Runoff Assessment Response to Landuse Landcover Changes by Using RS and GIS

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Abstract - As compared with whole world India is the most biggest and most populated area which consumes a large amount of food and water. Here we need to concentrate bit more on land and water resources. These are many unexpected changes in the hydro logical cycle which are experienced by the environment. Most of the issues can be forecasting by GIS[Geographical information system] and RS[Remote sensing].Some of them are we a being studied by SWAT [Soil and water assessment tool]. These forecasting methods we mostly used to study and understand the land use and land cover runoff of the surface. The present study is taken for the year 2009 and 2013. The other changes which effect these and the data related to these we being entered in GIS. All the preceding data is then given for the input in SWAT , which gives the values and specific period of runoff and precipitation.

Key Words: Remote Sensing, GIS, land use/Land cover, Resource management, Town Planning

1. INTRODUCTION

Urbanization is associated with all forms of modern development. More often than not, it is accepted as an integral part of growth, even though it presents some few challenges. Many people consider this to be a better management of human life, as it gets rid of old traditions. However, the realities of the urban life are often more than they are in the big cities. Scarcity of such resources as freshwater and land, air pollution, and many other similar vices are often ignored because development' is here.

Land use and land cover planning and management is related to the sustainable development of natural resources. Changes in land or anthropogenic factors can change the availability of water resources as they main hydrological processes such as evaporation, infiltration, and surface runoff both during and after rain events. Land use changes and development of BMPs land cover differently impact watersheds by changing surface runoff and groundwater, both of which are important for ecosystems. The significance in this study is to understand how such management helps in analyzing these changes and improving them for the generations to come..

2. OBJECTIVES

1. To acquire and assess changes in land use and land cover within the vicinity of the research in the given study area by investigating specific parameters
2. To compute annual runoff characteristics for the area of research within the selected time frame.
3. To examine the response of runoff in the given study area relating to the changes in land use and land cover during the given time period.
4. To devise measures that will minimize the adverse effects on land-use, land cover as well as natural cover.

3. METHODOLOGY

It creates a cartographic representation that would eventually guide in correcting, processing, and integrating field-collected data into a final image for regional reference in a systematic flowchart of processes.

I. First batch: data collection and input-where manual input or scanning may be performed during this stage. Using relevant software, usually CAD software, samples should be transformed.

II. Next follows migration of data into some database that could be broadly classified into spatial data and attribute data.Core of this now would be GCPs that georeferenced with the spatial inputs from SOI maps.
III. Thereafter gives rise to a rectified toposheet of the whole site by alignment and mosaic formation of the various sections.

In this regard, satellite data-are loaded, pre-processed, enhanced, and georeferenced to ground control points (GCPs).

It also integrates merged weather-aspect data attribute and spatial data. Aim is to finally merge all this data that fits LISS-III resolution with those of high-resolution PAN satellite imagery, which use the visual image estimation and hard printouts.

Such an overall development features well-choreographed broad typing of works-defined avatars for the final product to be correct and of high quality.

4. DESCRIPTION OF STUDY OF AREA

4.1 Location and Extent

The Kinnerasani study area is located within the states of Telangana in India. Telangana was established following the bifurcation of Andhra Pradesh between the undivided and reorganized states under the A.P. State Reorganization Act in 2013. The high claims state somewhat affirm the area of around 112,077 sq.km (43,273 sq miles) of land encompassed by Telangana and the population counted was 35,193,978 as per the census of 2011, making the state the twelfth-largest by area and the twelfth-most populous state in India.Urban population in Telangana comprises 13,609,000 or about 38.64% of the total population, whereas the national average stands at about 26.13%. According to the 2011 Census, Telangana urban population growth was 25.13% compared to India's 31.16% for the period between 2001 and 2011. However, Census 2011 also shows that the southern regions had the highest share of the total population. The urban population in Telangana is not evenly distributed. Hyderabad, the capital of the state, is the most urbanized area, with urban population constituting 56.9% of the population. In the rest of Telangana except for Hyderabad, only 15.2% of the population now lives in urban areas.

