

Pattern of commuting: A case study in Aligarh city

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Abstract

Over recent years the phenomenon of commuting has become very much discussed issue as a consequence of rapid economic and population growth resulting in tremendous problems in and around the cities. Therefore, in present study an attempt has been made to analyze the spatial pattern of commuting in Aligarh city that is expressed in terms of direction of movements, distance they cover to commute, transport mode they use, the time they take to commute and the money they spend on commuting. The study is based on primary data generated through the field survey in Aligarh city carried out during the months of August and September, 2015. For data collection, 170 commuters were randomly selected from various places in and outside the Aligarh city. For the collection of data, the selected commuters were interviewed by using well-structured questionnaire. The study reveals that about forth-fifth commuters belong to young and mature working age group (21-45) while only the one-fifth of commuters is composed of old-age group and the fraction of male commuters is higher (83.75 percent) as compared to females commuters (16.25 percent). The 72.75 percent of the commuters are from rural areas whereas only 27.25 percent belong to urban areas. The male commuters cover longer distance to commute than that of females and the probability of commuting is lowered when the distance is longer to be covered. Most of commuters depend on the modes of public transportation to reach to their work place on regular basis in Aligarh city. Moreover the time of commuting has been found being influenced greatly by the modes of commuting, commuting distance as well as the socio-economic status of commuters.

Keywords: Commuting, Commuters, Mobility, Modes of transportation, Distance and Time, Aligarh City

Introduction

Generally, population mobility or movements includes all kinds of spatial relocation from routine daily commuting to permanent migration that occur over various distances and in which the duration of moves varies from a few hours to many years (Mahbub, 1997) ^[7]. According to Zelinsky, (1971) ^[20] the population mobility can be divided into migration and circulation. The distinction is on the basis of the degree permanent change of residence (Mahbub, 1997) ^[7]. In this research paper it has been emphasized to focus on commuting as reversible form of daily mobility. Commuting is of shortest duration. It is a circular movement that occurs over a day. There are various views among scholars in defining the commuting. Commuting is the interplay between residence and workplace over a day. It is determined by an equilibrium state of housing and labor market, in which individual's wellbeing or utility is equalized over all combinations of alternatives in these two markets (Stutzer and Frey, 2007) ^[17]. It allows workers to link their workplaces spatially with their residence on a day-to day basis (Ommerenet, 1997). According to Polyzos and D. Tsitas, 2015 "Commuting refers to the act of daily travelling between two locations for employment purpose. While Tamara Lukie and Bajan Dercan, 2010; described commuting as daily migration that represents a special form of spatial economically active population performing an occupation of pupils and students. The theoretical framework that describes the commuting phenomena is synthetic provided by different scientific sector, such as Regional, Economic, Political, Economy, Anthrograph and economic geography. Through this theoretical background three fundamental axes for the study of the commuting system are distinguished; The first concerns the location behavior of

the productive activities (travel destination) (Beckman and Thiss, 1987), the second regards the urban land pricing and residence cost (travel origin) (Sinon and Vander Vee, 1992) and last refers to the determining characteristics of commute (Noland, 1997; Susilo and Kixamora, 2008; Yeo and He, 2009). The theoretical matter of the first category contributes to the comprehension of the mechanism that creates a location for a labor activity (destination). The second category describes the attitude and strategies that produce the residence location (origin). Finally, the third category studies travel or intermediate matter such as the means of commuting, the volume of the trip and its duration (Polyzon S, Tsitos D, Minetos D, 2013).

