

## **CHAPTER 7**

### **SUMMARY AND CONCLUSION**

#### **7.1 Summary**

Participatory GIS is the technique in which maps are developed with the help of local people and further converted into digital format with the help of GIS. In other words, “P-GIS is the concept of using geo-information science in broad-based and public participatory processes”. “It emerged from the rich and diverse experiences in participatory development and is an attempt to utilize GIS technology in the context of the needs and capabilities of communities that will be involved with, and affected by, development projects and programme” (Tripathi and Bhattacharya, 2004). A similar description of this concept was put forwarded by Rambaldi et al. (2004) where they said “P-GIS is the result of a spontaneous merger of Participatory Learning and Action (PLA) methods with GIT and S. P-GIS practice is based on using geo-spatial information management tools including sketch maps, aerial photographs, satellite imagery, Global Positioning Systems (GPS) and Geographic Information System (GIS) to represent peoples’ spatial knowledge. Such knowledge is expressed in different forms, like digital or physical, i.e. 2- or 3- dimensional maps, that are used as venues for information sharing, discussion, and analysis of current situations and as support in advocacy and decision making” (Follosco, 2005).

In both the villages there is a huge gap between people perception and real image. People are unaware of resource utilization and they are using resources in a large scale without thinking about the future generation. In Dolicoto village somehow people are trying to cope with the situation and practicing the things which are not effective in environment. In Lokampur village there is no such sustainability about resource utilization. People are not willing know about the negative impact of over utilization of resources.

In both the villages when maps are developed with the help of local people they thought that that one is real image. But when real images of their villages are produced, people are surprised to know about the boundary they believe. Their cultivation areas and many more things which are classified in the villages are having vast different about the things which are found in the villages. With the help of GPS reading the boundary and object

are demarked and marked in accessible areas. But in some places there is not direct access to objects and boundaries especially in Dolicoto village. In that case local people helped in boundary demarcation and object location.

The study can be considered significant because it tries to give an idea about the people perception and their participation in resource utilization and their role in developing mental maps.

The present study is divided into seven chapters, viz. introduction, geographical background of the village, Participatory GIS, resource inventory in the study area, traditional technology and sustainability, capturing people's decision through GIS and summary and conclusion.

The introductory chapter of this dissertation includes statement of the problem, objectives, research questions, database and methodology, organization of the work, a brief review of literature, acronyms and local terms and terminology. Many works on Participatory-GIS have already been done in India as well as abroad. However Participatory-GIS is still lacking behind in micro level areas of India. This works seem to be a pioneering one in the sense that it covers a wide area in Local people's perception as well as resource utilization. It covers both physical and cultural ideas on resource extraction. To gain these objectives, three research questions are formulated. The review of relevant works is done through important related works in the field of P-GIS in Africa, Philippines, USA, Europe and India.

The second chapter is also an introductory, where both physical and socio-economic components of both the villages are discussed. "Lokampur village is located in Naobaicha Tehsil of Lakhimpur district in Assam, India. It is situated 22 km away from district headquarter Bilotia. Bilotia is the sub-district headquarter of Lokampur village" (villageinfo.in). The second village name "Dolicoto is located in the Papum-Pare district of Arunachal Pradesh. Dolico village is located in Banderdawa Tehsil of Papum Pare district in Arunachal Pradesh, India. It is situated 3km away from sub-district headquarter Banderdewa and 34km away from district headquarter Yupia" (villageinfo.in). Lokampur village is endowed with alluvial soil and Dolico village is endowed with mountain soil. Lokampur village is influence by Monsoonal climate. This village is also experience the sub-tropical with semi dry summer and cold in winter. In the other hand Dolico village is influence by Monsoonal climatic. This village is also experience the sub-tropical with semi

dry summer and cold in winter. Most of the part of Lokampur village is covered with agricultural land and traditional home gardens also cover some parts. Dolicoto village is covered with forest area and some parts are covered with jhum cultivation and traditional home garden.

Lokampur village is typically Adivasi village where Adivasi Muslim people (*Jolaha*) are found in highest number. The total Muslim Adivasi people is 913 according to field survey. The Dolicoto village is typically a Nyishi village where Christian Nyishi is dominantly found. Their population is 202 according to survey. Total population of Lokampur is 1655 out of which 814 are male and 841 are female population and the total and total population is 378 out of which 192 are male and 186 are female population.

