

An Empirical Study of Urban Primacy in Sub Himalayan North Bengal: The Case of Siliguri

*¹Tuhin Dey Roy, ²Arjun Saha, ³Rajib Mitra, ⁴Dr. Arindam Basak

^{1,2,3}Research Scholar, Department of Geography and Applied Geography, University of North Bengal, West Bengal, India

⁴Assistant Professor, Department of Geography and Applied Geography, University of North Bengal, West Bengal, India

ARTICLE DETAILS

Article History

Published Online: 20 January 2019

Keywords

Empirical, Rank Size Rule, Index of Primacy, Dominance, Decentralized

*Corresponding Author

Email: deyrotyuhingeo@nbu.ac.in

ABSTRACT

In this paper an empirical Study has been made to find out the nature and the present scenario of urban primacy. Sub Himalayan North Bengal having an important physio-cultural importance also the phenomenon of urban primacy quite strongly. With an increase in urban population, better urban amenities and services **Siliguri** emerged as the single largest city of the whole region. In terms of population **Siliguri** is four times larger than the second largest city of Sub Himalayan North Bengal and also account for around two-third of urban population of this region. **Siliguri**, a primate city not only serves its adjacent areas, but also have a vast catchment area of the entire region. Sub Himalayan North Bengal, which is a very important physio-cultural region in terms of its geographical, historical, socio-political causes and Siliguri is the strategic center and transit point for the whole region. In order to measure the level of primacy Rank Size Rule of Zipf, Index of Primacy of Jefferson (Gibbs) and Reily's Breaking Point Analysis has been used. The study concludes with the dominance of **Siliguri** with respect to other town of this region, which advocates for the need of proper decentralized planning in future for sustainable betterment.

1. Introduction

In today, population growth rate in urban areas of under-developed and developing countries are too high. It was estimated that in the year 2025, world urban population will cross the boundary of 5 billion and 90% population of this will from different developing nations (Ahmadi et al. 2013). It is because of different opportunities in only urban areas of developing countries. Continuous growth of populations and movement of people towards the urban areas for getting opportunities are the reason of formation of urban primacy which is a familiar characteristic of urbanization of urban centers of different developing countries (Faraji et al. 2016). Urban primacy occurs when a large city actively dominates and control over a group of small cities in where populations are less than half of the dominant city which is known as primate city. "A primate city is the leading city in its catchment region, disproportionately larger in demographic size and significance than any others in the urban hierarchy" (Jefferson, 1939).

Over last couple of decades, Siliguri has recorded massive urbanization. On one hand major urban centers of this region experienced sluggish growth or have shown sign of stagnation, while only Siliguri has recorded rapid and substantial growth. We all know that urbanization in India is mainly large city oriented and it has been considered as "cancerous" and anti-developmental (Sarkar and Maji, 2013). It is not only the largest

urban center in terms of demographic size and area but is also one of the rapidly growing cities of this region. Population size of it is larger than the combined population of all major urban center put together and most of the urban center fall in its sphere of influence. This paper attempts to find out the primacy and also to analyze its influence over the surrounding region.

2. Study Area:

The study area covers the five districts of North Bengal (Darjeeling, Kalimpong, Jalpaiguri, Koch Bihar and Alipurduar). Physiographically this region is rectangular in shape and situated in the foothills of Himalaya. The western part is slightly undulating whereas the eastern part is mostly flat. This region is also known as Terai-Dooars-Hill region. The term 'Terai' came from marshy tract interflow of rivers (Tista, Torsha, Jaldhaka etc.) reemerge in this region and 'Dooars' came from a major stretch of this area which is bordered in the north by Bhutan, Hill referred as the whole hilly section of this region. Hence the whole region is known as Terai- Dooars-Hill Region. This region is located in a narrow strip of land linking mainland India to its North-Eastern States. This Region is famous for three 'T's - Tea, Timber and Tourism to the rest of the world. For the urban centers other than Siliguri, major districts headquarters and populated town have been considered.

