

Study on Land use Pattern Change and Its Causes

Haque, A., Alam, J. B.*, Shaha, N. K. and Raihan, F.

Shahjalal University of Science and Technology, Sylhet, Bangladesh

Received 12 Sep. 2007;

Revised 20 Dec. 2007;

Accepted 10 Jan. 2008

ABSTRACT : Land use of Sylhet has changed gradually. This is found from the field survey that in 1970 the area was dominated by marshy land (645.33 katha), vacant land (430.88 katha) and crop land (336.17 katha). By 1988 there was no university in the area. Residential area also increased. It covered 39.11 % of total study area. Now in 2007 there is a radical change noticed in the area in comparison with 1988. Population has increased and accordingly residential area has also increased. Now it covers about 58.71 % of the study area. A survey was conducted to judge the view of the old residents of the area about the change of the land use pattern. The impacts of land use changes are desertification, climate changes and hill cutting. Improper lands use like removal of vegetal cover brings about marked changes in the local climate of Sylhet. Deforestation changes rainfall, temperature, wind speed etc. It was observed that rainfall pattern; atmospheric window of Sylhet has been changed significantly within last ten years.

Key words: Land use, Marsh, Crop, Population, Desertification, Vegetal cover

INTRODUCTION

Land use pattern depends upon the mutual relationship between man and environment. There are many factors that influence land use pattern. Often the use of individual land parcel is influenced by land value. Certain area may have greater advantage for particular use. If the land is not used by that particular use, it may lose its advantage. Stuart Chapin has rightly said, "Certain locations are more highly valued for residential use than other sites because of the greater convenience to shops, schools, centers of employment and recreational facilities. Corner locations command a higher price for certain types of retail use because of greater convenience to stream of pedestrian traffic."

Among other influencing factors of land use there are- use of land of adjacent areas, social values and norms, human values, human needs, public interest etc. Land use of adjacent areas may create external economy on a particular land (Pennington, 2003, Rogers, 1999, Sautet., 2000, Simmie, 1993, Simon, 1957, Sowell, 1980, Steele, 1992, Wholgemuth, 1995, Wholgemuth,

1999). Thus that type of land use will be beneficial for the adjacent land. Social values also influence land use. In a Muslim society where Islamic rule is strictly maintained, naturally people of the area will not allow any temple or church in that area. Similarly other people of other religion being dominant in number in a locality will not allow any land use that may go against their religion. Government of a country also plays role in controlling land use pattern for its interest. If it is found that a particular land is very much suitable for industrial use but government may restrict the land use for its larger interest thinking about future of the country. Thus in this way there are many factors that influence and regulate land use pattern.

Sylhet, the north-eastern administrative division of Bangladesh, located at 24°53' latitude and 91°52'E longitude, has a number of topographical features like hills and hillocks and high flood plain. The paper investigates the land use change and presents the causes, present situation, and its corresponding consequences.

*Corresponding author: Email-jahiralam@yahoo.com

MATERIALS & METHODS

It should be pointed out that one katha is equal to 720 square feet that is being frequently used in Bangladesh. Methodological steps is shown in Fig. 1. Data which do not have specific geographic entity rather they are directly related to the spatial data are called spatial data. A spatial data that were necessary for the study are–(i) Land use information from satellite image, (ii) Causes of changing and not changing land use and (iii) Economic return from different land use.

Reconnaissance survey means preliminary survey. Such type of survey is necessary for better understanding of data required for the research. It helps building concept regarding the research. Therefore, a reconnaissance survey was conducted with a draft questionnaire to finalize it and to incorporate the items required. The survey was also necessary to have an idea regarding the study area, i.e. the area that ought to be taken as

the study area where the problems may be best identified.

Since the study is based on land use change, detail data regarding land use since 1970 was necessary. That is why a census survey among the plot owners of the study area was conducted to know why they changed or did not changed the pattern of land use of their plots. After the pre-testing of the draft questionnaire there was some minor modification in the questionnaire and it was thus finalized for data collection from field. Data that were collected to conduct the study may be classified as – primary data and secondary data. These are described below.

Collected data was processed by the software's SPSS, ARCVIEW and ARC/INFO. Using ARCVIEW and ARC/INFO the map was digitized and was given a digital format for analyses. Data given spatial data was converted to digital format using SPSS.