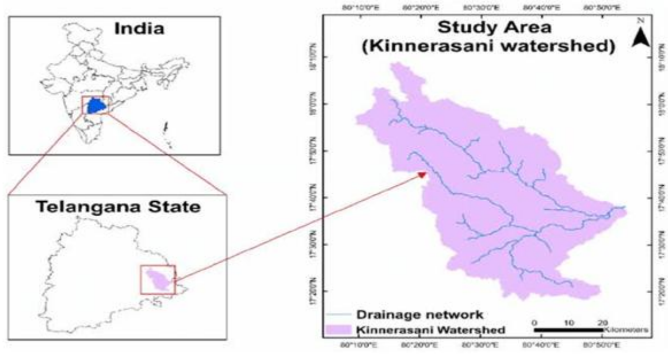

Fig -1: Location Map of study area

5. RESULT AND DISCUSSION

A. Soils

There exist, broadly speaking, two classes of soils in the Kinnerasani basin. Clays occupy 84% of the total area, compared to only 14% of clay loams. 2% can be assigned to others, including rock and water bodies. These are detailed in the table below.

B. Physiography

The physiography of the area is one which exhibits fairly rolling underfoot with the slope of the ground varying between 1% and 6% relatively gentle and steep. About 13% of the area is practically flat and 58% moderately steep. The overall study area has an elevation of about 107 m (351 ft) above mean sea level.

C. Climatic conditions

In broad terms, the climate of the city is equitable, having summer, winter and rainy seasons. In previous climate studies which have emerged, it appears that more than seventy five percent of the rains are associated with the South-West monsoon with the North-East monsoon and summer rains making up the remaining twenty five percent. Thus, for this city, most of the rains experienced is during the South-West monsoon.

D. Landuse and Landcover Mapping

Land Use and Cover are defined as observed economical Physical features on the Surface of the Earth. This procedure is basic fundamental in each and every Geographic Information System and it differentiates with reference to the model (vector or raster) and the origin of data .

The data input methods area.

1. Surveying and other ground measurements.
2. Digitizing and scanning of existing maps.
3. Remote sensing, and Photogrammetry,
4. GIS data transfer from other GIS in specific formats.

E. Land Use planning

Planning of land use in rural area has received inadequate concentration in association with town planning until in recent times .India is predominately agricultural country. The development of land use planning is not recent in its origin but its practice is truly recent. The Landuse/Landcover map gives comprehensive clear depiction to the decision makers and planners for determining future planning of agricultural and urban sector in order to maintain land potentials. Planning of Land use for sustainable future use and meeting the needs of the society. Satellite data for the large areas are available to determine the natural resources and investigation surveys within short phase of time has forced us to use the information for development and planning.

F. Land use and Land cover maps 2009 and 2013

The land use /Land cover maps are produced for the years 2009 and 2013 (Shows in Figure 2,and 3) and the main goals of the land use/ land cover classification system area.To design an integrated structure which encompasses every conceivable land use classification of the country, subject to certain restrictions, for the purpose of extensive cartography. To assess the usefulness of fused IRS-ID PAN and LISS-III satellite image data in resource mapping through both visual interpretation techniques and digital image processing such as supervised classification for several land use/ land cover types. To put in place a land use/land cover classification system that would be applicable to the contemporary satellite pictures that are accessible in India.

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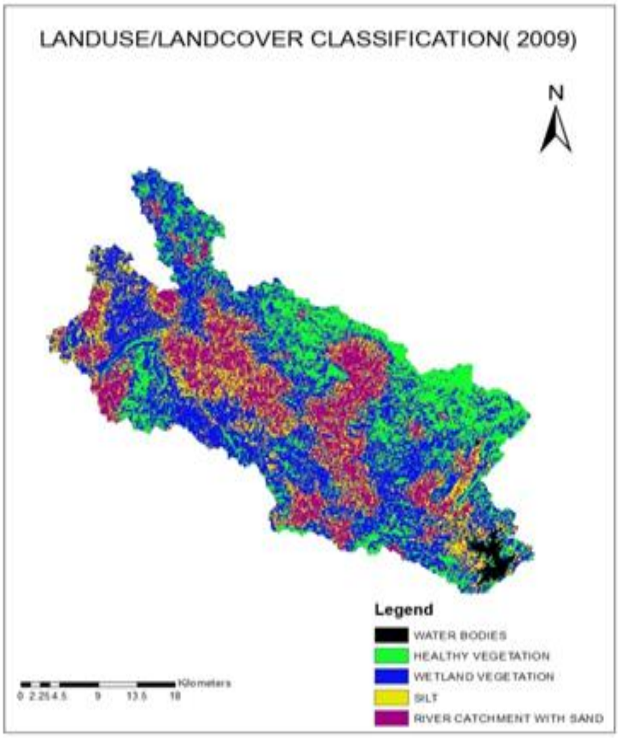