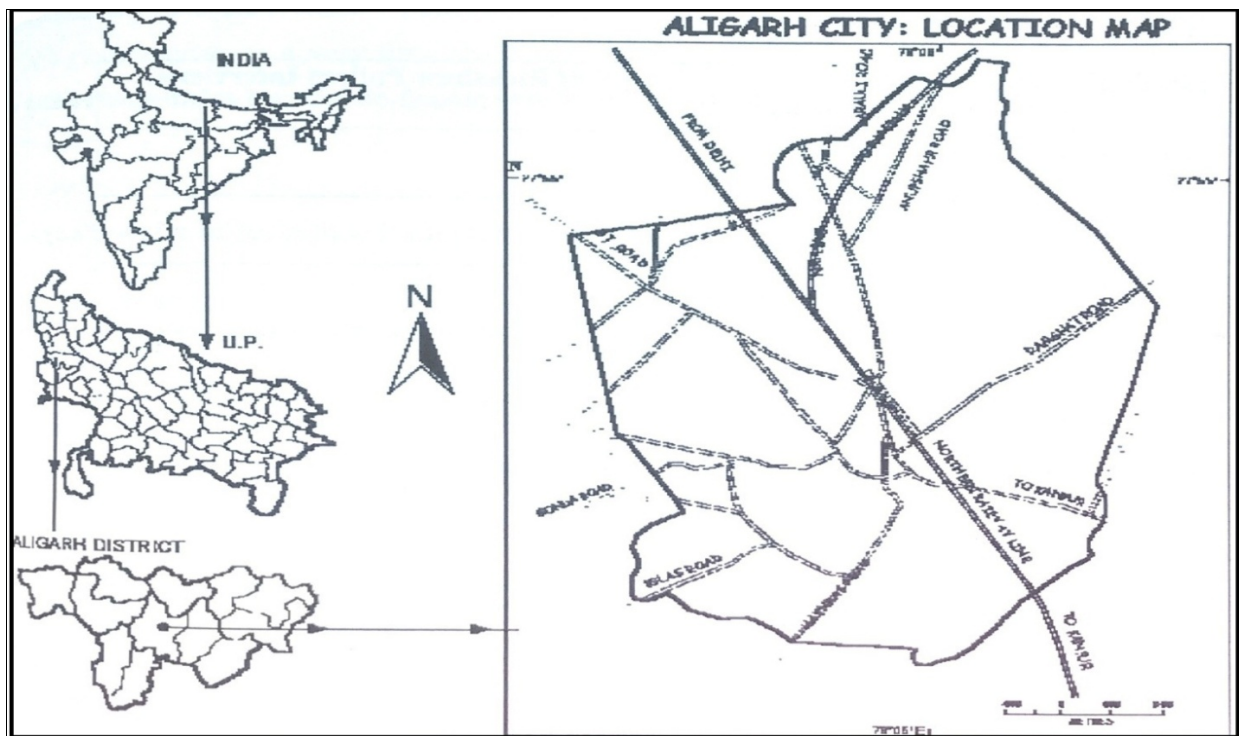
The literature on urbanization in India identifies an emerging trend of more and more people staying outside the cities and commuting every day for work and work related purposes (Mohnan 2008; Chandrasekhar 2011; Bhagat 2011; Kundu 2011; Sharma 2013;) ^[3, 12]. The trend is likely to accelerate over time due to increase in employment opportunities in urban areas particularly cities and the limited scope of the rural areas to employ its residents. Besides, with the improvement of accessibility and connectivity, commuting is increasing rapidly which not only providing the availability to work to jobless people but also making them able to integrate internal home-sphere to external workplace (Punpuing, 1993; s27). Thus participation in workforce does not divert commuters from household duties (Mondal B, Samant G; 2014).s

Commuters are significant because they stay in one place and work in another place. For the accomplishment of this purpose, they move between the place of residence and place of work daily (Chandrasekhar, 2011) ^[3]. This daily journey-to-

work gives a rise to a spatial pattern, which is determined by a number of factors. Availability of regular work in the city is the most important factor that pulls workers to the city. Better wages in the city is another important pull factor. Non-availability of jobs in the place of residence pushes the workers to seek work in the city (Goswami B, George K; 2014). Besides these major push and pull factors, a number of other factors such as geographic factors (distance, physiographic, climate, etc), demographic factors (age, gender), socio-economic factors(occupation, income level, economic agglomeration and diversification of the two areas) etc. also determine the commute pattern (Mondal B; 2015). The present study is an attempt to understand the existing commuting pattern of workers in Aligarh city from its surrounding areas. In geography of commuting (Dickinson, 1957), commute pattern is expressed in terms of commuters direction of movement, distance they cover daily, the time they take to commute, types of transit they depend to travel and commute costs (Mondal B; 2015). Since these variables are often guided by a number of socio-economic and socio-demographic variables such as age, gender, occupation, land holding, occupancy of vehicles, there have also been discussed in relation to the parameter of commuting. In the light of the above, in present study, it has been attempted to identify the demographic characteristics of commuting as well as pattern of commuting that involves commuter’s direction, commute time, commute cost, commute distance and modes of commuting.