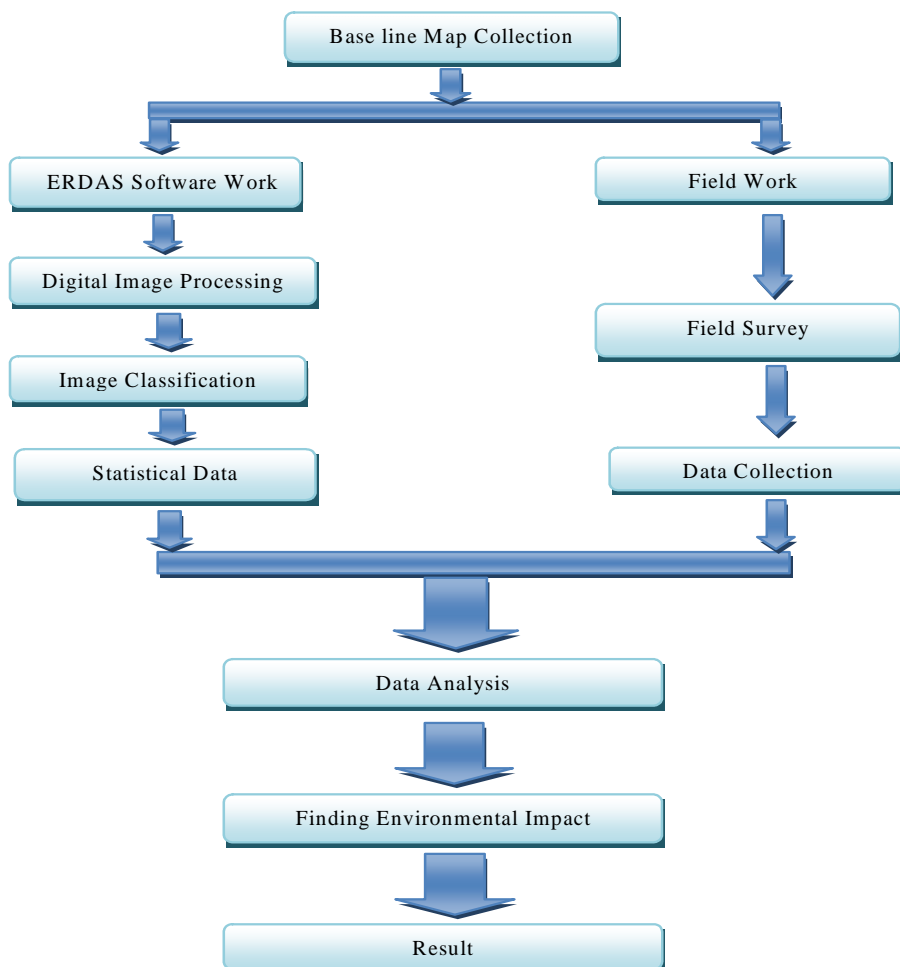


Fig. 1. Methodological steps of the study

RESULTS & DISCUSSION

All land use data was analyzed by using ARCVIEW. Other data was analyzed by using SPSS. The graphs were prepared with the help of SPSS. Land use of the study area has changed gradually. This is found from the field survey that in 1970 the area was dominated by marshy land (645.33 katha), vacant land (430.88 katha) and crop land (336.17 katha). The marshy land was totally unutilized and people grew paddy and different types of vegetables in the crop land. Thus among other uses only crop land was utilized for productive purpose. Very small portion of the study area was used for residential purpose. It covered only 20.62 katha which consists 0.98 % of the total study area.

By 1988 there was no university in the area. Residential area also increased. It covered was 39.11 % of total study area. And this was the dominant use of that time. Most of the residents were involved in such business that is somehow related to university. Now in 2007 there is a radical change noticed in the area in comparison with 1988. Population has increased and accordingly residential area has also increased. Now it covers about 58.71 % of the study area.

A survey was conducted to judge the view of the old residents of the area about the change of the land use pattern. There were 13 members in the group. Among them 3 have been well acquainted with the area for 36 years and cent percent of them says that establishment of university is the only cause for land use change. Their views have been analyzed in the following Table 1.