Fig -2: Land use/ Land cover classification Map (2009)

6. COMPARISION OF 2009 AND 2013

The table (1) provides data on monthly runoff for the miracle years 2009 and 2013 expressed in their specific units. The difference in volumes of each month in every year is of great interest. In 2009, runoff occurred mostly in summer and early autumn months, peaking with high values in May (23.1), June (46.17), July (64.63), and August (67.71). Scanty runoff possibly occurred the remaining months of the year, except under those climatic conditions or practices which might manage water. In contrast, that value for 2013 more pronouncedly appeared around the middle of the year. July measurement had a single highest value of 350.44. June fluctuated at 104.14. The overall pattern remains quite similar for peak months, but the greatest difference indicates July, whereby the runoff was much greater in 2013. Noticeable minor runoff in the month of February, April, and October against that observed in 2009 would speak to this. It should indicate the difference in some weather events for some years, say rainfall and snowmelt, if not to indicate change in the management of water.

Attached is a chart showing monthly runoff of each material for both years, 2009 and 2013. The difference is quite high in terms of the amount as well as the seasonal pattern. For 2009, the runoff pattern is pretty smooth; it starts to rise gently in May, peaks in August, and then tapers off by October. On the other hand, 2013 had rather drastic fluctuations and peaked abruptly in July, peaking at about 350 units, which is considerably higher than for 2009. Every year appears to be of the same general profile, with mid-year runoff peaking from June through August; for 2013, however, all summer values tended to be greater. These differences point to a difference in the environmental parameters like the amount of rainfall or snowmelt, or maybe differences in operational variance in handling water management between the years.

The graph(1)shows the reality of land cover types-water bodies, healthy vegetation, wet land vegetation, scrubland, and river catchment areas-four years from 2009 to 2013. Water bodies are both minuscule with hardly any variation from the years 2009 and 2013. There lies a state of relative equilibrium for healthy vegetation across these years, therefore singling out no such changes. There is a reduction in wetland vegetation between 2009 and 2013, however, expressing a decline in this land cover type. At the same time, scrubland has seen a rise, possibly a sign of land degradation or a change in vegetation type. River catchment areas look constant over two years with hardly any changes at all. Therefore, they indicate temporal environmental changes: loss of wetland vegetation and increase in scrubland, which might be both natural processes and processes influenced by human activity**.**

Table -1: Comparison of 2009 and 2013

MONTH	RUNOFF F(2009)	RUNOFF F(2013)
JANUARY	0	0
FEBRUARY	0	0.19
MARCH	0	0
APIRL	0	0.28
MAY	23.1	0
JUNE	46.17	104.14
JULY	64.63	350.44
AUGUST	67.71	75.89
SEPTEMBER	18.38	44.46
OCTOBER	5.08	31.66
NOVEMBER	9.2	0.16
DECEMBER	0	0.01

6.1 Area of features present in2009 and 2013

The table(2) provides a comparison of land cover areas (measured in specific units) for five features between 2009 and 2013.Water bodies show a slight increase from 1.57 in 2009 to 1.6 in 2013, indicating minimal change. Healthy vegetation exhibits a notable decline, reducing from 18.94 in 2009 to 13.4 in 2013, which could reflect vegetation loss or environmental degradation. Wetland vegetation also decreases significantly, dropping from 43.93 in 2009 to 35.8 in 2013, suggesting a reduction in these areas over time. In contrast, scrubland shows a marked increase from 14.93 in 2009 to 21.3 in 2013, possibly indicating changes in land use or vegetation growth. Similarly, river catchment areas with sand have expanded from 20.6 in 2009 to 27.9 in 2013, reflecting possible sedimentation or changes in water flow patterns. This table highlights shifts in land cover over time, with reductions in vegetation and wetland areas and increases in scrubland and sandy river catchments.