The Study Area

The Aligarh city of Uttar Pradesh has been selected for present study. Aligarh city lies between 27°52’N to 27°56’N latitudes and 78°3’E to 78°6’E longitudes. It occupies an area of about 36.10 square km in the west of Uttar Pradesh. Total population of Aligarh city as per census 2011 is 874,408 out of which, 52.80 percent are males while 47.19 percent are females. The sex ratio of city is 894 females per 1000 males, whereas, the child sex ratio is 885. The literacy rate in the city is 68.52percent. While literacy of male and female is 73.53 percent and 62.93 percent respectively. The area selected for the present study is well connected with its hinterland by both roadways and railways. The famous Grand Trunk passes through the city and many of Highways are well connected to Aligarh such as- NH91, NH93 and Yamuna Expressway. Besides, Aligarh is an important center of Uttar Pradesh and is mostly famous for its lock industry. The famous Aligarh Muslim University is also situated here. Thus, being an industrial educational and administrative city of Uttar Pradesh it provides the sources of employment for the people particularly belonging to its surroundings rural areas. As the industrialization, urbanization and level of education is improving, consequently the rate of commuting is also increasing very fast in the city. So it has been rightly selected to analyze the socio-economic analysis of commuters in Aligarh city.



Data Base and Methodology

The present research paper is based on the primary sources of data generated through the comprehensive field survey, carried out during year 2015. For the purpose of data collection, individual interview was held to the respondents through the well-structured questionnaire. In present study, through the random sampling technique 170 individuals have

been surveyed on the possible places where the commuters might be found in majority such as railway station, bus stands, roads, markets, labor markets, working places, etc. But after sorting and screening (such as incomplete questionnaire, invalid data, etc.) only 160 samples were selected for further analyses. In this study only those persons were included in sample survey that travelled to Aligarh city to work regularly

excluding the persons with the purpose of education, shopping and household trips. A pilot survey was carried out during the month of July, 2015 to know their extent and places which reported that most of commuters in Aligarh city were from rural areas belonging to the categories of agricultural landless laborers, marginal and small farmers who worked only in sowing and harvesting season and became workless in agriculturally slack season. To record the number of commuters, three periods of time in a day early morning (6:00 am to 9:00 am), evening (5:00 pm to 8:00 pm) and working hours (8:00 am to 9:00 pm) were selected. After the completion of field survey, the data collected by using individual slips were scrutinized and converted into tabular form according to the requirement of the various aspects of the study.

Aims and Objectives

The major objectives of the study are

- (1) To examine the demographic characteristics of commuting.
- (2) To analyze the modes of commuting availed by the commuters in the city.
- (3) To assess the directions of commuting, distance of commuting, and commute time of commuters.

Table 1: Demographic Characteristics of Commuters in Aligarh City, 2015

	Category	Male	Female	Total
1.	Sex	83.75	16.25	100.00
2.	Age Group			
	15-20	8.98	23.07	11.29
	21-30	35.47	26.92	33.94
	31-40	35.82	23.07	33.95
	41-50	11.19	15.38	11.87
	51-60	5.97	7.69	6.25
	Above 60	2.50	3.84	2.62
	Total	100.00	100.00	100.00
3.	Education			
	Illiterate	29.85	36.36	34.70
	Primary	21.64	27.27	21.25
	Secondary	8.20	18.18	7.49
	Senior Secondary	11.19	9.09	10.62
	Graduation	16.41	9.09	14.37
	Post-Graduation	7.46	-	7.50
	Others	5.22	-	4.37
	Total	100.00	100.00	100.00
4.	Marital Status			
	Married	73.13	46.15	68.75
	Unmarried	20.89	38.46	23.75
	W/S/D	5.97	15.38	7.50
	Total	100.00	100.00	100.00
5.	Religious Composition			
	Hindus	76.11	84.61	77.50
	Muslims	20.89	15.39	20.00
	Others	2.98	-	2.50
	Total	100.00	100.00	100.00

i) Gender

Gender is mentioned in many studies as a factor of importance, influencing commuting. In general men commute longer, further and more frequent compared to women (Groot et al, 2012; Osth and Lindgren, 2012; Schwanen et al, 2004; Susilo and Maat, 2007; Vem acker and Witlox, 2011) and this

difference is greater when children are present in a household because of the still traditional larger role in child care by women (Deding *et al*, 2009; Ancker and Witlox, 2011). Among women commuters the probability of long distance commuting of single women with a dependent child is lowered by 20 percent than other women (Champion *et al*. 2009). The East Midlands development Agency (2007) found evidence from 2001 census that the East Midland females are less likely than males to travel, Outside of their local authority to access work. The National Travel Survey 2005 (Det, 2006) found that in Great Britain men commute an average of 17 km compared with 10 km for women. This empirical study also supports the above mentioned evidences from earlier research. There has been observed a sharp gender disparity among commuters in study area. It was found that men dominate in commuting over the women. The data contained in table-1 shows that out of total selected commuters 83.75 percent were males whereas only 16.25 percent females. The main causes behind this gender disparity among commuters found during the survey are; (i) Long distance to be travelled to city, (ii) Absence of good road and public transport, (iii) Low skill status (iv) Low wages (v) Non-availability of non-farm jobs nearby (vi) Traditional attitude towards women in society.