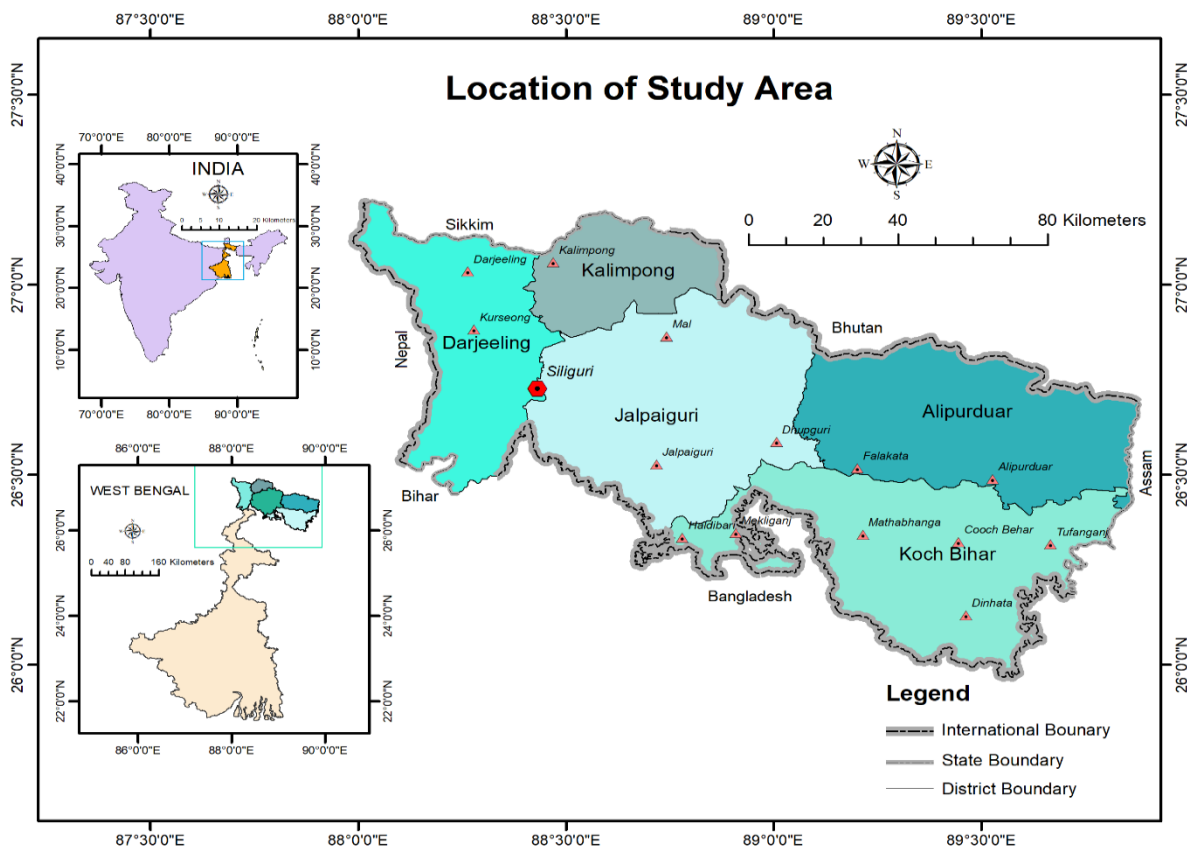


Figure 1: Location of Study Area

3. Objectives:

The basic objectives of this paper are-

- a) Analyze the demographic characteristics of Siliguri city.
- b) Analyze nature and degree of primacy in Siliguri city.
- c) To study the dominance of Siliguri city with respect to its adjacent urban center of Sub Himalayan North Bengal.

4. Methodology:

Collection of data

The data used for this study were obtained from both primary and secondary sources. Primary data has been collected by interviewing peoples attached with various govt. and private organization and secondary data has been collected from Census of India, Digital Library.

5. Analysis of data

The data has been analyzed using different statistical techniques.

The Annual Exponential Growth Rate of Urbanization has been calculated by the formula:

$$[1/n\{\ln(PU_{t+n}/PU_t)\}] * 100$$

Where, ln = Natural log,

PU_{t+n} = Percent urban in t+nth census,

PU_t = Percent urban in tth census,

n = Census interval.

