Public Transport Mobility And Regional Connectivity In Pauri Garhwal District Of Uttarakhand, India: A Geographical Analysis

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Abstract

Transport mobility in rural areas plays a major role in promoting the quality of life and socio-economic development. It provides households with various access to services such as education, healthcare, employment, market, and settlement. Effective transport mobility helps to fill the gap between rural and urban areas, enhancing rural livelihoods and reducing disparities. Transport mobility provides several benefits to the public, such as understanding the purpose of traveling and gaining access to destinations and activities. However, reasonable and protected ways of transport have to be completely accessible at lower public, ecological, and financial costs. On the other hand, regional connectivity provides a safe, comfortable, and a variety of commodities at various locations in the hilly area of the district. In this survey-based study an attempt has been made to analyze the mobility of public transport two hours in the morning (09:00-10:00 AM and 10:00-11:00 AM) and two hours in the evening (05:00-06:00 PM and 06:00-07:00 PM) and also analyze the regional transport connectivity from the primary urban center (Srinagar, Pauri, Kotdwar and Landsdown) to other hilly areas of the district. The primary transportation services on these roads are buses, trucks, trackers, cars, and two-wheelers. The results indicate that mobility varies from hour to hour but depends on the transport cognition of the various roads and the regional connectivity share, which are suitable and safe for the public traveling in the hilly terrain of the Pauri Garhwal district.

Keywords: Public transport, Transport mobility, Regional Connectivity, Ecological and financial charge, Commodity, Urban center.

1. INTRODUCTION

India's transportation sector is vast and diverse, meeting the everyday needs of 1.1 billion people and supplying food and services. The transportation sector comprised a significant portion of the country's GDP in 2012–2013, accounting for 5.2% of the total (Estimates & National, 2013). An intense physical connection is critical for advancing India's rural and urban economies, working populations, societies, and cultures. India's need for transportation services and infrastructure increased in the 1990s. India needs dependable and effective urban transportation networks to maintain its rapid economic expansion. Urban and rural transportation is important in India since it contributes to decreasing poverty by facilitating more access to the labor market and raising wages in underprivileged areas (Estache & Mondiale, 2008). In Indian cities, encouraging sustainable urban economic development requires a focus on accessibility and urban mobility. Additionally, they are closely related to the stock and flows of urban areas regarding the consolidation and spatial growth of the built form. However, because car-centric policies have been embraced by successive plans and projects at the local level, urban mobility has not contributed to anticipated objectives. It is crucial to realize that the requirement for people to satisfy their required social or economic connections is the source of the need for mobility (Kamargianni et al., 2016)

In Uttarakhand, the public transport department addresses the issue, especially about isolated and unreachable regions in the mid- and outer-Himalayan ranges. It aims to build and enhance road networks that offer connectivity between and within states, which is crucial for the efficient expansion of the area. Mobility and connectivity are some of the most important outcomes of the transportation system in the district. It provides reasonably protected, safe goods and services commodities in the society of the Garhwal District. In the hilly area of Garhwal, people's income is very low, and there is a lack of agricultural practices and other resources. Due to this, they cannot afford transport costs; on the other hand, in the urban center, there are more sources of income, and more people are engaged in various activities, and mobility of transport is high during the day. Connectivity provides every satisfaction that fulfills our daily life needs and commodities. Transport connectivity represents an efficient transport network for moving people from one location to another without problems.

2. LITERATURE REVIEW

Accessibility and connectivity of public transport infrastructure in the urban region determine the ability to move efficiently from one place to another and provide access to a safe, affordable, sustainable quality of life and living standards in cities (Morozov et al., 2023). Public transport plays a vital role in passenger movement as a low-cost, efficient, and comfortable mode of sustainable transportation (Hadas et al., 2014). To improve the rural transportation infrastructure in hilly areas, we need to develop the latest technologies, smart mobility, and land systems that monitor the successful transport saturation on roads (Porru et al., 2020). Population Growth and infrastructure improvement pressure public transportation and increase the demand for better transport connectivity (Ponodath et al., 2018). Public transport connectivity is initiated to stimulate service quality and the consistency of journey time (Chowdhury et al., 2014). Transport networks and services play a key role in moving people from one place to another on the earth's surface through a comfortable journey in terms of connectivity, infrastructure of roads, and modifications of transport routes (De Stasio et al., 2011). The public transport mobility knowledge graph contributes to the audience's real consideration of the user to station location, develops the human mainstream location on their respective places, and helps the user track road mobility areas. (Zhang et al., 2023). Regional public transport influences various attributes such as choice, demand, priority for local and regional travelers, and understanding coordination between passengers and travelers (Hansson et al., 2019). Public transport mobility and regional connectivity are very poor compared to urban areas because rural areas lack access to transport infrastructure due to hilly terrain (Berg & Ihlström, 2019). Transport and mobility are interlinked with social systems and structures, mainly impacting livability in urban and rural settings and planning (Hermelin & Henriksson, 2022). Lack of access to transportation primes social segregation, transport, and land use strategies emphasizing accessibility and empowering the public to reach destinations at reasonable costs and times (Hawas et al., 2016). Providing well-organized public transport in terms of accessibility is one of the key purposes of plan makers and planners in metropolitan areas worldwide (Saghapour et al., 2016). Mobility and service accessibility are geographical aspects characterized by the percentage of network coverage and accessible location of transport services(Beimborn et al., 2003). Regional connectivity provides easy and accessible communication to public transport users, which develops self-confidence and satisfaction among passengers (Kenyon & Lyons, 2003). Security at the stations is a significant concern for the passengers, as well as good lighting, cleanliness, CCTV cameras, lockers, and emergency telephone booths in rural areas (Kumar et al., 2011). The above and available literature in the study signify the major issue and challenges of the transportation system over the globe and mainly focus the transportation role in the development of society, security for passengers, sustainable transportation, assessable transport coverage in rural area, lack access of transportation in rural landscape, transportation planning and development, satisfactory level of public transportation and many more issue address the through the literature reviews. In light of the above literature, there is a lack of transport mobility, which varies from place to place and also on major roads. This research clearly finds the gap between the literature on transport mobility and regional connectivity in the Pauri Garhwal district. The major objective of the study is to examine the time-fixed road transportation mobility in the morning (AM) and evening (PM) hours from the urban centers of the study area, and to analyze the inter-regional connectivity of road transportation between Rural-to-urban centers in the study area.