ii) Age

Age seems to be the major determinant for commuting pattern as younger people tend to commute and further than older people (Dargoy, Clark, 2012; Sandow, 2008; Simonsahn, 2006). It is almost universal that most of the commuters belong to working age-group, i.e. 25-60 years age group (Champion *et al*. 2009; Partridge *et al*. 2010; Erikson, 2011; Chandrasekhar, 2011) ^[3, 9]. But within this working age-group, there are many variations across countries. In England, Canada and USA younger working people commute more. On the contrary the commuter is 39 years which is much higher than that of migrants, 25 years. It is because aged people stay at home. They look after families and on-farm activities and therefore they prefer commuting rather than to migrate (Mahbub, 1996) ^[7]. The data contained in table-1 on the age-group of commuters that the highest proportion of commuters (67.49 percent) is in 21-40 age-group. After 40 years of age, the declining trend in proportion of commuters in various age groups has been recorded; their percentage in age-group, 41-50, 51-60 and above 60 has been registered 11.87 percent, 6.25 percent and 2.62 percent respectively.

iii) Education

There is a significant role of education influencing the pattern of commuting of a city. The empirical literature devoted to understand the determinant of commuting pattern finds that a higher level of education is associated with longer trips in terms of distance (Lee and McDonald, 2003; Papnikolaou, Vance and Hedel, 2008). Similar results are found with regard to commuting time (Lee and McDonald, 2003; Shen, 2000). More especially Shen (2000) finds that highly educated people travel longer while low educated people tend to work closure to home. In edition it has been urged that highly educated people have a higher probability to be long distance commuters (Ohman and Lindgren, 2003).

In order to understand the role of individual education on commuting pattern, many of factors should be taken into account. The distance and time travelled depend on residential

and work location, both of which are chosen by individual (Stefen P.T Groot, L.F De Groot and P. Veneri, 2012).

In present research an attempt has been made to identify the implication of educational level on commuting pattern of Aligarh city. The data contained in table-1 gives an account of educational state of commuting. It can be seen from the table-1 that out of total commuters 34.37 percent were illiterate and 65.63 percent literate. Out 65.63 percent literate commuters 21.25 percent got education upto primary level, 7.49 percent upto intermediate 14.37 percent upto graduation and 7.50 percent upto post-graduation, whereas the rest (4.37 percent) comprised of diploma professional and technical degree holder etc.

It has been observed through the survey most of illiterate commuters or educated upto the level of primary and higher secondary belonged to nearby surrounding rural areas of the city whereas the commuters from urban areas comparatively and highly educated they were found to involved in business, educational, commerce, administrative services. Contrary to it the illiterate and likely less educated workers belonging to urban area were seen engaged in casual pity work such as construction, street vending, Rickshaw pulling, Loading unloading, Manufacturing, white washing etc. Moreover, Majority of low educated commuting workers were examining leaving close to their work places. Approximately, Three-fourth of employed worker leaved within 20 Km of their work location. While the higher educated worker travelled to work to city covering the longer distance. Besides they also have been observed spending more time on daily journey to work as compared to low educated people on the whole, it may be concluded that pattern of commuting of a city is determine greatly with the level of education.

iv) Marital status

Marital status of commuter is a major factor determining the special behavior of a city. Earlier researchers have found that married people commute more as compared to unmarried it is because of two basic reasons. First married workers by commuting can maintained both household responsibilities as well as the workspace commitments. Second they can look after the farm activities along with their non-farm jobs (Mahbub, 1997)^[7].