Rank Size rule (Zipf) has been used to study the city size distribution.

$$P_n = P_1/n$$

Where, P_n = Population of the City

P₁ = Population of largest city

n = Rank of the City.

The trend and degree of Primacy has been analyzed by calculating the Index of Primacy.

$$PI = R_1/R_2 \text{ or } R_1 / \sum R_2 + R_3 + \dots$$

Where, PI = Index of Primacy

R₁ = Population of largest urban center

R₂ = Population of second largest urban center & so on.

Reilly's Breaking Point Analysis has been used to calculate the zone of influence of Siliguri city upon its neighbouring area

$$\text{Breaking Point (Db)} = D(AB) / 1 + \sqrt{P(B) / P(A)}$$

Where, Db = breaking point or boundary distance of the hinterland from the main urban center A

D(AB) = shortest or straight line distance between main urban center A and urban center B

P(A) = population of main urban center

P(B) = population of urban center

For Breaking Point Analysis daily bus service data, data related to inflow of patient in various government hospitals and newspaper circulation data has been collected through interview and was used for final imposition of the sphere of influence of Siliguri city upon its neighboring catchment area. Some mapping techniques also used for preparing this paper.

6. Theoretical Framework:

Basically the 'Urban Primacy' stands for the ratio of the primate city to the next largest city of any region or country and size of it is double than the next order cities. It is also being

called as the 'Central place' of that region which provides different types of facilities to the surrounding area and also dominates in the whole region. This concept of primacy was introduced by Mark Jefferson in 1939, in this concept he discussed about the relationship between the population size and functions of largest city with other cities in a country. According to him, "Once a city is larger than any other in its country, this mere fact gives it an impetus to grow that cannot affect any other city, and it draws away from all of them in character as well as in size" (Jefferson, 1939). Some examples of such cities are Buenos Aires, Paris, Sao Paulo, Cairo etc. But this concept was criticized in several ways by Das and Dutta (1993). For a vast country like India it is very hard to find a single primacy. Therefore, in Indian Context Mumbai, Kolkata are good examples of multiple primacies. Countries with a single primate city do not show the good governance, because it single primacy is a result of regional imbalances and negligence with other parts of that country or region.

The Rank Size Rule was popularized by G.K Zipf in his Book "Human Behavior and the principle of least Effort" (1949). Here he explained the empirical regularity between cities of varying size. Zipf postulated that the size and number of settlements in any nation are governed by two set of forces i.e. the forces of diversification and the forces of unification (Ramachandran, 1989). Here the unification forces refer to attracting forces and diversification forces refers to push factor.

He also suggested that when these two forces are balanced, there is a regularity of settlement size and number.

Reilly's law of retail gravitation was later modified as Converse's Breaking Point formula. In this concept they opined that any center's attraction depend upon their population and the distance between two towns. This method has been used to find out the sphere of influence of any town by many renowned geographers. On the other hand the information collected through interview of government officials and private organizations has been used for final delineation of area of influence.

Berry (1961) discussed that primacy is a quite familiar for the undeveloped countries and a normal rank size distribution for developed world. So for a developing country like India rank size distribution is applicable at national level and primate city size distribution is applicable at regional level. This study examines the relationship between rank sizes, primacy distribution in Indian regional urban context.

7. Results and Discussions:

The population of Siliguri Municipal Corporation has been growing very rapidly. The population growth of Siliguri from 1941 to 2011 has been shown on Table 1. After Independence due to a huge amount of migration Siliguri expanded at a faster rate with the decadal growth touching 200 percent. There after the city experienced moderate to rapid growth with a tendency of slowing down during 2001 – 2011.