3. THE CASE STUDY: PAURI GARHWAL

District Pauri Garhwal is positioned in the state of Uttarakhand in Northern India, with the city of Pauri as its administrative unit. It is located between latitudes 29°,26' and 30°,19' N and longitudes 78°.12' and 79°,14' E. The total geographical area of the district is 5,329 km^2. The district is bordered by Dehradun and Haridwar on the west, district Bijnor (Uttar Pradesh) on the south, districts Nainital and Almora in the south-east, districts Chamoli and Rudraprayag on the northeast and north, and the northwest is Tehri Garhwal. The district extends from the Bhabar track bordering the Ganga plains to the high mountains. The Land of Pauri Garhwal is sacred, with fine views of snow-capped peaks of the Himalayas, picturesque valleys and surroundings, meandering rivers, dense forests, and hospitable people with a rich culture. (District, 2011)

The Pauri Garhwal District has a population of 687,271. The district has a population density of 129 inhabitants per square km. Its population growth rate over 2001-2011 was -1.51%. Pauri has a sex ratio of 1103 females for every 1000 males and a literacy rate of 82.02%. The predominant language of this district is Garhwali and, to some extent, Nepali and Kumauni (District, 2011)
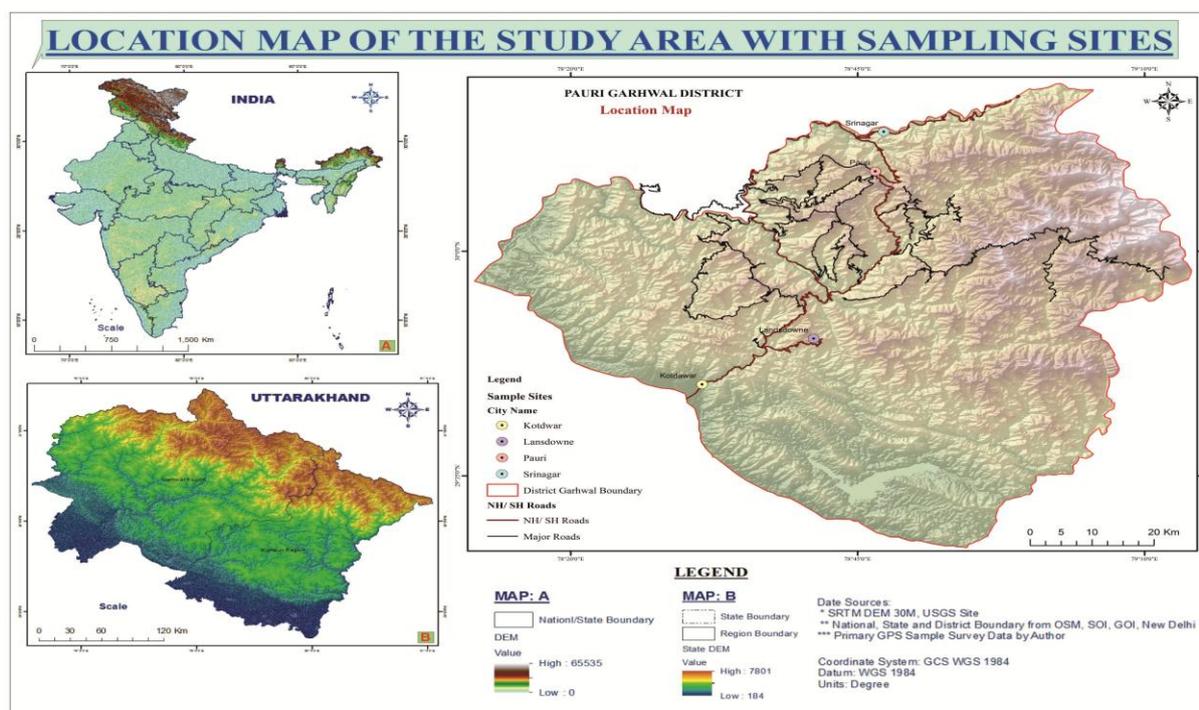

Figure 1: Location map of the study area
Source: Prepared by the author using ArcGIS

4. METHODOLOGY

This study is based on the data collection from the Pauri Garhwal district of Uttarakhand. In this study, both primary and secondary data were collected. Primary data was based on the well-structured questionnaires and field surveys conducted in various parts of the district. A major portion of the secondary data was used to formulate the whole study, including the literature survey, data, and research methods. The data was collected through random sampling methods. A total of 7870 mobility samples were collected in the morning and two hours in the evening from four sampling sites. 401 outgoing vehicle samples were collected from the sampling site for regional transport connectivity.