At present population of the area has increased more in comparison with 1988. About 60% of the total area is being used for residential purpose. Among the dominant uses there are tea garden, chara (12.06%) and commercial land (16.66%). Besides university covers 0.5 % of the total study area. Crop land, water body and marshy land are gradually disappearing. Some roads and drains are constructed to serve the residents, which covers a very negligible part of the area.

It is clear from the images analysis and survey that the total forest areas of Sylhet district at 1988 was 52,930.1 ha and at 1997, it has become

37,031.6 ha. It is clear from field visit and focus group discussion with local people that it is decreasing day by day due to unplanned urbanization and real estate limited, collection of fire wood. The environmental impact of the high loss of forest are climate changes, soil erosion, biodiversity, effect on hydrological cycle, increase of natural climates, decrease of natural beauty. More over, the total settlement area of Sylhet at 1988 was 52930.1 ha and it has become 37031.6 ha at 1997. At 2006, it was predicted to be around 46,713 ha based on field data collected by local land department. It is clear from the analysis that the settlement is rising day by day and it is creating environmental problems like landslide as well as decrease natural beauty.

False color composite (FCC) image of LANDSAT, TM and SPOT images were used for visual interpretation of land use change. From the selected images of the year 1988 and 1997 (Figs. 2 & 3), the areas of changed land use were determined by digital planimeter. It was found that the area of Sylhet city was 32.82 square kilometer in the year 1988 and in the year 1997, it was 51.82 square kilometer. Therefore the areas of land use change are positive, that means city area has been changed from agriculture to housing. About 2.68 square kilometer of water body has been detected which have been filled up by earth for urban development. Housing construction has been increased from 12.97% to 38.19% (percentage on the basis of total city area).

It is clear from the images analysis and survey that the total water bodies of Sylhet district was 81535.2 ha at 1988 and it has become 34535.7 ha at 1997. It has reduced to 28435.6ha at 2006. The loss of water bodies is due to unplanned urbanization and result of capture of lowland areas by real estate limited companies. It will cause damage of transportation routes, water logging, decrease of fish production etc.

Sylhet is a hilly region. Many hill hillocks are situated in and around the city. Some renowned tea gardens such as Manichara tea garden, Lakkatura tea garden are situated around the city. Some channels locally called Chara are originated from these hill and hillocks and passes through the city. The drainage system of the city is natural. A total of nine charas crosses the city and finally fall

Table 1. Living time wise residents perception about land use change

Number of respondent	Living time (years)	Establishment of University responsible for land use change (% of total respondent)	Establishment of University not responsible for land use change (% of total respondent)	Establishment of University to some extent responsible for land use change (% of total respondent)
3	36	100	0	0
4	28	75	0	25
6	19	66.67	0	33.23

Field survey, July 2006 (Khan, 2005)

