An Analysis on Vegetation Cover Changes in Pakokku Township Using Geographic Information System

Nu Nu Lwin[1], Khin Lay Yu[2], Myo Myo Win[3]

ABSTRACT

This research paper is "An Analysis on Vegetation Cover Changes in Pakokku Township". The study area lies within Pakokku District, Magway Region in the Dry Zone. It was composed of 27 wards, 54 village tracts and the total 252 villages. The main aim of research paper is to analyze the natural vegetation cover changes in Pakokku Township. The main objectives are to study the place where vegetation cover distributes in the study area and to examine the scope of area of the vegetation cover. The Natural vegetation cover change has been studied by using Geographical Information System and Remote Sensing. It is found that there is 397455.03 sq- miles of the vegetation cover of rural area in Pakokku Township in 2009 and 294865.02 sq-miles in 2015. It is observed that the vegetation cover of rural area has largely degraded temporality. Therefore, the vegetation cover changed to 102590.01sq-miles in Pakokku Township between 2009 and 2015. Vegetation cover is found less between 4- mile and 6 -mile from Shinmakan village in 2015 than 2009 due to the cutting wood and firewood of local people near the surrounding of the Tantkyi Taung. More vegetation cover is found in other regions during the cultivated seasons.

[1]Assistant Lecture, Department of Geography, Sagaing University of Education

Lecture, Department of Geography, Sagaing University of Education

Tutor, Department of Geography, Sagaing University of Education

INTRODUCTION

Forests constitute a key natural resource as well as a source of environmental services, and are considered valuable, because they provide a wide range of benefits to the society: products (timber, fuelwood, fodder, green manure, minor produce, medicines, etc.), ecosystem services (soil conservation, hydrological regulation, carbon sequestration, etc.) and repository of biodiversity. Hence, the vegetation studies form a vital component of any natural resource management. The forest monitoring should therefore provide information on the benefits being produced by a forest. Development of forest conservation and management strategies requires an understanding of the spatial and temporal patterns in the forest condition.

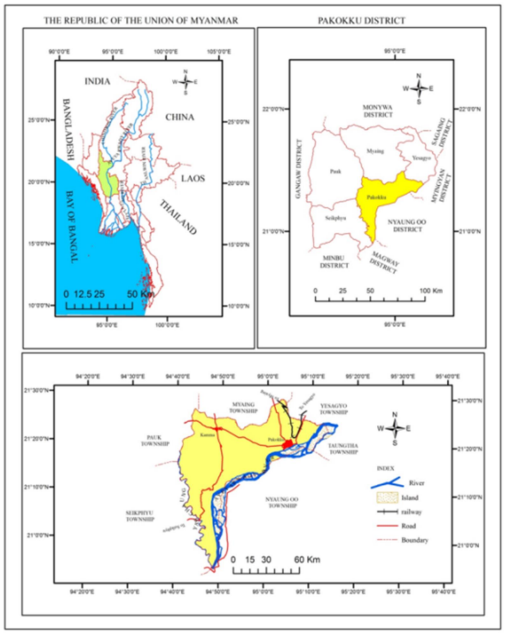
The present study assesses the condition of the forests of Pakokku Township. The rapidly developing techniques of remote sensing and geographical information systems (GIS) potentially

play a significant role in such analysis of forest condition. With the advent of remote sensing technologies, especially the satellite imagery which enables large area coverage, the first attempts to come up with comprehensive forest assessments. The present work focuses on vegetation status in Pakokku Township.

Study Area

The study area is situated within Pakokku District, Magway Region in the Dry Zone of Central Myanmar, lying between north latitudes 20^{o} 55' and 21^{o} 29' and east longitudes 94^{o} 40' and 95^{o} 13'. It is located on the western bank of the Ayeyarwady river bend that lies below the Ayeyarwady- Chindwin River confluence. The area of Pakokku Township is 485.84 square miles (310,937 acres). It was composed of 27 wards, 54 village tracts including a total of 252 villages from 2015. The study area found western mountain ranges, upland area and flat plain. The western part of the Pakokku Township is Tankyitaung Range which runs from north to south. This range is long about 31 miles in length within the Pakokku Township. It is about 1047 feet (300 m) above sea level. This range covered about 25 % of the area of township. The upland area is located along the middle area between Ayeyarwady River and Yaw Chaung, northwestern and northern area near the boundary with Myaing Township in Pakokku Township. The flat plain lies between the Ayeyarwady river and the western mountain ranges. The plain area, below (100) m, is located between the above mentioned upland and rivers in general. The plain rises gradually from the banks of rivers toward the upland in the northwestern portion of the study area. The Chindwin River and Ayeyarwady River flow passing through the eastern edge of the township, about 10 miles above Pakokku town, join and flow as one - Ayeyarwady River. Yaw *Chaung* is 41 miles long within the study area. It is found that there are Alluvial Soils, Brown Compact Irrigated Soils, Yellow Brown Dry Forest Soils, Eroded Red Brown Savanna Soils, Red Brown Savanna Soils, Turfy Primitive Soils, and Primitive Crushed Stone Soils in the study area. As the study area lies within the Dry Zone area of Central Myanmar, the natural vegetation is mostly dry species such as *Than-Dahat* forest and Thorny Shrub forest. The dry forest is divided into *Than-Dahat* forest and thorny shrub forests.