A mixed-method approach was used to analyze the mobility pattern and mode of transport in the district, which includes the field survey, interviews, and manual counting on the selected roads. Four main urban centers with good transport connectivity were selected to study the mobility pattern to the other areas (Pauri, Srinagar, Lansdowne, and Kotdwar). From four sampling sites, data were collected for two hours in the morning (9:00 to 10:00 AM and 10:00 to 11:00 AM) and two hours in the evening (05:00 to 06:00 PM and 06:00 to 07:00 PM). A total of 7870 mobility samples were collected in four hours.

The number of vehicles outgoing from the main center to the other region is observed to calculate the regional transport connectivity in these sampling sites. 401 outgoing vehicle samples are collected from

main urban sites, including 206 buses and 195 trackers. ArcGIS mapping software will be used to design the maps in this study. Google Earth and Google Maps extract various roads connecting the primary urban center to other areas.

5. RESULTS AND DISCUSSION
5.1 Road Transportation Mobility between 9.00 and 10.00 AM from Urban Centers of the District

Road transportation mobility between 9.00 to 10.00 AM is very high because people start traveling to their destination in the morning. These hours are not very busy, but the mobility is very high, as shown in the table. The mobility of the Bus is higher at Srinagar to Rudraprayag Road at 6.60% and lower at Kotdwar to Dehradun Road at 2.65%. Mini Bus is also considered a good and comfortable means of transportation in the Garhwal area. The mobility of the Mini Bus is higher from Srinagar to Rudraprayag at 3.77% and lower from Kotdwar to Lansdowne Road at 1.47%. The mobility of Tracker is higher at Srinagar to Rishikesh Road at 16.76% and lower at Kotdwar to Dehradun Road at 5.15%.

The mobility of trucks is higher at Pauri to Srinagar and Pauri to Kotdwar roads, which is 18.52%, and the lower mobility of trucks at Kotdwar to Dehradun Road is 10.29%. Mobility of cars is higher at Kotdwar to Dehradun Road, which is 36.03%, and lower mobility of cars at Pauri to Srinagar and Pauri to Kotdwar is 27.78%. The higher mobility of two-wheelers from Kotdwar to Dehradun and from Kotdwar to Lansdowne is 44.12%, and the lower mobility from Pauri to Kotdwar and from Pauri to Srinagar is 37.04%, as shown in Table No.1.

Table 1: Percentage of Transport Mobility in Pauri Garhwal District between 09:00 to 10:00 AM

S.N.	Major Roads	Cluster of Timing	Transportation Type					
			Bus	Mini Bus	Tracker	Truck	Car	Two-Wheeler
0	1	2	3	4	5	6	7	8
1	Kotdwar to Lansdowne	09 -10: AM	2.94	1.47	7.35	14.71	29.41	44.12
2	Kotdwar to Srinagar		2.83	1.98	7.08	17.00	28.61	42.49
3	Kotdwar to Dehradun		2.65	1.76	5.15	10.29	36.03	44.12
4	Pauri to Kotdwar		4.63	2.78	9.26	18.52	27.78	37.04
5	Pauri to Srinagar		4.63	2.78	9.26	18.52	27.78	37.04
6	Srinagar to Rishikesh		2.79	2.23	16.76	13.97	27.93	36.31
7	Srinagar to Rudraprayag		6.60	3.77	14.15	9.43	28.30	37.74
	Average		3.87	2.40	9.86	14.63	29.41	39.84

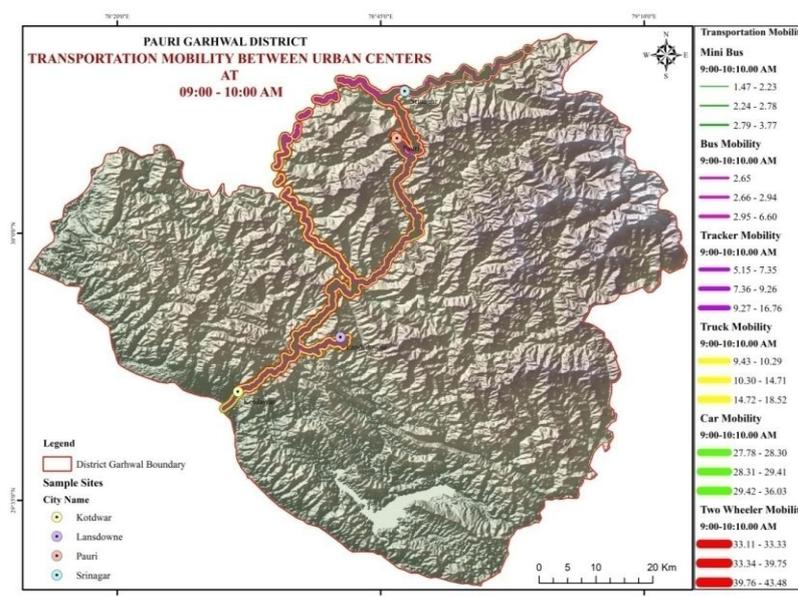**Source: Author's analysis based on primary survey**