Chapter 3 contains a brief and general idea about Participatory-GIS. The field where P-GIS can be used and the component of the tools are explained. Many definitions have been given which are stated by many different scholars in different countries. Concept, definition, Participatory-GIS, Public Participatory-GIS, and Guide to Participatory-GIS etc are worth mentioning. The different ways of carrying out Participatory-GIS in micro level can be clear from chapter three where it is explained.

Resource inventory in both the villages and early settlement have been analyzed in chapter 4. Different types of resource utilization in Lokampur and Dolicoto village have been discussed and how the people settled in these areas also been explained. Land resource utilization has been discussed with the help of maps and also their preferences in choosing the activity. Forest resource utilization in plain area and mountain area is different. In plain area there is not so much of forest found but in mountain, most of areas are covered with forest. People clear forest for jhum cultivation and practiced it for 8-10 years. Water resource plays a very important role in attracting new dwellers to settle and expand their territory. People are unaware of over exploitation of water resource. Slowly water resource is gaining its value in human life of both the villages.

Traditional technology and sustainability of Lokampur and Dolicoto village is compared and criticized in chapter 5. In this chapter the changing pattern of agricultural equipments and inputs are explained. In Lokampur village people slowly changing their agricultural inputs and implements and using modern methods of agriculture like, HYV seeds, fertilizer, pesticides, insecticides, tractors, threshers etc. Due to modern technology, production increasing day by day, but over use of fertilizer and pesticides and insecticides in

slowly increasing soil degradation. People are unaware of proper method of doing modern types of farming. In Dolicoto village, people still does the same way of jhum cultivation as they were doing in last three decades. They are trying to keep their cultural system as it is. The used simple tools and local seeds in jhum.

Capturing people's decision through GIS is mentioned in chapter 6. In this chapter a detailed explanation is given about how people shifted their occupation from agriculture to other. This chapter also explained that how a boundary can be differ from mind to mind and person to person. When the maps developed by villagers and compared with real maps of that same area, then there found a vast different in both the maps. From this comparison we can clearly understand that different people have different perception about the same thing. Other than these maps are prepared with the help of survey, GPS points, focus group discussion etc. from the maps developed; we can see the changes in last few decades. Mainly the forest areas are decreasing day by day because of jhum and other activities.

## **7.2 Conclusion**

Lokampur and Dolicoto village have different physiographic features. Lokampur village is a plain area and Dolicoto village is mountainous area. Settlement in Lokampur villages concentrated by the side of road connected from Dolohat Bazar to 12-Mile. In Dolicoto village settlements are concentrated near the road side where little amount of plain area is available. Lokampur village has larger population compare to Dolicoto village. The physiographic division like terrain feature influencing the local people to settled in a particular area but in Lokampur village, it is cultural feature like road influencing people to settled near road side. Resource utilization is most important part of this study. Different type of resource found in both the villages, but major resources are forest, land and water resources. Forest resource is used for the domestic fuel and grazing for cattle like *Mithun*. Forest is also cleared for jhum cultivation in Dolicoto village. In Lokampur village most of the land is used for cultivating rice. Seasonal cultivation is done and in some portion tea plantation is done.

People of Lokampur village are shifting their old traditional method to modern method and using HYV seeds, fertilizers, pesticides, insecticides etc. In Dolicoto village people are still following the old traditional method for jhum cultivation. They do not use

HYV seeds and fertilizers. Some of the families are settled permanently. Some families were move to this village due to transfer for the job.

People's perception about the mental maps is different compare to real map. People have different idea about their village boundaries. In Dolicoto village there is no specific boundary in the areas where jhum cultivation is done. According to village people how much forest u can clear that much will be included to village boundary.

The evolution of Lokampur village started in 1935. British collected labourers from Jharkhand, Chhattisgarh, Orissa, West Bengal and settled them in the village. In the earlier time people were workers of Doolohate Tea Estate. But after independence increasing population start doing cultivation in nearby areas. In Lokampur village it is hard to find historical significant about the name, because peoples in the village do not have any idea about this name.

The evolution of Dolicoto village was started in 1980. People from nearby areas like Nirjuli, Karsingsa, Papunala, Pichola etc came and settled for cultivation. After some years, few government officials who are transferred from Pasighat, Zero have been posted in PTC Colony at Banderdewa which have led to the growth of settlement in the village and later on they settled permanently. In Dolicoto village, same as Lokampur it is hard to find historical significant about the name, because peoples in the village do not have any idea about this name.