The marital status of selected commuters has been given in table-4. An examination of data contained in table-4 reveals that 68.75 percent of all commuters were married and 23.75 percent unmarried while the remaining proportion of commuter (7.50 percent) comprised of widowers, separated or divorced. The further gender wise analysis of marital status of commuters depicts that among the females 46.15 percent married and 38.46 percent unmarried, while, among males the respective figures were found 73.13 percent and 20.89 percent. However, ratio of female commuters (15.38) in the category of widowed, separated or divorced exceeded that of male commuters (5.97 percent).

v) Religious composition

The religious breakup of commuters set out in table-2 shows that the Three-fourth (75.37) of commuters were Hindus and One-fifth (22.12) Muslims whereas the rest (2.50 percent) belonged to other religions. The basic reason behind the finding of high proportion of the workers belonging to Hindu community is that most of commuters coming to the city to

work belongs Hindu majority nearby areas. Whereas number of female commuters belonging to Muslim community are likely less because of religious orthodox views and the restriction on them to work in open places.

Direction of Commuting

Commuting is a regular interaction between two location i.e. home and workplace. Commuting emerges when the four condition prevails; (i) a qualitative or quantitative imbalance between the demand and supply of workforce in the sending settlement (ii) vacant jobs in the destination, (iii) suitable transport connections between both places; residence and workplace and (iv) travel time between these two location should be accepted (Bohm and Pal. L, 1997). All of these factors playing a significant role in influencing the spatial pattern of commuting also determine the direction of commuting to a great extent. Some previous researches have been brought out taking into account the pattern of commuting including the commuting directions in which the directions of commuting have been divided into four kinds i.e. (i) Rural to urban commuting (R-U), (ii) Urban to urban (U-U) (iii) Rural to Rural. Besides, these three categories i.e. commuting to undefined direction (rural/urban) is also prevalent among commuters (Mondal B, 2014). Apart the above types of commuting direction, some scholars have classified the direction of commuting into three types differently; such as (i) Rural to Urban commuting (the most popular) (ii) Reverse commuting (residence in central cities who work in suburbs), (iii) Lateral commuting (commuting between two suburbs). In this section, it has been recognized the two major types of direction of commuting in Aligarh city. First, Rural to urban (living in rural areas whereas working in cities) Second, Urban to Urban commuting (residence and workplace both in cities). Commuting of rural workers is rapidly increasing as a result of increasing trend of non-farm work (Rearden *et al.* 2007). It can be seen from the table that the share of people commuting to Aligarh city from rural areas is more than three-fourth (72.75), whereas the persons commuting to Aligarh city from urban areas comprise only one-fourth (27.25 percent). The table shows a wide gap among the commuters on the basis of their direction. In this way table supports the evidences recent researches that depicts commuting for work from rural areas is increasing all over the world be it developed (Harris *et al.* 2008; Partridge *et al.* 2010)^[9] or developing countries (Mahbub, 1997)^[7] small size of land holding, ;low wages of income, excessive pressure of population on agriculture, seasonal work and mechanization in agriculture etc, found through the survey, have been the major causes rural to urban which have forced people greatly if rural areas to seek the sources of earning in cities. It has been observed that Rural-Urban commuting increases with increasing rate of unemployment.

There has been identified a significant difference in the pattern of commuting , the rural to urban and urban to urban commuters on account of their occupational structure as well as level of education. As the study shows that 72.75 percent of selected commuters were from rural areas out of which 46.61 were illiterate and 54.39 percent literate, most of them were educated up to the level of primary and higher secondary. Consequently, they were found belonging to the categories of landless agricultural and casual labors, marginal and small farmers, rural artisans, engaged in low skill elementary jobs

such as constructional workers, street vendors, rickshaw pullers, drivers, carpenters, milkman, salesman, etc. Whereas the commuters from urban areas were comparatively highly educated and they were seen to be involved in business, educational, trade, commerce, administrative, and banking services etc. Besides, some of female commuters working in city after crossing the rural boundaries were found doing the work construction and manufacturing while the females commuting to city from urban areas, being comparatively highly educated were noticed teaching in government and private school or working in hospitals as health workers.

Table 2: Directions of Commuting, 2015

Place of Origin	Percent
Rural-to-urban	72.75
Urban-to-urban	27.25
Total	100

Sources: Based on field survey, 2015

Commuters by Distance

Commuting is a reversible movement, a movement of shortest duration that occurs even over a day. Therefore, the trend of distance in commuting is not found longer as compared to migration and other irreversible and long-term movements. The probability of commuters is lowered when the distance becomes longer to be covered. Percent distribution of distance moved by commuters is given in table-8. It can be seen from the data that ratio of males is much higher than females in long distance whereas in short distance commuting the trend get reversed. Up to 25km the proportion of female commuters was higher (76.91 percent) while the share of male commuters comprised only 67.90 percent. For distance 26-75 Km the proportion became 31.07 percent and 23.07 percent respectively. The distance above 100 Km covered by the people on regular basis included only 1 percent male. There was not witnessed even a single women in the study area covering the distance from the 51-75 Km to 100 Km and above of 100 Km.