Figure 2: Transport Mobility in Pauri Garhwal District between 09:00 to 10:00 AM

Source: Prepared by the author using ArcGIS

5.2 Road Transportation Mobility between 10.00 and 11.00 AM from Urban Centers of the District

The Mobility between 10:00 to 11:00 AM from urban centers to other areas in the district is also high because this hour shows high mobility of traffic on the Road. People travel densely during these hours. We can say that the Maximum Saturation of vehicles recorded on the road is shown in the Table. The Mobility of buses is higher at Srinagar to Rudraprayag Road at 7.41%, and lower mobility is noticed at Kotdwar to Dehradun Road at 2.55%. In comparison, higher mobility of Mini Bus was also noticed at Srinagar to Rudraprayag Road at 5.19%, and lower mobility at Kotdwar to Dehradun Road was 1.66%. The higher mobility of Tracker at Srinagar to Rishikesh Road is 16.67%, and the lower mobility at Kotdwar to Srinagar Road is 6.06%; the higher mobility of Trucks at Pauri to Kotdwar Road is 19.87%, and the lower mobility at Kotdwar to Dehradun Road is 10.19%. The higher mobility of Cars on the Kotdwar to Dehradun Road is 39.49%, and the lower mobility on the Kotdwar to Lansdowne Road is 28.25%. In comparison, the higher mobility of two-wheelers on the Pauri to Srinagar Road is 43.48%, and the lower mobility on the Pauri to Kotdwar Road is 33.11%, as shown in Table No.2 given below.

Table 2: Percentage of Transport Mobility in Pauri Garhwal District (10:00-11:00 AM)

S.N.	Major Roads	Cluster of Timing	Transportation Type					
			Bus	Mini Bus	Tracker	Truck	Car	Two-Wheeler
	1	2	3	4	5	6	7	8
1	Kotdwar to Lansdowne		3.95	2.82	8.47	16.95	28.25	39.55
2	Kotdwar to Srinagar		3.03	2.02	6.06	15.15	30.30	43.43
3	Kotdawar to Dehradun		2.55	1.66	6.37	10.19	39.49	39.75
4	Pauri to Kotdwar	10 -11 AM	4.64	2.65	9.93	19.87	29.80	33.11
5	Pauri to Srinagar		5.07	2.90	8.70	10.87	28.99	43.48
6	Srinagar to Rishikesh		3.81	2.38	16.67	15.24	28.57	33.33
7	Srinagar to Rudraprayag		7.41	5.19	14.81	10.37	28.89	33.33
8	Average		4.35	2.80	10.15	14.09	30.61	38.00

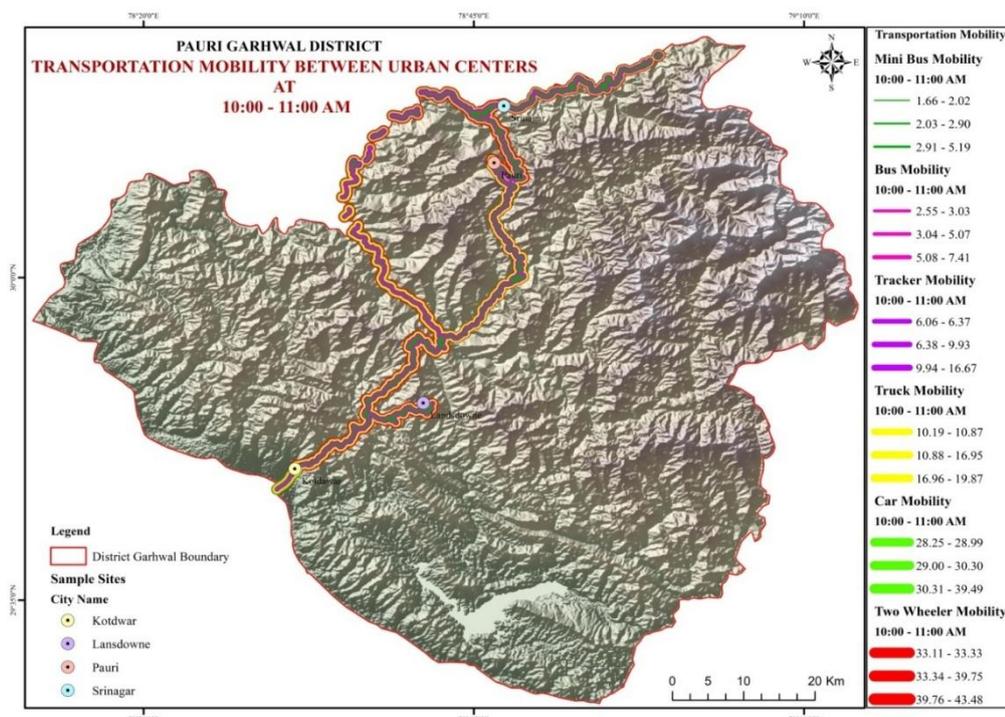Source: Author's analysis based on primary survey

Figure 3: Transport Mobility in Pauri Garhwal District between 10:00 to 11:00 AM
Source: Prepared by the author using ArcGIS