Lokampur village area is mainly plain area and Dolicoto village is hilly area. Both the villages influence by Monsoonal climate. Lokampur and Dolicoto village, both experience the sub-tropical with semi dry summer and cold in winter. In Lokampur village, alluvial soil is found in most part of the village which is part of Bhabar soil. In some parts clayey and sandy soil are found. In Dolicoto village region there is mostly laterite, sandy and mountain soil are found. The laterite soil is confined to the northern part of the village. In north-eastern part there is sandy soil and some portion of laterite soil is found. In the remaining parts of the village mountain soil is found.

In Lokampur village there is one small stream in eastern boundary which demarcated the boundary between Kathal Pukhuri and Lokampur village. In south-western part there is one small river known as Boka River which demarcate the boundary between Lokampur and

Sonapur village. In Dolicoto village there are small streams flowing side by the village. The small streams are continuing flows as it emerge from the hills in western part.

Both the villages have unique flora and fauna which are very special for the people of the village. Lokampur villages do not have much forest area, but has selective flora. In Dolicoto village there is large area found under forest. Depending on forest people keep domestic animal like *Mithun*. In Lokampur village *China Hans* a unique variety of duck is found.

In Lokampur village, according to field survey in 2018 there are 331 houses at present and total population is 1655 out of which 814 are male and 841 are female population. In the other hand, according to field survey in 2018 there are 58 houses present and total population is 378 in Dolicoto village out of total which 192 are male and 186 are female population.

Demographic characteristics in both the villages are different. The total population of Lokampur village is 1655 (Field Survey, 2017-18) and the density is 1346 persons per sq. km. The people are mostly Hindu Assamese and Muslim Adivasi. The main languages in this village are Assamese, Adivasi. In the other hand, in Dolicoto village the total population is 378 (Field Survey, 2017-18) and the density is 367 persons per sq. km. The people are mostly Christian Nyishi and Tagin. The main language is Nyishi and Tagin.

In Lokampur village 5-10 and 20-25 age group is highest and age group like 60+ is least. Age group like 0-5 has lowest number in case of male and in 5-10, male are more than female. Similarly, almost all the age group of female has higher number than male. In Dolicoto village male number is higher than females. 5-10 age group is highest and 60+ age group is lowest. In this village, female number is more than male in 0-5 age group. But in almost all the age groups, Male number is more than females. Age groups like 40-45 and 45-50 have very less number of male and female populations.

According to survey 2017-18, the literacy rate of Lokampur is 70.5%. Thus Lokampur village has higher literacy rate compared to 65.6% of Lakhimpur district. The male literacy rate is 77.22% and the female literacy rate is 63.72% in Lokampur village. Again, the literacy rate of Dolicoto is 83.9%. Thus Dolicoto village has higher literacy rate compared to 68.6% of Papum Pare district. The male literacy rate is 91.03% and the female literacy rate is 77.11% in Dolicoto village.

Lokampur village is home to 1655 people, among them 814 (49%) are male and 841(51%) are female. 76% of the whole population are from general caste, 2% are from schedule caste and 13% are schedule tribes. Child (aged under 6 years) population of Lokampur village is 13%, among them 54% are boys and 46% are girls. There are 331 households in the village and an average 5 persons live in every family. Again,Dolicoto village is home to 378 people, among them 192 (51%) are male and 186 (49%) are female. 8% of the whole population are from general caste and 92% are schedule tribes. Child (aged under 6 years) population of Dolicoto village is 17%, among them 52% are boys and 48% are girls. There are 58 households in the village and an average 8 persons live in every family.

Agriculture is main occupation of the peoples since many decades. People mainly depend on agriculture for food. In Lokampur village rice cultivation is the main but in Dolicoto village maize, teak, and bamboo is main cultivation. Some amount of rubber plantation done in Dolicoto village. Agricultural Land is found to be fertile in Lokampur village which is suitable for rice cultivation. In Dolicoto village mainly Mountain soil are found in which maize, teak, and bamboo cultivation are done. Lokampur village has total house holding land 6.01 hectare and agricultural land 84.95 hectare. Dolicoto village has total house holding land 18.90 hectare and cultivating land 127.45 hectare.

Connectivity of an area is very essential part of development. Metallic and Non Metallic and Concrete road are constructed in the village. In Lokampur village there is Pakka and kutchra road are available and connected to National Highway 15. In Dolicoto village kutchra and concrete road is constructed and connected to National Highway 15. Lokampur village is connected with a road which is known as 12 Mile-Doolohat Bazar Road. There are 12 kutchra road are connected all over the village. In Dolicoto village there is one main concrete road connected to National Highway-15 (Before NH 52). Other kutchra roads are connected to concrete road in the village. There are 5 small kutchra road is connected to Dolicoto road.