Table 1: Temporal trends in population growth of SMC (1931-2011)

Year	Total Area in Km ²	Absolute Population	% of Increase
1931	15.54	6067	-
1941	15.54	10487	72.85%
1951	15.54	32480	209.72%
1961	15.54	65471	101.57%
1971	15.54	97484	48.90%
1981	15.54	154378	58.36%
1991	15.54	216954	40.53%
2001	41.9	472374	117.73%
2011	41.9	513264	8.66%

Source: Siliguri Municipal Corporation, Compiled by Researcher

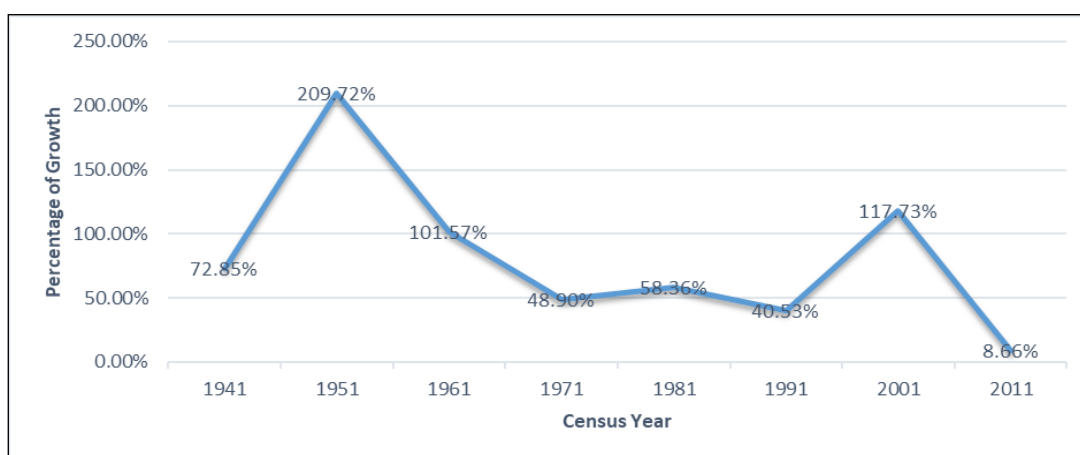


Figure.2 Temporal Changes in Population Growth of Siliguri Municipal Corporation

Tempo of urbanization refers to the speed of urbanization and is measured by growth in the level of urbanization over the years. The Annual Exponential Growth Rate of Urbanization has been used in his context.

Table 2: Annual exponential growth rate of urbanization in SMC

Year	Percentage
1931-1941	5.47
1941-1951	11.30
1951-1961	7.00
1961-1971	3.98
1971-1981	4.59
1981-1991	3.40
1991-2001	7.78
2001-2011	0.83

Source: Various Census of India publication and compiled by researcher

As seen in the table 2 during 1941 – 2001, the annual exponential growth rate of urbanization in Siliguri city is very high. However, this is in contradiction to West Bengal as a whole which registered a very sluggish annual exponential growth rate of urbanization during this period. Table 3 shows a comparison between percentage of decadal variation of population in Siliguri and other major towns of sub Himalayan North Bengal. As seen from the table, the decadal growth rate of population in Siliguri is much greater than other towns of sub

Himalayan North Bengal. Actually the decadal growth rate of population in Siliguri exceeds two to three times that of other urban centers of sub Himalayan North Bengal for most of the decades. Although, towns like Cooch Behar and Jalpaiguri with a long history of urbanization originated during the Pre-British period, however, Siliguri being much younger grew at a rapid rate. Gradually with better infrastructural facilities and accessibility Siliguri emerged as the primate city of Sub Himalayan North Bengal.

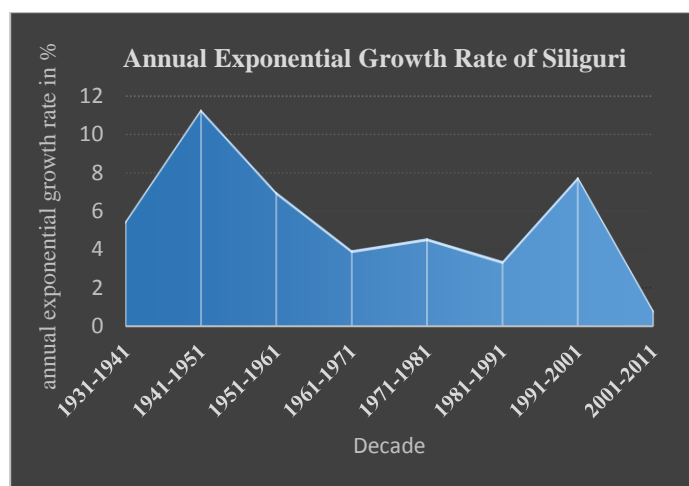


Figure 3: Annual Exponential Growth Rate of Urbanization

Table 3. Comparison of decadal growth rate of population for major towns of Sub Himalayan North Bengal