5.3 Road Transportation Mobility between 05.00 to 06.00 PM from Urban Centers of the District

Mobility between 05:00 and 06:00 PM is very high. The concentration of vehicles between these hours is very high, and people like to travel at this hour due to the climatic variation. The temperature between these hours is very low. Social inclusion and social transformation are significant factors in transport mobility, as shown in Table 3. The higher mobility of Buses on the Srinagar to Rudraprayag Road is 4.23%, and the lower mobility on the Pauri to Srinagar Road is 1.96%. In comparison, the higher mobility of the Mini Bus at Kotdwar to Srinagar Road is 2.55%, and the lower mobility at Pauri to Srinagar Road is 1.31%. The higher mobility of Tracker at Srinagar to Rudraprayag Road is 15.87%, and lower at Pauri to Srinagar is 5.23%. The higher mobility of trucks at Kotdwar to Lansdowne Road is 23.53%, and the lower mobility at Kotdwar to Dehradun Road is 12.18%. The higher mobility of cars from Kotdwar to Dehradun is 37.89, and the lower is at Srinagar to Rudraprayag Road, which is 27.51%. On the other hand, the higher mobility of Two-wheelers on the Pauri to Srinagar Road is 42.48 %, and the lower at Kotdwar to Lansdowne Road is 29.41%, as shown in Table No. 3 given below.

Table 3: Percentage of Transport Mobility in Pauri Garhwal District (05:00-06:00 PM)

S.N.	Major Roads	Cluster of Timing	Transportation Type					
			Bus	Mini Bus	Tracker	Truck	Car	Two-Wheeler
	1	2	3	4	5	6	7	8
1	Kotdwar to Lansdowne	05 - 06: PM	2.35	2.35	7.06	23.53	35.29	29.41
2	Kotdwar to Srinagar		3.19	2.55	5.96	17.02	28.72	42.55
3	Kotdawar to Dehradun		2.03	1.89	5.41	12.18	37.89	40.60
4	Pauri to Kotdwar		2.68	2.01	8.05	23.49	33.56	30.20
5	Pauri to Srinagar		1.96	1.31	5.23	16.34	32.68	42.48
6	Srinagar to Rishikesh		2.16	2.16	11.89	18.92	29.73	35.14
7	Srinagar to Rudraprayag		4.23	2.12	15.87	15.87	27.51	34.39
	Average		2.66	2.06	8.50	18.19	32.20	36.40

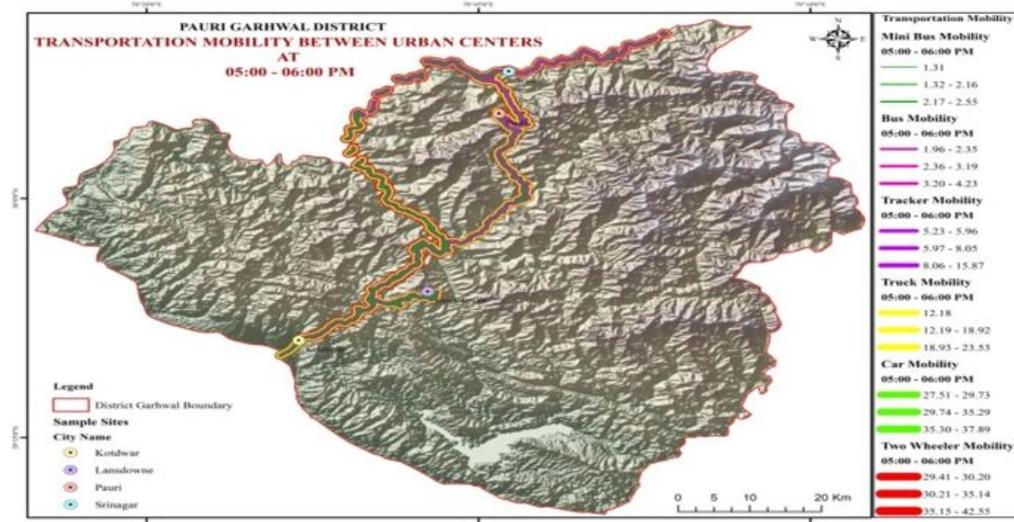Source: Author's analysis based on primary survey

Figure 4: Transport Mobility in Pauri Garhwal District between 05:00 to 06:00 PM
Source: Prepared by the author using ArcGIS

5.4 Road Transportation Mobility between 06.00 to 07.00 PM from Urban Centers of the District

During this hour, the whole mobility of transport is seen as higher. The mobility of Buses, minibusses, and trackers is very low compared to other hours. On the other hand, the mobility of trucks, cars, and two-wheelers is very high, as shown in the Table. The mobility of buses is higher at Kotdwar to Srinagar Road, which is 2.54%, and lower at Srinagar to Rudraprayag Road, which is 1.43%. On the other hand, the mobility of the Mini Bus is higher at Pauri to Kotdwar Road, 2.24%, and lower at Pauri to Srinagar Road, 0.74%. The mobility of Tracker is higher at Kotdwar to Srinagar, which is 6.36%, and lower at Kotdwar to Dehradun Road, 3.72%. Higher mobility of Truck, Car, and Two-wheeler at Pauri to Srinagar, Srinagar to Rudraprayag, and Kotdwar to Dehradun roads which is 22.22%, 35.71% and

47.15%, and lower mobility of transport at Srinagar to Rudraprayag, Srinagar to Rishikesh and Kotdwar to Lansdowne roads at 10.71%, 25.64% and 36.81% respectively as shown in (Table No: 4) given below.

