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# Report on Watershed Assesment Used by Gis and Remote Sensing

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***Abstract – This paper describes the studies conducted generation of a digital data base for using spatial data modeling using Remote sensing and GIS techniques for Anabur, Davangere district. This digital data base serves as a ready reckoned- tool for pollution risk assessment and aids in faster decision making process in issues related to development.***

***The studies consisted in development of a digital data base for the Anabur water shed of 900sq.kmsL depicting Land use, Land cover changes in classes such as Barren Rocky, Water Bodies, Semi-Evergreen Forest, Evergreen Forest, Litho logy, geo-morphology and Agricultural Area by calculating the area in hectares of the resulting Land use/Land cover types for each study years and subsequently comparing the results. Thus the study detects land use changes between the year 2000 to 2009 by using Land and LISS-3 satellite images.***

***Information on Land use/Land cover in the form of maps and statistical data is very vital for spatial planning, management and utilization of land. In the study, Remote Sensing and geographic information system (GIS) were used in order to study Land use/Land cover changes. Land use change may influence many natural phenomena and ecological processes, including runoff, soil erosion and sedimentation and soil conditions. The Areas are changing due to various human activities, natural conditions and development activities. According to the user requirements, updating of land use mapping is required to various departments. Monitoring of Land use/Land cover changes which would help to plan the development activities. Change detection has shown that the Barren Rocky area increased between 2000 and 2009 by 22.26% from 5825.21 ha to 7121.87 ha, Evergreen Forest area increased between 2000 and 2009 by 24.83% from 16333.40 ha to 20388.85 ha, Water Body area decreased between 2000 and 2009 by 2.02% from 10822.37 ha to 10603.42 ha,***

***Keywords: Satellite, Hectors, Land, GIS***

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## 1. INTRODUCTION

The increasing availability of geospatial data provides an opportunity for environmental engineers to contribute to the identification of “Potentially Polluting Sites”. To adequately assess the environmental risk of these sites, relevant information must be collected and converted into a multi-scale geo database suitable for site inventory and geo-spatial analysis. However, the successful collection and integration of data model information requires some effort to ‘normalize’ and standardize the data based on recognized international standards. Local governments need tools that make the most of available information to target high risk locations for pollution movement and to evaluate current and future impacts of on-site systems. Hence this spatial data models can be used to identify, manage, monitor and plan remedial measures for the vulnerable site. These data models require less time, effort and are economical when compared to conventional survey or non-spatial data modelling methods. These data can also be used for preparedness planning and reduce the risk of human beings experiencing the after effects of the pollution.

## 2. CONTENT

In classification process, Supervised Classification method in GRASS was performed based on a set of user-defined classes, by creating the appropriate user-defined polygon. The methodology of extracting Land uses / Land cover from satellite image is shown in fig 1. In supervised classification process, “User-Defined Polygon” function reduces the chance of under estimating class variance since it involved a high degree of user controls. Training points were repeatedly selected from the whole study area by drawing a polygon around training sites of interests.

Land use / Land cover classes of these training points were extracted with respect to general knowledge obtained from topographic maps and field visits. The supervised classification was performed using the maximum likelihood algorithm. To evaluate the accuracy of the classified image, "Accuracy Assessment" tool in GRASS was used. The reference class values were compared with the classified class in error matrix. Then overall accuracy and kappa values were computed by using user's accuracy (a measure of commission error) and producer's accuracy (a measure of omission error) of each class. Calculation of the Area in hectares of the resulting land use/land cover types for each study year and subsequently comparing the results. The comparison of the land use/land cover statistics assisted in identifying the percentage change, trend and rate of change between 2000 and 2009.

### 2.1 Data Acquired and Source

For the study, Landsat and LISS-3 satellite images of Anabur watershed were acquired for two Epochs; 2000 and 2009. Landsat satellite image of the year 2000 was obtained from U.S .Geological Survey (USGS), LISS-3 satellite image of the year 2009 was obtained from BHUVAN website.