Year	Siliguri	Darjeeling	Jalpaiguri	Cooch Behar	Alipurduar	Kalimpong
1941-1951	209.72	23.44	48.60	107.76	-	39.46
1951-1961	101.57	20.97	18.13	26.11	16.24	50.54
1961-1971	4.9	5.47	13.17	28.06	26.76	-6.67
1971-1981	58.36	34.36	11.94	15.73	32.56	23.28
1981-1991	40.53	26.84	11.32	14.63	43.22	34.44
1991-2001	117.73	46.72	46	8	5	10.73
2001-2011	8.66	10.82	6.9	-1.38	-10.64	14.9

Source: Various Census of India publications, Compiled by Researcher

When considered Sub Himalayan North Bengal, there is no other urban center which has able to go near Siliguri in terms of population growth and other infrastructural development. Siliguri is four times bigger than Jalpaiguri, ten times bigger than Kalimpong. As we early discuss Siliguri Municipal Corporation population is 513,364 but in 2011 census, govt. of India declared Siliguri Urban Agglomeration

having population 705,579 {Siliguri (M.corp), Kalkut (CT), Dab gram(CT), Binnaguri (CT), Chakiabhita(CT)}. In the case of Index of Primacy Both Siliguri Municipal Corporation with respective urban centres and Siliguri Urban Agglomeration with respective urban Agglomeration in this study area has been calculated to find out the better Result.

Table 4: Index of Primacy (only Siliguri Municipal Corporation Population)

No of Urban Center	Name of Urban Center	Index of Primacy 2011
PI	Siliguri (513,264)	
PI ²	Siliguri, Dab Gram	4.31
PI ³	Siliguri, Dab Gram, Darjeeling	2.15
PI ⁴	Siliguri, Dab Gram, Darjeeling, Jalpaiguri	1.48
PI ⁵	Siliguri, Dab Gram, Darjeeling, Jalpaiguri, Coochbehar	1.21
PI ⁶	Siliguri, Dab Gram, Darjeeling, Jalpaiguri, Coochbehar, Alipurduar	1.05

Source: Various Census Publications, Compiled by Researcher

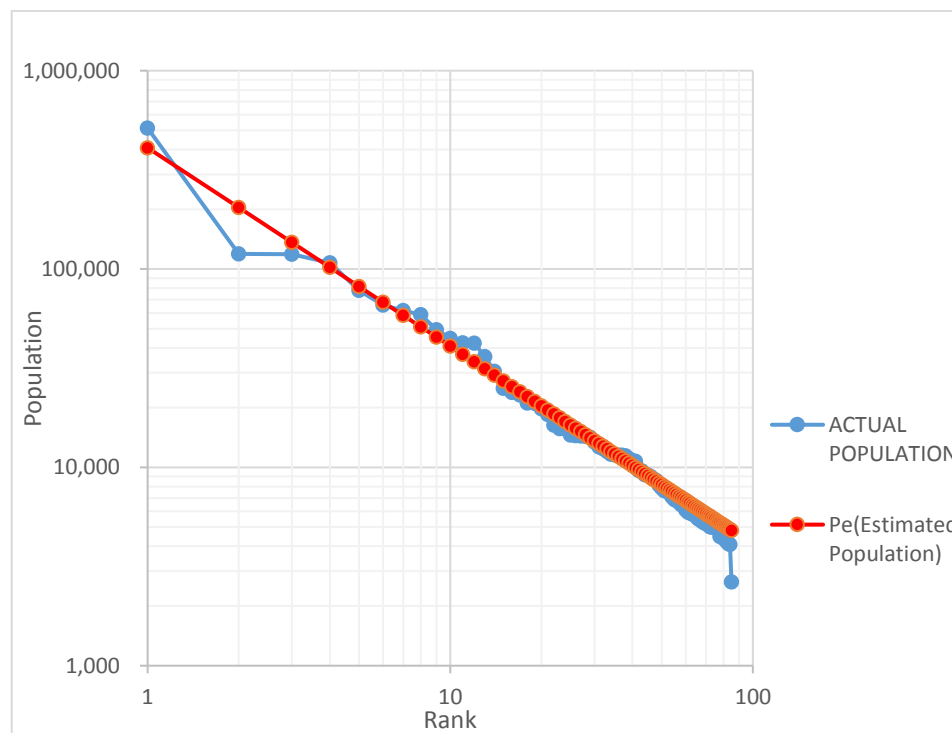
With only Siliguri Municipal Corporation Population the index of primacy of Siliguri works out to be 4.3 for two city index (Siliguri, Dab Gram), 2.15 for three city index (Siliguri, Dab Gram, Darjeeling), 1.48 for four city index (Siliguri, Dab Gram, Darjeeling, Jalpaiguri), 1.21 for five city index (Siliguri, Dab Gram, Darjeeling, Jalpaiguri, Coochbehar) and 1.05 for six city index (Siliguri, Dab Gram, Darjeeling, Jalpaiguri, Coochbehar, Alipurduar), as is revealed by table 3. Whereas