Participatory GIS concept mainly deals with the maps and models developed by a surveyor with the help of local people of an area, interview and focus group discussion. Area maps or village maps in micro levels can be different in different levels. GIS software and computer combined together to convert sketch maps into digital maps. Map of both the

villages are drawn with the help of local people and converted into digital images. Some points are marked with the help of GPS, which are taken during the time of survey.

Resource inventory in both the villages have some similarity like soil resource, water resource and forest resource. Forest resource in Lokampur village is very little. It is because people cleared forest for cultivation field. In Dolicoto village, there is abundant forest is found. The village boundary has no specific demarcation and has no limited area, so people can access more area as they much they want. People clear forest for jhum cultivation every year with the help of tools. For water resource people in Lokampur village utilize pond, ring well, hand pump, motor water etc. In Dolicoto village people depend on water tank. Few peoples have done drilling for drinking water, because water tank is far from their home. Land resource is used for settlement and cultivation.

Lokampur village do agriculture and they are practicing it for more than 4 decades. But at present situation, people are shifting their agricultural inputs and equipments from old traditional method to modern tools and technology. In Dolicoto village people do jhum cultivation in the mountain slopes by clearing forest. They are still dependent on old traditional tools, local seeds and local manure.

People's decision in choosing which resources need to utilize and which is not is very important. People utilize resources according to their need in different phases of development. To extract resources people should know their area very well. During the survey it is found that there is different concept and perception on the boundary of the villages, and other things like road and big trees. After the focus group discuss and through interview, people helped in mapping the village. When the actual maps and maps sketch by local people are compared, a vast different is found. This is how Participatory-GIS help in mapping village boundary and classification of objects.

It is found that resource utilization started when the village's evolution occurred. But still resource utilization is going on and it will continue in future. So in order to develop sustainability proper resource utilization planning is still lacking behind in both the villages.



## **Suggestion**

On the basis of above summery and conclusion, few suggestions are given towards attaining the sustainability in resource utilization.

- i. Scientific investigation and thorough survey should be conducted so that the present status of all the resources can be analyzed and policies can be made.
- ii. Discussion with local peoples should be periodically made so that problems can be highlighted and some strategies should be made to mitigate the problems related to over utilization of resources.
- iii. The traditional management system of both the villages like old system of cultivation should not be eliminated, because it has ecological significant in environment.
- iv. Rain water harvesting and properly use of water can reduce some extent of problems regarding water scarcity in winter season.
- v. Over use of pesticides, insecticides and fertilizer should be avoided. Over use can destroy the ecological balance and rare species may fade away.
- vi. Some schools can be developed where people especially farmers can go and general awareness can be taught about resource. From this process, many things can be convey to all the people of both the villages.
- vii. The Government and NGO's should give special awareness to these villages. These two villages have many problems which are still not solved.
- viii. Participatory-GIS concept should be introduced to this local people and involved them to act as active agent in maintaining resource utilization.

## **7.3 Scope for Further Research**

As the present work has been done within some research constraint such as short time span, lack of capital and surveyor, no proper ideas on village's boundaries and lack of proper knowledge for historical study, therefore it could not be possible to explore all the potentialities and problems of the villages. As the village data is limited, therefore it is not possible to manage all the aspects within short span of time. Peoples of both the villages' are changing their cultivating inputs and equipments and house type due to influence of modernization. Because of this villages are facing many problems, for which it has huge possibility for further study. At present, Participatory-GIS is used as a tool for developing mental maps all over the globe by various scholars in geography, planners, environmentalist, ecologist etc. Thus there is an immense range for further research in this field.