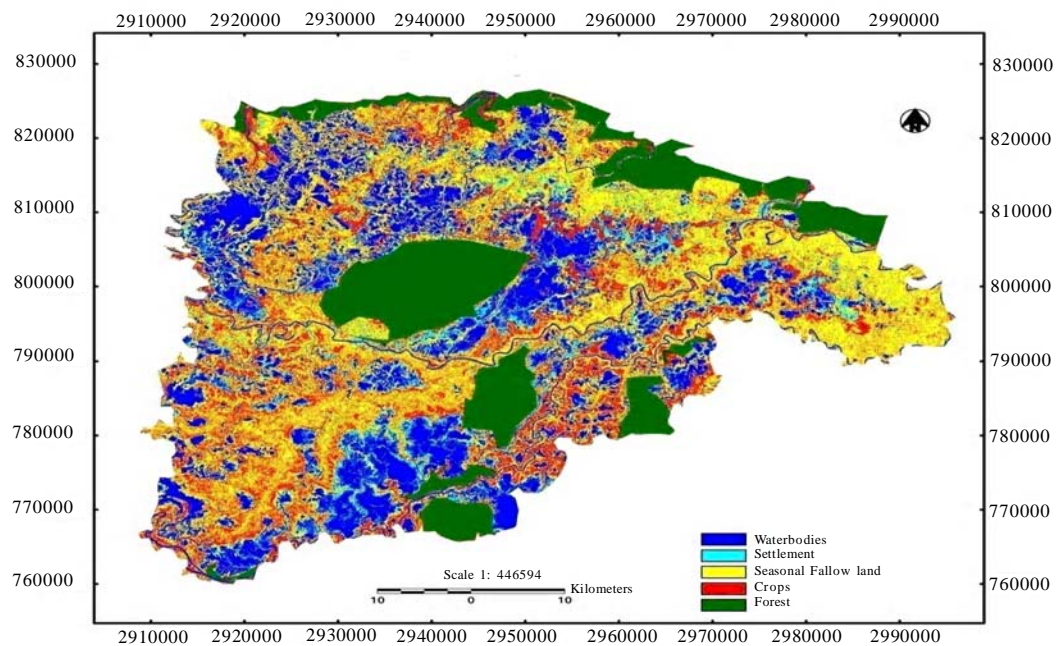


Fig. 2. Land Use Map of Sylhet District of 1988

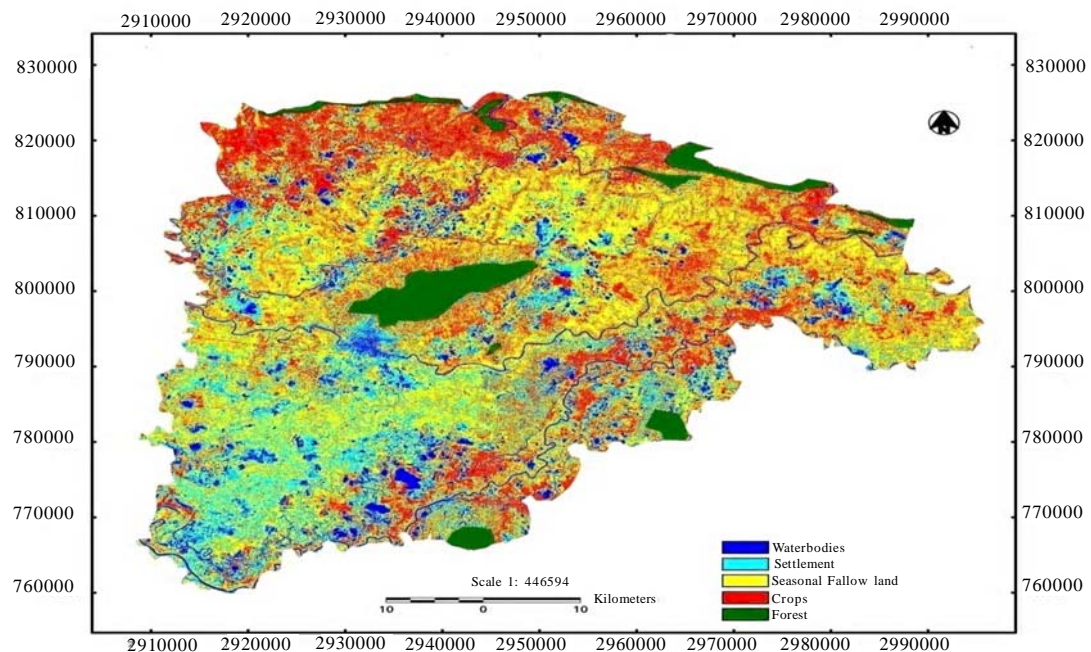


Fig. 3. Land Use Map of Sylhet District of 1997

in the Surma. The river Surma flows through the city, dividing it into two distinct parts. Generally storm water and household gray water are carried by these chara and discharge to the river Surma.

To identify the causes a survey was conducted among 91 plot owners under whom the study area covers. They were asked why they changed their land use pattern and the reasons were broadly classified into three categories – university and its accessories, more return from land (i.e. from the changed land use they get more economic return than before. For example, some plot owners changed their vacant plot into building and give it rent and thus earn more money) and need for residence (i.e. to have a shelter some plot owners have built houses for their own.). The survey result is summarized in the following Table 2. Another reason of land use change is poverty. Table 3 show the settlement occurs in Sylhet city by various housing company.