with Siliguri Urban Agglomeration Population the index of primacy of Siliguri works out to be 5.9 for two city index (Siliguri, Darjeeling), 3.12 for three city index (Siliguri, Darjeeling, Jalpaiguri), 2.32 for four city index (Siliguri, Darjeeling, Jalpaiguri, Coochbehar), 1.91 for five city index (Siliguri, Darjeeling, Jalpaiguri, Coochbehar, Alipurduar) and 1.68 for six city index (Siliguri, Darjeeling, Jalpaiguri, Coochbehar, Alipurduar, Kalimpong), as is revealed by table 4.

Table 5: Index of Primacy (Siliguri Urban Agglomeration Population)

No of Urban Center	Name of Urban Center	Index of Primacy 2011
PI	Siliguri (705,579)	
PI ²	Siliguri, Darjeeling	5.9
PI ³	Siliguri, Darjeeling, Jalpaiguri	3.12
PI ⁴	Siliguri, Darjeeling, Jalpaiguri, Coochbehar	2.32
PI ⁵	Siliguri, Darjeeling, Jalpaiguri, Coochbehar, Alipurduar	1.91
PI ⁶	Siliguri, Darjeeling, Jalpaiguri, Coochbehar, Alipurduar, Kalimpong	1.68

Source: Various Census Publications, Compiled by Researcher



Source: District Census Handbook, Jalpaiguri, Darjeeling, Cooch Behar, Compiled by Researcher

Figure.4 Rank Size Rule, Sub Himalayan North Bengal in 2011

From the Figure No 4, about the concept of Rank Size Rule it was examined that the population of the largest city was above than the estimated population. But the second and third ranked city's population was below than with estimated population. There after some cities are above and some are

below than the estimated population. 85th ranked town population was also very below to the estimated population. So according to the calculation of Rank Size Rule of Sub Himalayan North Bengal Siliguri has more than single dominance over total region and surrounding all other town.