Table 3: Percent Distribution of Commuters by Distance, 2015.

Distance in Km	Male	Female	Total
Within 10	36.56	42.30	37.50
11-25	31.34	34.61	31.87
26-50	19.40	15.38	18.75
51-75	8.20	7.69	8.12
76-100	2.98	-	2.50
Above 100	1.49	-	1.25
Total	100	100	100

Source: Based on field survey, 2015

Modes of Commuting

For their daily to work. Transport is a significant component of commuting. Commuting requires a combination of appropriate transport infrastructure, improved transport services and affordable means of transport, both motorized and non-motorized (Starkey *et al.* 2002). Commuters always want to get hold on any mode of transport at any point of time to reach their destination timely. Therefore, it is very certain that without the good provision of transport commuting is not possible. However, selection of mode of transport depends on the combination of a number of factors (topographic factors, climate weather, absolute distance, etc.), economic factors

(economic condition, cost, nature of work), cultural factors (choice, taste, tradition, social status, advancement of civilization, etc) and governance factors (laws, regulation, etc) (Mondal B, 2014). Many of the commuters use more than one mode for their journey to work. Therefore, main mode distance in the journey to work and back home has been used for the analysis (Goswami, B. and George K. 2014).Therefore in light of above; an attempt has been made to describe how the commuters select mode of transport to travel to their work place in city. In this section the modes of transportation have been divided into three categories (i) Public transport (ii) Private vehicles (iii) non-motorized.

A) Public Transport

Public transport (also public transportation, public transit) is a shared passenger transportation service which are available for use by the ground public, as distinct from modes such as Taxicab, carpooling which are not shared by strangers without private arrangement (M. Singh, 2011). In the light of above bus, train, auto rickshaw and taxis, etc. has been considered the modes of public transportation used by commuters.

The table-3 providing the information about the modes of transportation in Aligarh city reveals that bus is the most selected mode to commute to the city that is being used by 36.87 percent commuters to reach to their destination because of its cheap and convenient services. However, the selection of bus has been observed influencing greatly by the commuters' socio-economic status. The low and middle income people with lower level of education are found more using the bus for short and long distance commuting more than high income and educated people. But there are some people who are yet highly educated but their income level is not so high, therefore they like to use public transport such as bus for saving the travel cost.

Many of local passenger train are well connected to its surrounding areas and thus provide the convenient travel for daily commuters. That is why train was found the second most dominant mode of transportation in city used by 20 percent commuters for regular journey to work. Trains to commuters not only allow the high capacity for short and long distance but also provides the cheap and faster services to outer suburbs as well as neighboring towns and villages it stops at all station, that are located to serve a smaller suburb or town centre.

Auto rickshaw (popularly known as Auto) is a very important and popular mean of transportation in Aligarh city. In Aligarh city 14.87 percent commuters were observed using an auto-rickshaw for their daily commute. Most of commuters have been seen using the auto-rickshaw for a minimum distance of six kilometers and a maximum distance of twelve kilometers. Whereas some of them select an auto-rickshaw to reach to their destination within a very short time because the auto-rickshaw was easily available to reach to their work place timely with a minimum time. In terms of age and sex, the auto was preferred by both young and old aged commuters for their journey whereas the proportion of female using the auto as means of daily journey was higher as compared to male. Low and middle income commuters were more depending on auto to commute than high income people. Besides these modes of public transportation, there were other types modes used by 7.99 percent commuters for their daily work trips e-rickshaw, taxi, jeep, etc.