### Scale Points and Surveyed GPS Points of Lokampur village

Sl. No.	Description	Scale Point from identified features on Photo Map (Northern) (in meters)	Scale Point from identified features on Photo Map (Easting) (in meters)	GPS Surveyed Point of identified features (Northern) (in meters)	GPS Surveyed Point of identified features (Easting) (in meters)
1	Anganbari school corner	610475.61	2985821.088	610470.63	2985830.094
2	Tinali (Road crossing)	611345.751	2981269.012	611343.756	2981266.022
3	Pond 1	612489.689	2979760.882	612494.696	2979757.894
4	Pond 2	611268.377	2978483.888	611264.381	2978487.892
5	Peepal Tree	610831.819	2991344.608	610827.818	2991346.668
6	Burial ground front gate	608010.671	2988009.648	608008.677	2988003.651
7	Road crossing (Tinali)	598021.911	2979296.977	598017.904	2979298.982
8	Amarjyoti Janajati Vidyalaya	596296.101	2968449.039	596298.109	2968451.043
9	Buka Nadi bridge	593027.808	2956943.638	593023.884	2956941.645
10	Tinali (Puali shope)	610556.555	2993766.408	610552.565	2993768.412
11	No. 20 tinali (Fulbari-Lokampur road)	616174.613	2999351.740	616171.665	2999357.746
12	Banyan tree	611720.339	2981635.620	611723.349	2981630.627
13	School corner	610692.080	2990988.279	610698.086	2990990.281
14	Lokampur Jama Mosque gate	615390.451	2998155.576	615394.45	2998150.582
15	Tea garden corner	615712.638	2988065.323	615708.643	2988063.322
16	Pond 3	610461.565	2991779.041	610466.575	2991784.033
17	Temple	593172.407	2957408.661	593169.405	2957404.667
18	Stream village entering point	617939.071	2999510.570	617941.069	2999506.574
19	Coconut tree	614136.430	2991554.550	614131.428	2991552.552
20	Playground corner	615097.780	2983914.670	615096.793	2983912.663

### Difference between GPS reading and scale point

<b>Sl. No.</b>	<b>Description</b>	<b>Scale Point from identified features on Photo Map (Northern) (GPS point - Scale map point) (in meters)</b>	<b>Scale Point from identified features on Photo Map (Easting) (GPS point - Scale map point) (in meters)</b>
1	Anganbari school corner	-4.98	9.006
2	Tinali (Road crossing)	-1.995	-2.99
3	Pond 1	5.007	-2.988
4	Pond 2	-3.996	4.004
5	Peepal Tree	-4.001	2.06
6	Burial ground front gate	-1.994	-5.997
7	Road crossing (Tinali)	-4.007	2.005
8	Amarjyoti Janajati Vidyalaya	2.008	2.004
9	Buka Nadi bridge	-3.924	-1.993
10	Tinali (Puali shope)	-3.99	2.004
11	No. 20 tinali (Fulbari-Lokampur road)	-2.948	6.006
12	Banyan tree	3.01	-4.993
13	School corner	6.006	2.002
14	Lokampur Jama Mosque gate	3.999	-4.994
15	Tea garden corner	-3.995	-2.001
16	Pond 3	5.01	4.992
17	Temple	-3.002	-3.994
18	Stream village entering point	1.998	-3.996
19	Coconut tree	-5.002	-1.998
20	Playground corner	-0.987	-2.007

### Scale Points and Surveyed GPS Points of Dolicoto village

<b>Sl. No.</b>	<b>Description</b>	<b>Scale Point from identified features on Photo Map (Northern) (in meters)</b>	<b>Scale Point from identified features on Photo Map (Easting) (in meters)</b>	<b>GPS Surveyed Point of identified features (Northern) (in meters)</b>	<b>GPS Surveyed Point of identified features (Easting) (in meters)</b>
1	Water tank 2	551284.451	1991552.039	551286.45	1991549.036
2	Water tank 3	551691.229	2991838.728	551695.232	2991842.724
3	Anganbari school gate	551908.129	2991820.260	551904.121	2991816.266
4	Primary school gate	552038.760	2991741.141	552033.767	2991746.151
5	Brick factory corner	551838.149	2992158.630	551842.151	2992154.624
6	Stream-road crossing	552120.212	2992273.400	552115.202	2992277.390
7	Concrete road end point	551725.511	2991908.760	551721.501	2991902.740
8	Jhum field 1 corner	551894.306	2991722.596	551899.301	2991718.589
9	Jhum field 2 corner	552111.204	2991846.352	552115.202	2991841.356
10	Jhum field 3 corner	551308.280	2991631.045	551300.283	2991636.039

### Difference between GPS reading and scale point

<b>Sl. No.</b>	<b>Description</b>	<b>Scale Point from identified features on Photo Map (Northern) (GPS point - Scale map point) (in meters)</b>	<b>Scale Point from identified features on Photo Map (Easting) (GPS point - Scale map point) (in meters)</b>
1	Water tank 2	1.999	-3.003
2	Water tank 3	4.003	3.996
3	Anganbari school gate	-4.008	-3.994
4	Primary school gate	-4.993	5.01
5	Brick factory corner	4.002	-4.006
6	Stream-road crossing	-5.01	3.99
7	Concrete road end point	-4.01	-6.02
8	Jhum field 1 corner	4.995	-4.007
9	Jhum field 2 corner	3.998	-4.996
10	Jhum field 3 corner	-7.997	4.994