durability.
- Renewable Energy Integration: Shifting to renewable energy sources for generating Dhaka city areas can mitigate greenhouse gas emissions as well as expanding energy efficiency.
- Technological Advancements: Manipulating technology like smart grids, IoT sensors, and data analytics can intensify infrastructure adeptness and lessen maintenance costs of Dhaka city.
- Public-Private Partnerships: Association between governments and private sector organizations can contribute the required financing as well as competence to handle extensive and far-reaching infrastructure projects of Dhaka city.
- Climate-Resilient Design: Scheming infrastructure with climate adaptability in mind, such as raised buildings and flood-resilient infrastructure, can secure Dhaka city from the impact of natural disasters.
- Community Engagement: The government of Bangladesh would including local institution and inhabitants in the decision-making process make certain that infrastructure projects meet the requirement as well as desires of the citizens of mega city Dhaka.

References:

1. Arnott, R. J., and Stiglitz, J. E. (1979), 'Aggregate Land Rents, Expenditure on Public Goods, and Optimal City Size', The Quarterly Journal of Economics, 93(4), 471-500.
2. Collier, P., and Ireland, G. (2016), 'Shared-use Mining Infrastructure: Why it Matters, and How to Achieve it', Development Policy Review, forthcoming. Venables,
3. A. J. (2015), 'Housing and Urbanization in Africa: Unleashing a Formal Market Process', in E. Glaeser and A. Joshi-Ghani (eds), The Urban Imperative; Towards Competitive Cities, Oxford,
4. Oxford University Press. Demographia (2015), Demographia World Urban Areas, available at http://www.demographia.com/dbworldua.pdf

5. Department for Transport (2013), 'Transport Analysis Guiudance: WebTAG', available at https:// www.gov.uk/guidance /transport-analysis-guidance-webtag
6. Estache, A., Serebrisky, T., and Wren-Lewis, L. (2015), 'Financing Infrastructure in Developing Countries', Oxford Review of Economic Policy, 31(3-4), 279-30.
7. Foster, V., and Briceño Garmendia, C. (2010), Africa's Infrastructure; A Time For Transformation, Washington, DC, World Bank.
8. Glaeser, E. (2008), 'Cities, Agglomeration and Spatial Equilibrium', Oxford, Oxford University Press.
9. Harati, R., Nakamura, S., Lall, S. V., Dikhanov, Y. M., Hamadeh, N., Oliver, W. V., Rissanen, M. O., and Yamanaka, M. (2016), 'Is Living in African Cities Expensive?', Washington, DC, World Bank, mimeo.
10. Henderson, J. V., Regan, T., Samsonov, I., and Venables, A. J. (2016), 'Building Functional Cities', Science, 352(6288), 946-7.
11. Jones, P. (2016), 'Closed for Business; High Urban Costs', Department of Economics, University of Oxford, mimeo.
12. Marshall, A. (1890), Principles of Economics, London, Macmillan.
13. Melo, P. C., Graham, D. J., and Noland, R. B. (2009), 'A Meta-Analysis of Estimates of Urban Agglomeration Economies', Regional Science and Urban Economics, 39, 332-42.
14. Rosenthal, S. S., and Strange, W. C. (2004), 'Evidence on the Nature and Sources of Agglomeration Economies', in J. V. Henderson and J. F. Thisse (eds), Handbook of Urban and Regional Economics, Vol. 4, New York, North-Holland.
15. Teravaninthorn, S., and Raballand, G. (2009), Transport Prices and Costs in Africa: A Review of the International Corridors, Washington, DC, World Bank.
16. Thomas, K., Haque, O. S., Pinker, S., and DeScioli, P. (2014), 'The Psychology of Coordination and Common Knowledge', Journal of Personality and Social Psychology, 107, 657-76.
17. UN-Habitat (2015), 'World Atlas of Slum Evolution', available at http://unhabitat.org/world-atlas-of-slum-evolution/
18. Venables, A. J. (2007), 'Evaluating Urban Transport Improvement: Cost Benefit Analysis in the Presence of Agglomeration and Income Taxation', Journal of Transport Economics and Policy, 41, 173-88.
19. Incorporating Wider Economic Aspects within Cost-Benefit Appraisal', Discussion Paper 2016 05, International Transport Forum, Paris, Organization for Economic Cooperation and Development, available http://internationaltrans portforum.org/jtrc/discussionpapers/ incorporating-wider-economic-impacts-cba.pdf
20. Breaking into Tradables: Urban Form and Urban Function in a Developing City', CEPR Discussion Paper No. 11212.
21. World Bank (2014), 'Urban China: Toward Efficient, Inclusive and Sustainable Urbanisation',
22. Washington, DC, the World Bank, and P. R. China, the Development Research Center of the State Council. Urban infrastructure for development 409 at Bodleian Library on December 7, 2016 http://oxrep.oxfor