Table 4: Percentage of Transport Mobility in Pauri Garhwal District (06:00-07:00 PM)

S.N.	Major Roads	Cluster of Timing	Transportation Type					
			Bus	Mini Bus	Tracker	Truck	Car	Two-Wheeler
0	1	2	3	4	5	6	7	8
1	Kotdwar to Lansdowne		1.84	1.23	4.91	21.47	33.74	36.81
2	Kotdwar to Srinagar		2.54	2.12	6.36	14.83	29.66	44.49
3	Kotdawar to Dehradun		1.49	1.74	3.72	13.65	32.26	47.15
4	Pauri to Kotdwar		2.24	2.24	5.97	18.66	29.85	41.04
5	Pauri to Srinagar	06 - 07: PM	1.48	0.74	5.19	22.22	33.33	37.04
6	Srinagar to Rishikesh		1.54	1.03	12.82	20.51	25.64	38.46
7	Srinagar to Rudraprayag		1.43	0.71	8.57	10.71	35.71	42.86
	Average		1.79	1.40	6.79	17.44	31.46	41.12

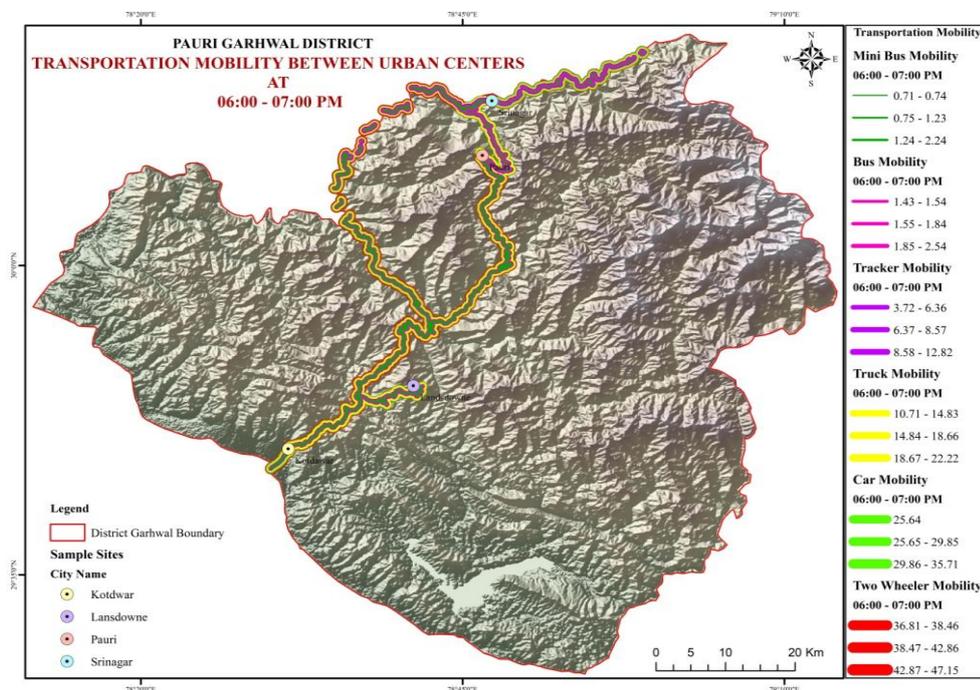**Source: Author's analysis based on primary survey**

Figure 5: Transport Mobility in Pauri Garhwal District between 05:00 to 06:00 PM
Source: Prepared by the author using ArcGIS

5.5 Inter-Regional Connectivity of Road Transportation from Urban Centers in Pauri Garhwal District
Regional connectivity is also essential for the progress of regional centers. Transport communications in local cities and towns play a significant role for local centers as a service access to commodities and materials in the area. Good regional transport communications improve the condition of the local market

and provide it with new income opportunities and more competitive environments in regional development. In Pauri Garhwal District, the primary two regional road transport sources are buses and trackers, which connect one region to another. Transport connectivity is important for the city's development because it connects with other well-developed industries. Regional transport connectivity provides the basic needs of goods and services at their location at affordable prices. Without connectivity, it is impossible to provide the necessary goods and services used daily in the rural areas of the Pauri District

5.6 Inter-Regional Connectivity of Road Transportation from Srinagar (NPPs) Urban Center to Other Service Centers.

The Bus connectivity from Srinagar to Pauri was very high, 10.00%. Because Pauri is the district administrative headquarters, people travel for official work, so the connectivity depends on the well-developed regions. The low connectivity of the Bus shown from Srinagar to Delhi is 2.0% due to Delhi being too far from Srinagar, and connectivity is very poor because people do not have a proper reason to travel from Srinagar to Delhi regularly, as shown in the graph below (Table No. 5).

The higher connectivity of the tracker is shown from Srinagar to Pauri, which is 10.67%. Because Pauri is the hilly district's headquarters, the connectivity of the Bus is not possible for people who like to travel in the tracker for their official work. Trackers are the most successful transportation in the hilly area of Uttarakhand, while trackers from Srinagar to Delhi have a low connectivity of 0.00%. The reason for the low connectivity is that there is no direct transport available on this route. People picked long-distance transportation like trains and buses from Haridwar, Dehradun, and Rishikesh cities, and a few people hired a tracker in emergency situations.