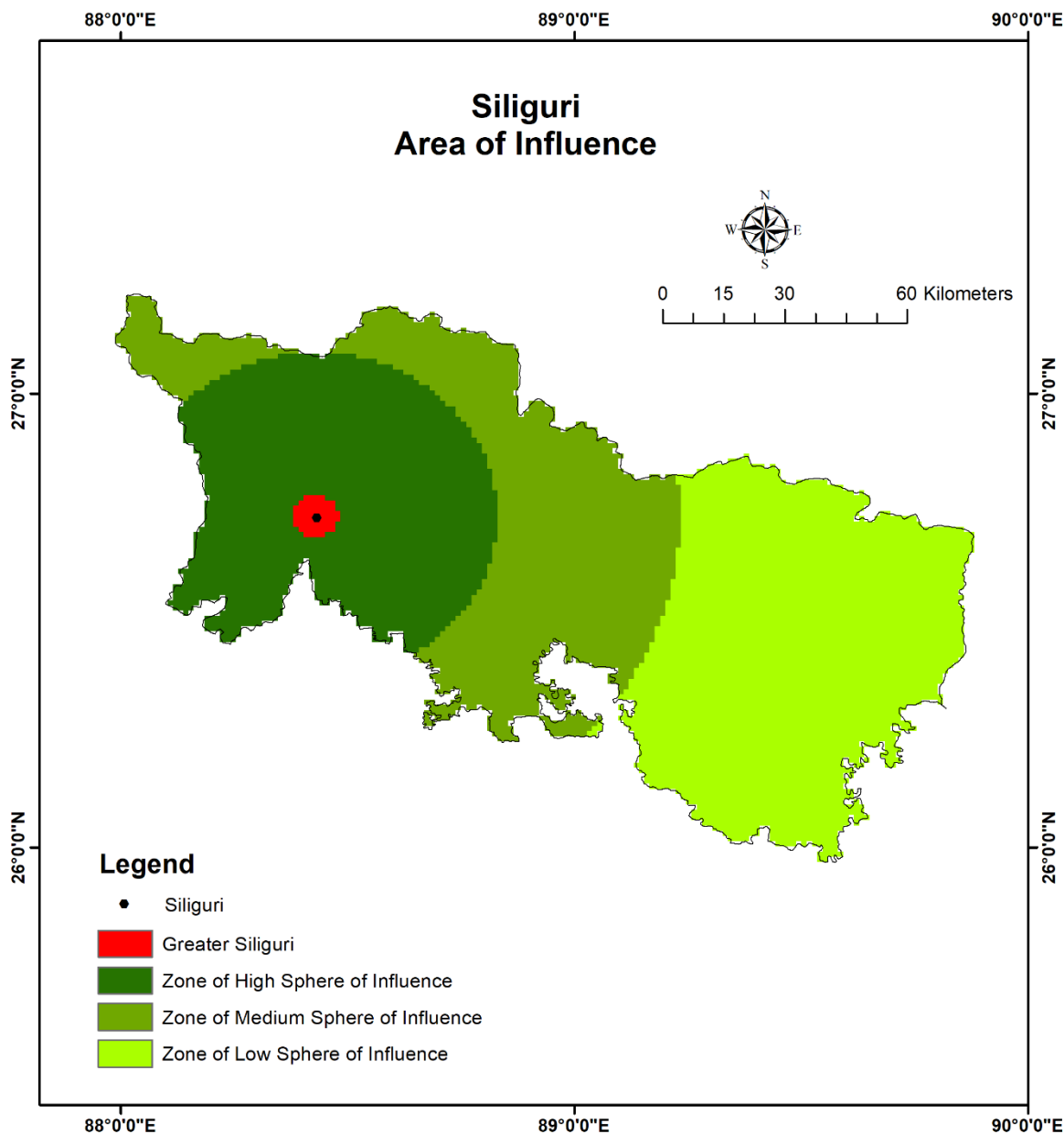


Figure.5 Showing Sphere of Influence of Siliguri in Sub Himalayan North Bengal

This area of influence has been made on the basis of Composite analysis of breaking point analysis of Siliguri and other important towns and Daily Bus Service Data, Hospital maintain data. The composite service area has been made to GIS approach. Its gross area has been calculated which amount to be 12,753 Km².

Greater Siliguri: The Greater Siliguri may be considered as a Siliguri Municipal Corporation, Dabgram, Champasari, Shivmandir, Badgogra and other surrounding census towns. Meanwhile, this area may be extended up to Fulbari in the East and Naxalbari In the west near future.

Zone of High Sphere of Influence: This zone extends upto 30- 40 km in both in North-South and East West directions. The urban centers falling in this zone are Jalpaiguri, Darjeeling, Kalimpong, Kurseong etc. Jalpaiguri is far older urban center than Siliguri, but in recent times it is fully over shadowed by Siliguri.