Map – 1 Location of The study Area



Source: Topographic Map No. 84k/11, 84k/12, 84k/15, 84L/13,84 O/3

Aim and Objectives

Aim

The main aim of this paper is to analyze the natural vegetation cover changes in Pakokku Township.

Objectives

The objectives in this study area are:

- To study the place where vegetation cover distribute in the study area
- To examine the scope of area of the vegetation cover

Methodology

The study is based on both primary as well as secondary data. The analysis of vegetation covers using spatial and attributes data of the past and present is regarded as one of the basic requirements of geographical studies, and future planning. Mapping, modeling, and measurements of vegetation cover can be analyzed using Geographic Information System (GIS) and remote sensing-based statistical models. In the present study, the aerial photos and satellite image of 2009 and 2015 was used to determine the vegetation cover of Pakokku Township, in

this research, in order to identify the process of vegetation cover with time. The current study indicates the capability of aerial photos and satellite imagery in the effectiveness of spatio-statistical models of geographical studies. The Normalized Difference Vegetation Index (NDVI) has been worked out by using the following equations:

$$NDVI = (NIR – Red)/ (NIR + Red)$$

where RED and NIR stand for the spectral reflectance measurements acquired in the red and near-infrared regions, respectively. NDVI itself thus varies between -1.0 and +1.0.

FINDINGS AND DISCUSSION

The change of vegetation cover depends on the climate change, the growth of population, and socio-economic condition in Pakokku Township. The period under observation was in 2009 - 2015.

Live green plants absorb solar radiation in the photo synthetically active radiation (PAR) spectral region, which they use as a source of energy in the process of photosynthesis. NDVI is calculated from the visible and near-infrared light reflected by vegetation. Leaf cells scatter (i.e., reflect and transmit) solar radiation in near-infrared spectral region strong absorption would overheat the plant possibly damaging the tissues. Live green plants appear relatively dark in the PAR and relatively bright in the near-infrared. Clouds and snow tend to be rather bright in the red and quite dark in the near-infrared. There are a number of vegetation indices that have been developed to help in monitoring vegetation. They are based on the interaction between vegetation and electromagnetic energy in the red (R) and infra-red (IR) wavelengths. The reflection in the red region (0.6-0.7 micro m) is low because of absorption by leaf pigments (chlorophyll). The infra-red region (0.8-0.9 micro m), however, shows high reflection because of the scattering by the cell structure of the leaves. A very simple vegetation index can thus be achieved by dividing the measure of infrared reflectance by that of the red reflection. Areas of strong vegetation will thus result in a very high index value. The most commonly used vegetation index is the Normalized Difference Vegetation Index (NDVI).

Unsupervised classification will be done using the study areas. Every image is classified separately using exactly the study areas. Classification results in the area and the different

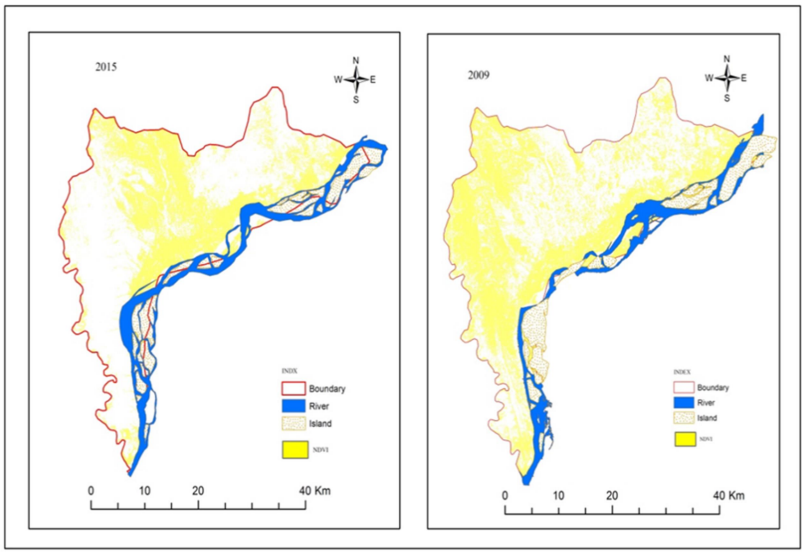
classes, and therefore by comparing different dated images the vegetation cover changes can be directly evaluated.