Table 5: Percentage of Public transport inter-regional connectivity in Srinagar

S.N.	City Routes		Frequency		Total	Percentage		Total Connectivity
	From	To	Bus	Tracker		Bus	Tracker	
1		Rishikesh	10	12	22	6.67	8	14.67
2		Haridwar	12	10	22	8	6.67	14.67
3		Dehradun	8	14	22	5.33	9.33	14.67
4		Pauri	15	16	31	10	10.67	20.67
5	Srinagar	Davprayag	5	8	13	3.33	5.33	8.67
6		Rudraprayag	10	12	22	6.67	8	14.67
7		Chombali	5	10	15	3.33	6.67	10
8		Delhi	3	0	3	2	0	2
9	Total		68	82	150	45.33	54.67	100

Source: Author's analysis based on the primary Survey

The Higher regional connectivity share of Bus and Tracker from Srinagar to Pauri is 20.67%, and the lower connectivity share from Srinagar to Delhi is 2.00%, as shown above (Table No. 5).

5.7 Inter-Regional Connectivity of Road Transportation from Pauri (NPPs) Urban Center to other Service Centers.

Pauri City is located at an elevation of 1814 m above sea level on the northern slopes of Kandoliya hills. The city has a well-developed infrastructure and an industrial manufacturing zone. The transportation infrastructure is good and easily accessible for all regional centers. The Bus transport connectivity is very high from Kotdwar, which is 11.21%, because Kotdwar is the central industrial and commercial hub. The low bus transport connectivity is shown from Pauri to Delhi and Pauri to Chandigarh, which is 1.87% and 0.93%, respectively, as shown below (Table No. 6). The low connectivity in these areas is due to the unavailability of bus services and the long distances. The higher connectivity of Tracker is shown from Pauri to Srinagar and Pauri to Kotdwar, which is 11.21% and 13.08%, respectively, and low connectivity from Pauri to Delhi and Pauri to Chandigarh, which is 0.00%. The low connectivity is due to the unavailability of transport and regular passengers, as shown in the table and graph below

Table 6: Percentage of Public transport inter- regional Connectivity in Pauri

S.N.	City Routes		Frequency		Total	Percentage		Total Connectivity share
	From	To	Bus	Tracker		Bus	Tracker	
1		Srinagar	10	12	22	9.35	11.21	20.56
2		Dehradun	8	10	18	7.48	9.35	16.82
3		Kotdwar	12	14	26	11.21	13.08	24.3
4	Pauri	Satpuli	10	10	20	9.35	9.35	18.69
5		Delhi	2	0	2	1.87	0	1.87
6		Chandigarh	1	0	1	0.93	0	0.93
7		Haridwar	8	10	18	7.48	9.35	16.82
8	Total		51	56	107	47.66	52.34	100

Source: Author's analysis based on the primary Survey

The total higher share of regional transport connectivity is shown from Pauri to Kotdwar, which is 24.30%. In contrast, the low regional connectivity share is shown from Pauri to Delhi and Pauri to Chandigarh, which is 1.87% and 0.93%, respectively. This low share is due to the longer distance from Pauri to these areas and the unavailability of services.

5.8 Inter-Regional Connectivity of Road Transportation sfrom Kotdwar (NPPs) Urban Center to Other Service Centers.

Kotdwar is situated at the foothills of the Shivalik at a distance of 101 km from Pauri. It is the entrance to the hills in the Pauri region of Uttarakhand and means 'Gateway to Garhwal.' Kotdwar is a well-established industrial sector connected to other regional transport. People migrate to these regions to fulfill daily needs and work in the private sector. The regional connectivity of buses is very high, from Kotdwar to Dehradun, at 11.40%. The connectivity is high due to Dehradun being Uttarakhand's capital city and its industrial hub. People travel for their official and job opportunities in the private sector. The low Bus connectivity is shown from Kotdwar to Srinagar, which is 1.75% because there are no direct transport services on this route, as shown below (Table 7). The higher connectivity of Tracker is shown from Kotdwar to Dehradun, which is 13.16%. The lower transport connectivity is shown from Kotdwar to Saharanpur and Meerut, which is 0.00%, as shown in Table 7 given below. The very low connectivity is due to the distance of this area being above 300 km. The availability of a tracker is not possible due to the maximum distance and higher fear rates.

Table 7: Percentage of public transport regional connectivity in Kotdwar

S.N.	City Routes		Number		Total	Percentage		Total Connectivity
	From	To	Bus	Tracker		Bus	Tracker	
1		Pauri	10	12	22	8.77	10.53	19.3
2		Srinagar	2	5	7	1.75	4.39	6.14
3		Dehradun	13	15	28	11.4	13.16	24.56
4	Kotdwar	Delhi	6	0	6	5.26	0	5.26
5		Lansdowne	9	4	13	7.89	3.51	11.4
6		Saharanpur	5	0	5	4.39	0	4.39
7		Haridwar	12	13	25	10.53	11.4	21.93
8		Meerut	8	0	8	7.02	0	7.02
C	Total		65	49	114	57.02	42.98	100

Source: Author's analysis based on the primary Survey

The total regional share of Bus and Tracker is higher from Kotdwar to Dehradun, which is 24.56%, and the lower regional connectivity share is shown from Kotdwar to Srinagar, Saharanpur, and Delhi, which are 6.14%, 4.39%, and 5.26%, respectively, as shown in Table 7 above.