TABLE 2 :Area Of The Features Present in 2009 And 2013

S.No.	Features	Area in 2009	Area in 2013
1	Waterbodies	1.57	1.6
2	Healthy vegetation	18.94	13.4
3	Wetland vegetation	43.93	35.8
4	Scrub land	14.93	21.3
5	River catchment with sand	20.6	27.9

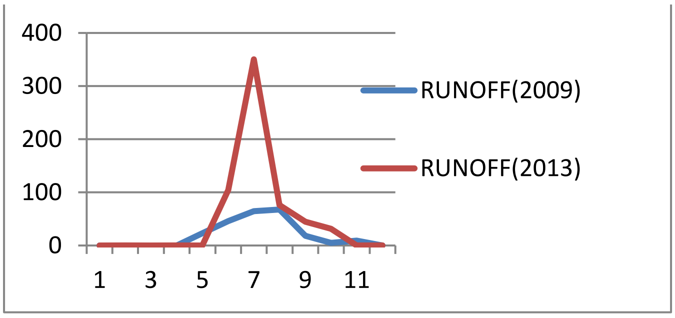
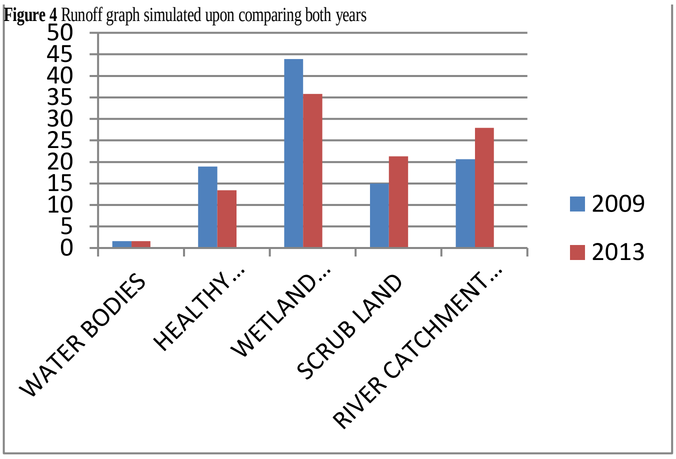


Figure 4 Runoff graph simulated upon comparing both years



Graph 1 Difference in Area of the features

7. CONCLUSION

The reasoning of specified parameters over the period of time has been provided important insights into the changes in the natural cover of the study area. These changes highlight the impact of environmental factors, human activities, or natural activities, allowing for a clear vision and understanding of various trends in land use, ecosystem health and potential areas of concern for improvement or development. This data is important for analysis and derivation of water resource availability, managing flood risks and understanding the impact of land use and climatic changes on hydrological processes. The outcome gives us the information on effective water management strategies and helps future planning for sustainable development and environmental conservation. The report demonstrate that changes in vegetation, urbanization or agricultural practices significantly influence runoff patterns, potentially increasing flood risk or affecting water availability. This analysis is essential for understanding the environmental consequences of land use changes and can guide future land management and water conservation efforts. The preparation of strategies to reduce negative impacts on land use, land cover and natural cover is necessary for upgrade the sustainable development and environmental protection. These strategies aim to balance human activities with ecological conservation by mitigating deforestation, soil erosion, habitat loss, and water degradation. Therefore, it is recommended that incorporating premises numbers and unit numbers of properties should be a prerequisite for GIS applications in Hyderabad to achieve better performance and more accurate results.

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BIOGRAPHIES (Optional not mandatory)

1'st Author Photo

Description about the author1 (in 5-6 lines)