Table (1) The Changes of Vegetation Cover in the Study Area
(2009 - 2015)

Years	Vegetation Cover (Square miles)	Changes (Square miles)
2009	397455.03	-
2015	294865.02	102590.01

Source: Calculated by the Researcher

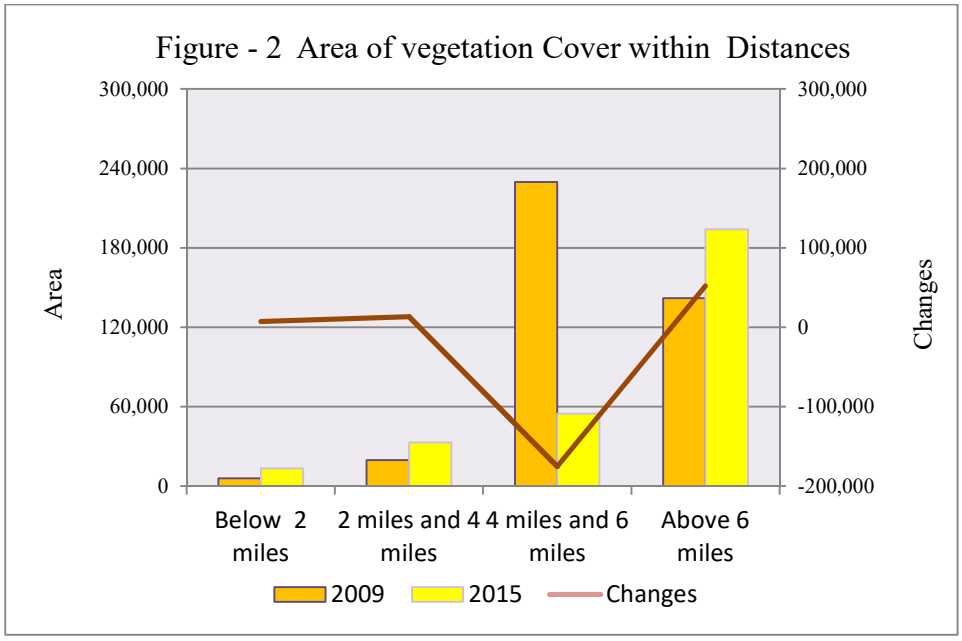
It is found that there is 397455.03 sq- miles of the vegetation cover of rural area in Pakokku Township in 2009 and 294865.02 sq-miles in 2015. It is observed that the vegetation cover of rural area has largely degraded temporality. Therefore, the vegetation cover changed to 102590.01sq-miles in Pakokku Township between 2009 and 2015.



Source : Digital Elevation Model, Landsat-7

Table (2) Area of Vegetation Cover within Distance

Sr	Distance	Area (sq-miles)		Changes
		2009	2015	
1	Below 2 miles	5969.51	13362.95	7393.44
2	2 miles and 4 miles	19675.08	32980.94	13305.86
3	4 miles and 6 miles	229846.74	54613.82	-175232.91
4	Above 6 miles	141963.70	193907.31	51943.61
	Total	397455.03	294865.02	-102590.01



According to table- 2 and figure - 2, it is found (102590.01) sq-miles of the changes of vegetation cover in this study area. Vegetation cover is found less between 4- mile and 6- mile from Shinmakan in 2015 than 2009 due to the cutting wood and firewood of local people near the surrounding of the Tantkyi Taung. More the vegetation cover is found in other regions during the cultivated seasons.

Suggestions

According to the physical features of Pakokku Township, the most suitable type of land use is forest area. By the conservation of the forests, the valuable forest products can be extracted continuously and in addition the conservation of the natural environment can be carried on. In

order to continue carrying out the conservation of forests, the tasks of the forest department should educate the residents of the region to realize the importance of forest conservation.

The main economic activity of the rural regions of Pakokku Township is agriculture. The reclamation of wastelands, virgin lands and cultivable wastelands into agricultural lands, the decrease in the agricultural land acreages can be prevented. In order to increase the agricultural land use intensity in the rural village tracts, scientific agricultural methods and agricultural implements should be extensively used and be carried out according to the direction of the Department of Agriculture.

Future Prospect

In Pakokku Township, the forest products can be extracted and produced by the conservation of forest lands. Moreover, by conserving the forest lands, the forest lands can be prevented from soil erosion and climatic changes and also to prevent from the flood. In future, the conservation of forest lands can protect and conserve the natural environments which are beneficial to the people of Pakokku Township. Based on the present vegetation cover by drawing a more systematic planning for the future, the vegetation cover of Pakokku Township will help improve more in the development of the region.

REFERENCES

1. Briassoulis Helen — **Analysis of Land Use Change: Theoretical and Modeling Approaches**, Regional Research Institutes, West Virginia University.
2. Chauhan R.B.S (1973) — **"Land Utilization in Auindhan Foothill Village"**The Deccan Geographer Vol. XI,No. 182, A Semi-annual of the Deccan Geographical Society and the Deccan Institute of Geography Secunderabad 500256. A.P, India
3. Feras M.Ziadat and Jawad T.Al-Bakri — **Comparing Existing and Potential Land Use for Sustainable Land Utilization**, Jordan Joural of Agricultural Sciences, Volume 2, No.4, 2006.

ACKNOWLEDGEMENTS

The authors would like to express their special gratitude to Dr. Saw Pyone Naing, Rector, Sagaing University of Education and Dr. Mya Mya Than, Professor, Head of Geography Department, Sagaing University of Education Dr.Win Win Nyunt, Associate Professor, Geography Department, Mandalay University for supervision, and guidance of this research paper.