6.9 Inter-Regional Connectivity of Road Transportation from the Lansdowne (CBs) Urban Center to other Service Centers.

Lansdowne is a coastal town in the Pauri Garhwal District of Uttarakhand. Lansdowne is a town and a hilly station located on the Kotdwar-Pauri roads at an elevation of 1780 m. It is 45 km away from Kotdwar. The higher connectivity of bus transport was noticed from Lansdowne to Kotdwar, which is 33.33%. The low connectivity of bus transport was noticed from Lansdowne to Pauri and Haridwar, at 6.67%. The higher tracker connectivity noticed from Lansdowne to Kotdwar is 26.67%, and the low connectivity from Lansdowne to Pauri, Haridwar, and Satpoli, which is 0.00%, as shown in Table 8 and the graph given below.

Table 8: Percentage of Transport inter-regional connectivity in Lansdowne

S.N.	City Routes		Number		Total	Percentage		Total
	From	To	Bus	Tracker		Bus	Tracker	Connectivity share
1		Pauri	2	0	2	6.67	0	6.67
2		Kotdwar	10	8	18	33.33	26.67	60
3	Lansdowne	Haridwar	2	0	2	6.67	0	6.67
4		Satpoli	8	0	8	26.67	0	26.67
5	Total		22	8	30	73.33	26.67	100

The total share of Bus and Tracker is higher from Lansdowne to Kotdwar, which is 60.00%. This is because Kotdwar is the central industrial and educational hub near Lansdowne. The low connectivity share is shown from Lansdowne to Pauri and Haridwar, which is 6.67%, as shown above (Table No. 8).
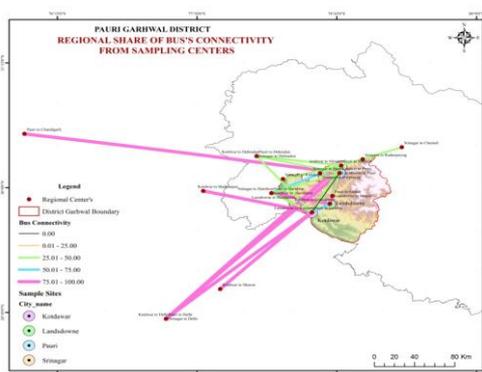

Figure 6: Regional share of Bus connectivity.
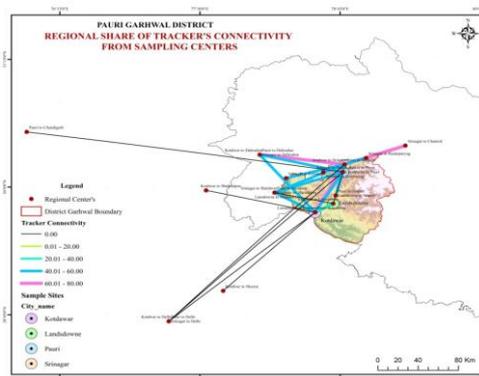**Source: Prepared by the author using ArcGIS**

Figure 7: Regional share of Trackers connectivity.
Source: Prepared by the author using ArcGIS
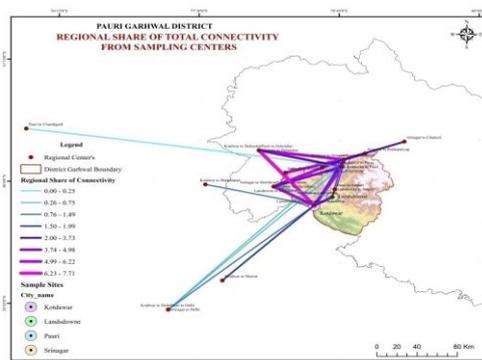

Figure 8: Regional share of Total connectivity.
Source: Prepared by the author using ArcGIS

7. CONCLUSION

Public transport mobility and regional connectivity are vital to sustainable development, economic growth, and social inclusion, particularly in Pauri Garhwal, Uttarakhand. Pauri Garhwal is a hilly district located in the lap of the Himalaya; road transportation is the main source of communication network because it provides a flexible and accessible means of transport connectivity in the region. Accessible public transportation systems in a rural area of Pauri Garhwal empower the rural communities, reduce the gap between urban centers, and enhance the basic services to the people, such as access to education, healthcare, employment, and markets. Transport mobility facilitates the movement of goods and labor, which is important for economic growth. Better connectivity also develops investment and creates job opportunities in agriculture, tourism, small-scale manufacturing, and retail sectors. The above results indicate that transport mobility varies over time and provides a better living standard to the households. Mobility varies from hour to hour, depending on the maximum number of vehicles traveling on the roads at a given time. It is observed that higher and lower mobility is seen in the two-wheelers and Mini buses, respectively.

Tracker plays a significant role in Regional Connectivity in the transportation system in the Garhwal District. Garhwal is a hilly district covered by huge mountains. Bus connectivity is impossible in every area because of the single type of road in the villages. The tracker is a successful means of transport for the Garhwal villages, and minimal risk was found.

To improve the transportation infrastructure in rural areas, the government should integrate public transportation with digital technology, such as mobile apps, the installation of CCTV for the safety of passengers, etc., and maintain the quality of roads, all-weather connectivity, bridges, and a proper drainage system in the hill landscape of the Garhwal district.

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