Table 2. Causes of land use change

Causes	Number of respondent	Percentage
Rice mill and its accessories	27	29.67
More return from land	45	49.45
Need for residence	19	20.88
Total respondent	91	100.00

Field survey, (Khan, 2005)

Table 3. Settlement occurs in Sylhet city by real estate companies

Name	Land area (decimal)
Hill side limited	900
Rupasi Bangla Properties Ltd.	6000
Paragon properties	840
Jabeda Alpha Properties Ltd.	450
Hill side apartments	157
Holy city Resorts Ltd.	3960
Rainbow housing	750
Lake city Ltd	1000
Shahjalal Property	300
Sun Valley	39000
Royal City	3900

Shaha, 2007

Desertification is occurred due to climatic changes. Improper lands use like removal of vegetal cover brings about marked changes in the local climate of Sylhet. Deforestation changes rainfall, temperature, wind speed etc. It was observed

that rainfall pattern; atmospheric window of Sylhet has been changed significantly within last ten years. The direct and probable impacts due to change of land use pattern destroying hills require detail Environmental Impact Assessment study. Depending on the topography, land use and hydro-climatic features of Sylhet, major effects of land use change can be grouped as follows:—

- A. Deforestation, desertification and biodiversity
- B. Ecological imbalance and climatic change
- C. Impact on morphology
- D. Destroying natural beauty

In 1970 Dominated land uses were marshy land, vacant land and crop land. This was only crop land that was used for productive purpose and from which people earned economic benefit. As time passed, population increased and for their existence they needed different economic as well as social activities. Afterwards one of the universities was established.

After some periods people found that it is profitable to make crop land to housing land. Then they started building houses and provided settlements for the people. Thus slowly land use was changing. The changing process of land use in the area has similarity with the agent-based theory of urban and regional spatial structure. In that theory it is said that clustering of certain activities are influenced by some factors like external economy, forward and backward linkages between activities etc. That is, land uses of similar types are agglomerated in a space if they have some forward and backward linkages among them or one kind of use helps other to gain profit. In this study it is found that the university have backward linkages with the housing that supplies it processed cutting hills and converting cropland. To maintain housing and to work on it gradually there increased the number of people and to give them shelter, people's settlements increased. Therefore, it is seen that there is similarity with the agent-based theory of urban and regional spatial structure and the study.

CONCLUSION

Land use of Sylhet has changed gradually. This is found from the field survey that in 1970 the

area was dominated by marshy land (645.33 katha), vacant land (430.88 katha) and crop land (336.17 katha). By 1988 there was no university in the area. Residential area also increased. It covered was 39.11 % of total study area. And this was the dominant use of that time. Most of the residents were involved in such business that is somehow related to university. The impacts of land use changes are desertification, climate changes and hill cutting. Improper lands use like removal of vegetal cover brings about marked changes in the local climate of Sylhet. Deforestation changes rainfall, temperature, wind speed etc. It was observed that rainfall pattern; atmospheric window of Sylhet has been changed significantly within last ten years.

REFERENCES

- Torrey, B. B., (2000). Urbanization: An environmental force to be reckoned with. (New York: McGraw Hill Ltd.).
- Shaha, N .K., (2007). Study on Environmental change of Sylhet District Using Remote Sensing and Geographical Information System. B. Sc Engineering Thesis, Shahjalal University of Science and Technology, Sylhet,
- Khan, S., (2005). Environmental degradation due to urbanization in Sylhet City. BSc. Engineering Thesis, Department of Civil and Environmental Engineering, SUST, Sylhet.
- Pennington, M., (2003). Hayekian Political Economy and the Limits of Deliberative Democracy. *Political Studies*, **51**(4), 722-739.
- Rogers, R.,(1999). Towards an Urban Renaissance. London.
- Sautet, F., (2000). An Entrepreneurial Theory of the Firm. London: Routledge.
- Simmie, J., (1993). Planning at the Crossroads. London: UCL Press.
- Simon, H., (1957). Models of Man. New York: Wiley.
- Sowell, T. (1980). Knowledge and Decisions. New York: Basic Books.
- Steele, D. (1992). From Marx to Mises. La Salle, IL: Open Court.
- Wholgemuth, M. (1995). Economic and Political Competition in Neo-Classical and Evolutionary Perspective." *Constitutional Political Economy*, **6** (1), 71-96.
- Wholgemuth, M., (1999). Entry Barriers in Politics, or: Why Politics, Like Natural Monopoly, Is Not Organised as On-Going Market-Process. *Rev. Aus. Econom.*, **12**, 175-200.