B) Private Vehicles

Private vehicles are personal car, motorcycle, taxi, hired motorcycle, etc. or other type of vehicles (Choiejet R, Tegunfung R.). During the field survey it was observed that the commuters living in the middle and high income household were more likely to commute by private vehicles and less likely to travel by public transport modes. The share of female commuters using the private vehicles for regular their journey to work was observed higher in adult into commute young aged commuters 21-45 years old than old aged commuters. In Aligarh city motorcycle and car were observed two dominant modes of private vehicles to commute in and outside the city. The table provides the information about the distribution of modes of transportation used by commuters. The table shows that proportion of commuters using the private vehicles was 16.49 percent in which the motor cycle (popularly known bike) was more important. About 13 percent commuters were examined depending on bike to reach to their work place regularly whereas the car was second dominant private vehicle in city for daily commute. An analysis of considering the modes of transportation opted by commuters in terms of their socio-economic status as well as work status points out that nearly about 82 percent of the commuters who used the bike as their only means of transport to travel daily belong to middle and high income household which help them to afford the bike to commute. Most of commuters using the bike for their daily commute were either the teacher, policeman, clerk and bank employee or milkman, or businessman and shopkeeper. Car was another mode of transportation used by 3.12 percent commuter. The commuters using the car for their daily commute were found belonging to very high level of socio-economic status. Some of them were doctors, engineers, lawyers or businessman. Their economic prosperity enabled them to commute by car. Most of commuters were analyzed using the bike to cover the 10-45 kilometers of distance. But some of them used the bike to travel for covering very short distance such as 4-9 kilometers. However, it has been examined that the number of commuters using the private vehicles is increasing slightly as the consequence of increasing level of income, improved status of education, inefficient urban and transport planning, inconvenient, insecurity, unreliability in public transport modes, incidence of accidents in overcrowded modes etc.

C) Non-motorized Vehicle

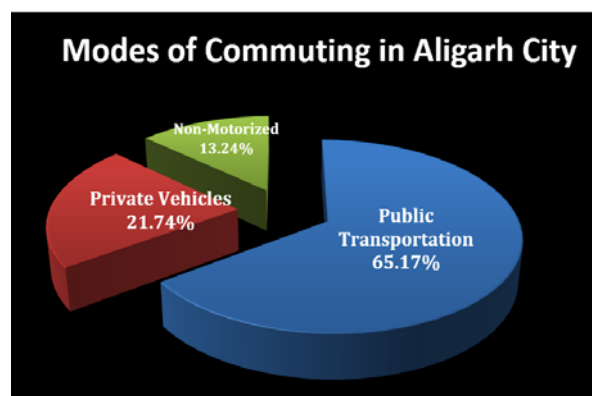
Non-motorized mode means all kinds of transport without engine such as walking cycling or cycle-rickshaw. These types of vehicles have been observed being influenced greatly by some geographic and socio-economic factors such as distance between home and work place, household income, occupation and level of education etc. The percent distribution of commuters' modes of transport given in table shows that 7.50 percent commuters in Aligarh city used bicycle as the main mode of their commuting on account of its easy accessibility and affordability. It was discovered that the commuters using bicycle were living near to their work place. The minimum distance between home and work place covered by bicycle was 4-5 kilometers while the maximum distance was 10-11 kilometers. As the household income increase, the percentage of commuting by non-motorized mode decreases. The commuters who completed primary level of education and living in poor household were more likely to commute by

bicycle and walking. The commuters depending on bicycle were mostly found engaged in low elementary job such as construction, loading unloading, whitewashing and painting, street vender, milkman, carpenter etc.

At the last having observed above mentioned discussion it may be concluded there is a positive relationship between levels of education, income, and the modes of transport. People with a better paid work status with high level of education, have a greater transport demand than those with lower work status, who mostly completed primary education. High status of commuters in terms of level of education, occupation, household income, could afford the private vehicle. Therefore, they were more likely to commute by private vehicles than use of public transport and non-motorized mode. At the whole it may be pointed out that about three-fourth of commuters having low socio-economic status used the public transportation due to its cheap and convenient with easy accessibility and availability in the city.

Table 4: Percent distribution of modes of transportation availed by commuters, 2015

	Types of Modes of Transportation	Total	Overall
1.	Public Transportation		
	Bus	55.23	36.25
	Train	19.04	12.05
	Auto-Rickshaw	17.15	11.25
	Others	8.57	5.62
	Total	100.00	65.17
2.	Private Vehicles		
	Bike	85.29	18.12
	Car	14.71	3.62
	Total	100.00	21.74
3.	Non-Motorized		
	Bicycle	71.42	9.37
	Cycle-Rickshaw	19.05	2.52
	By-walk	9.53	1.25
	Total	100.00	13.24
	Total	100.00	100.00



Time of commuting

This sub-section aims to explore the time spend by commuters to travel to work between place of residence and place of work for round trips. Commuting time is a significant component in studying the commute pattern of a city which help in considering how much time a commuter spend on commuting out of his daily routine. However, the commuting time of a worker is largely non-productive and reduces the free time

available with the work. The inverse relationship between commuting time and health status and productivity of the worker has been brought out by earlier studies. Although commute is positively correlated to the distance as the time to commute increases the rate of commuting decreases but there are some exceptions in this trend which is the result of the implications of various factors such as demographic characteristics of commuters, selection of modes of transportation by commuters, their per capita household income and their work status.