### 2.2 Data types & their Source

The trend of change can then be calculated by dividing observed change by sum of changes multiplied by 100 (Trend) percentage change = observed change * 100 – (1) Sum of change In obtaining annual rate of change, the percentage change is divided by 100 and multiplied by the number of study year 2000– 2009.

### 2.3 Accuracy Assessment

In order to assess the classification accuracy, 200 points are generated randomly throughout each image using the Add Random Point utility in GRASS 'A' class value is then entered for each of these points. These class values are taken as the reference points, to make a comparison with the class values of the classified images. The overall accuracy and KAPPA statistics are used to assess classification accuracy based on error matrix. Overall accuracy is computed by dividing the total correct value (i.e. sum of the major diagonal) by the total number of pixels in the error matrix. Accuracy assessment is performed for 2000 & 2009 LU/LC maps. An overall accuracy of 79.80% for 2000 & 83.65% for 2009 are obtained.

### 2.4 Change Detection Analysis

The most commonly used Change Detection methods are, i) Image overlay, ii) Classification comparisons of land cover statistics or Calculate the area in hectares of the resulting Land use/Land cover types for each study years and subsequently comparing the results, iii) Change vector analysis, iv) Principal component analysis, v) Image rationing, vi) The differencing of Normalized Difference Vegetation Index (NDVI).

The method used in this project is classification comparison of land cover statistics. The comparison of the Land use/Land cover statistics, assisted in identifying the increase and decrease in area under different classes between 2000 and 2009 as shown in table 2. The change in area can be interpreted with reference to time of acquisition of image i.e. 2000 image is acquired on December and also 2009 image on December, which shows a seasonal variation.

### 2.5 Illustrations

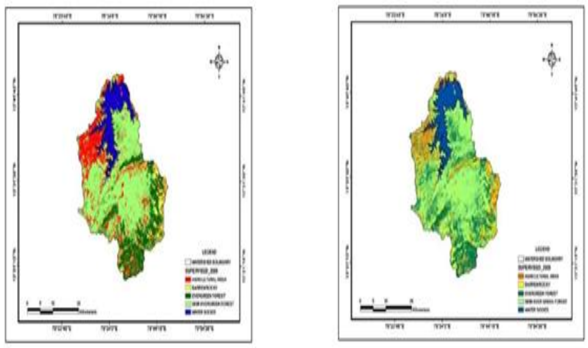

**Figure: 1 LULC map of the Year 2000**

### 2.6 Tables

**Figure: 2 Depth of Ground Water**

| SL No. | Data Type | Data product | Resolution | Source |
|---|---|---|---|---|
| 1 | Landsat image | 20-12-2000 | 30 | USGS |
| 2 | LISS-3 | 15-12-2009 | 23.5 | BHUVAN |

## 3. CONCLUSION

Land use maps resulted from Landsat and BHUVAN images and classification shows a satisfactory comparison. An average accuracy of 79.80% for Landsat and 83.65%for LISS-3 has been obtained from classification accuracy assessment. The urban areas and significant open areas are not identified successfully in the classified land use maps. Overall this appears to be a quick and satisfactory way to obtain ground cover information for a watershed of this size when sufficient ground data are either not available or for any reasons are difficult to obtain. Therefore, remote sensing imagery can be used successfully in providing up to date information.

The study demonstrated the use of spatial data modelling for pollution risk assessment by remote sensing and GIS is an effective method for pollution vulnerability assessment. The GIS technology has provided an efficient environment for analyses and high capabilities of handling spatial datasets. This spatial data can prove to be a very valuable tool for those who are in management position because it gives a very comprehensive indication of vulnerability to environmental contamination.

The spatial data thus prepared for Anabur Watershed helps the planners in broadly screening areas for waste disposal sites, industrial sites etc. The environmental atlas also helps users to recommend the most hydro-geologically acceptable setting for municipal and waste disposal sites, and also helps users to direct resources for further evaluation.

When the state or local administrator has limited resources available to devote to environmental protection, they are forced to focus these resources in certain areas. The spatial data model helps identify areas, which are more or less vulnerable than others to contamination. This delineation allows administrators to direct their resources to those vulnerable areas most critical to environmental contamination, thereby making use of most of the limited resources available.

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