Zone of Medium Sphere of Influence: This zone extends upto 40 - 80 Km in eastern direction. The urban centers falling

in this zone are Dhupguri, Mal, and Mainaguri etc. This is a narrow zone incomparable to others.

Zone of Low Sphere of Influence: This zone extends up to 80-170 Km in the Eastern Direction. The urban centers falling in this zone are Alipurduar, Cooch Behar, Dinhata, Tufanganj etc. Point to be mentioned that sometime this Zone can be extended in lower Assam, districts like Dhubri.

So after finishing all brief discussion, we find the hinterland of Siliguri is very big and thus make a huge impact on total region.

8. Findings

- The phenomenon of primacy is Very strong in Sub Himalayan North Bengal; since, the single largest city i.e. Siliguri, a primate and characteristically diversified city in this region, serves as a regional centre in the vast catchment.
- The primacy of the Siliguri city is gradually declining in the study area, as Cooch Behar emerged as a

flourishing town in recent time but is still prevalent within the sub Himalayan region.

- Siliguri City and its surrounding region have strong functional linkages with other region in all sectors, directly or indirectly.
- Degree of influence & relationship is inversely proportional to distance from the city.
- Sphere of Influence of Siliguri City is huge (12,753 Km²)
- There exists a zonation in chain of importance of urban revolves around Siliguri city, in sliding request – Primary, Secondary and Tertiary Zones of Influence with Greater Siliguri.
- At last with better accessibility and strategic location in last 3 or 4 decades Siliguri emerged not only as a service centre of this region, but also in the

educational sector, in military purpose, in Govt. Organization sectors, in transport facilities with better amenities it just turns as a Capital of this region.

9. Suggestions with concluding remarks

As we all know the location of Siliguri is the major factor of rapid development of this region, but a Urban Policy with an impulse on decentralization through Decentralized Planning is required for uniform and balance development of urban centres of sub Himalayan north Bengal. Govt must have to be focused on newer urban centres with possibilities like Alipurduar, Jaigaon, and Mal etc. Otherwise huge pressure makes a burden in Siliguri. Proper interests in formative segments like infrastructure, education, occupation is required to balanced upliftment of the whole region.

References

1. Ahmadi, R., Monfared, S., Torabi, Z. (2013). *Analysis of formation of urban primacy in Khuzestan province during 1956-2011*. Journal of Economic and Social History, 2(1), 19-50.
2. Badrawaj, R.K. (1974). *Urban Development in India*, Delhi: National Publishers. 87-89.
3. Bhattacharya, B. (2010). *Urbanization, Urban Sustainability and the Future of Cities*. New Delhi. Concept Publishing Company Pvt. Ltd. 160-161.
4. Chandna, R.C. (2005). *Concepts Determinants and Patterns. Geography of Population*. Kalyani Publishers. New Delhi. 362-398.
5. Das, R.J., Dutt, A.K. (1993). *Rank-Size Distribution and Primate City Characteristics in India- A Temporal Analysis*. Geo Journal, 29(2), 125-137.
6. Faraji, S.J., Qingpinga.Z., Valinoorib, S., Komijanib.M.(2016). *Urban Primacy in Urban System of Developing countries; its causes and consequences*. Human Research in Rehabilitation, 6(1), 34-45.
7. Jefferson, M. (1939). *The Law of Primate City*. Geographical Review. 29(2).126 –132
8. Ramachandran, R. (1999). *City and Region; Urbanization and Urban Systems in India*, Oxford Press. New Delhi. 267-291.
9. Sarkar, S., Maji, S. (2013). *An Analysis of Urban Primacy: The Case of Kolkata*. Indian Journal of Applied Research, 3(3), 158-162.
10. Siddhartha, K. (2019) *Cities Urbanization and Urban Systems*. New Delhi. *Kitab Mahal*. 166-172.
11. Yousuf, T., Shah S.A. (2014). *An analysis of Urban Primacy in Himalayan settlements: The case of Srinagar City of Jammu & Kashmir*. International Journal of Recent Scientific Research, 670-1674.
12. http://www.censusindia.gov.in/2001-common/census_2011.html Assessed on 2nd May, 2018.