Table 5: Percent Distribution of Commuters by Time spent by them on Commuting, 2015

Time (in minute)	Male	Female	Total
Less than 30	25.37	38.46	27.50
31-60	23.88	30.76	25.00
61-90	18.65	19.23	18.75
91-120	12.68	7.69	11.87
121-150	9.70	3.86	8.75
Above 150	9.70	-	8.12
Total	100.00	100.00	100.00

Source: Based on field survey, 2015

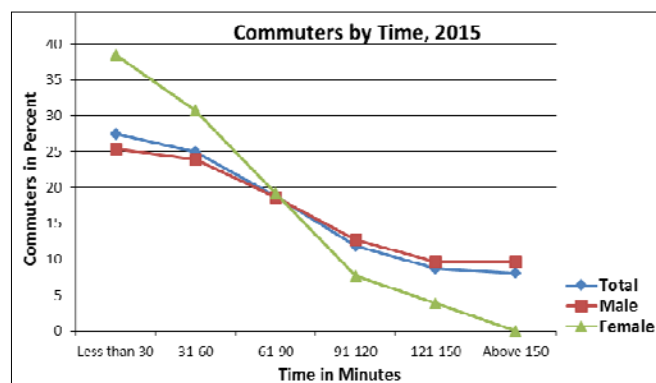


Table-6 presents the data on percent distribution of commuters by time spent by them on commuting. An analysis of the data given in the table shows that out of total sampled commuters in Aligarh city 27.50 percent spent about 30 minutes on their daily journey to work but the time between 31-60 minutes comprised of 25 percent. The corresponding figure between time of 61-90 and 91-120 minutes was observed 18.75 percent and 11.87 percent respectively. The time between 121-150 minutes accounted for 8.75 percent and above of 150 minutes consisted only 8.12 percent of all commuters. Thus the table depicts the fact that with the increase of time the rate of commuting decreased.

A gender-wise examination of data given in table exhibits that the male commuters were more likely to have long time as compared to female commuters. Upto the time of 30 minutes the fraction of female commuters was higher (38.46 percent) while the share of male commuters comprised only 25.47 percent. For the time of 31-60 minutes the ratio of male and female commuters was 23.88 percent and 30.76 percent respectively. While the percentage for 61-90 minutes were 18.65 and 19.23 percent respectively. Whereas between 91-120 and 121-150 minutes the corresponding figure were 12.68 percent and 7.69 percent, 9.70 percent and 3.86 percent. Above of 150 minutes the share of male commuter's amounted only 9.70 percent. However, there was seen no

female taking the time above of 150 minutes for daily travel to work.

Conclusion

It may be summarized from the above analysis that the pattern of commuting in Aligarh city varies with the demographic and socio-economic status of commuters. An observation of their demographic characteristics reveals that commuting in Aligarh city was dominated by young and mature working age group (21-45) whereas and the male commuters commute more and further than that of their female counterparts. Moreover out of total commuters 35 percent were illiterate and 65 percent were literate. Higher educated workers were found travelling to the city covering the longer distance and spending more time on their daily journey to work as compared to low educated people. Likewise the married people were more likely to commute than unmarried. Moreover low wages, highly pressurized agriculture land, small size of land holding, were the major causes in nearby rural areas that pushed 72.75 percent people to seek the work in Aligarh city while only 27.25 percent people were found commuting to Aligarh city from its surrounding small towns and cities to find the job as per their qualification. However there has been witnessed a sharp difference in the commuting pattern of rural and urban commuters in terms of income, education, occupation and distance and time. In addition a distance-wise analysis unfolds the fact that majority of commuters lived close to their neighborhood and approximately two-third of commuters lived within distance of 10 km of their workplace. Male commuters were observed covering the longer distance than that of their female counterparts and the probability of commuters was lowered when the distance became longer to be covered. Likewise, the commuters living in the household with the low level of socio-economic status in terms of education and affordability were more likely to commute by public transport and non-motorized modes and less likely to commute by private vehicle than commuters with the high level of income and education. Moreover the time of commuting has been found considerably interrelated to the commuters' level of education, income, occupation and distance. The study reveals the fact that the chance for more commuting was decreased when the time to commute increased.

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