



Need for Conservation and Sustainable Management of Wetlands

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Wetlands constitute a vital component in our landscape. They aid in synthesizing of nutrients and function as kidneys of the landscape. The rapid urbanization trend consequent to unplanned developmental activities with burgeoning population has posed serious challenges in the regional planning and management involving plethora of issues like wetland conservation, infrastructure development, traffic congestion, basic amenities, etc.

Urban sprawl refers to the dispersed development along highways or surrounding a city and in rural countryside with implications such as loss of agricultural land, open space and ecologically sensitive habitats. Sprawl is thus a pattern and pace of land use in which the rate of land consumed for urban purposes exceeds the rate of population growth resulting in an inefficient and consumptive use of land and its associated resources. In this context, the holistic approaches in urban planning, and visualization of urban growth and its impact on natural resources has gained importance.

Analysis of the urbanization pattern and trends using temporal remote sensing data based on supervised learning using maximum likelihood estimation of multivariate normal density parameters has been carried out. Supervised classification

was performed using Bayesian classifier and was verified with field knowledge, visual interpretation and Google Earth image. The supervised classified images of 1973, 1992, 1999, 2000, 2002, 2006 and 2007 with an overall accuracy of 72%, 75%, 71%, 77%, 60%, 73% and 55% were obtained by C implementation of the above derivation using the open source programs (i.gensig, i.class and i.maxlik) of Geographic Resources Analysis Support System (<http://wgbis.ces.iisc.ernet.in/grass>) as displayed in figure 1. Unsupervised learning technique was used to extract waterbodies from IR data. The corresponding number of wetlands and their areas were computed and are listed in table 1. The analysis shows that there has been a growth of 632% during 1973-2009 and 466% in urban areas of Greater Bangalore across 35 years (1973 to 2007). The study unravels the pattern of growth in Greater Bangalore with driving factors and its implication on the natural resources (water, vegetation, and energy), ecology and also on local climate, necessitating appropriate strategies for the sustainable management. Urbanization has telling influences on the natural resources evident from the sharp decline in number of water bodies and also from depleting groundwater table.

Consequences of urbanisation and urban sprawl

Urbanization has telling influences on the natural resources evident from the sharp decline in number of water bodies and also from depleting groundwater table. Major consequences of unplanned urbanization and loss of wetlands are:

Floods:

Common consequences of urban development are increased peak discharge and frequency of floods as land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Conversion of water bodies to residential layouts has compounded the problem by removing the interconnectivities in an undulating terrain.

Heat island:

Surface and atmospheric temperatures are increased by anthropogenic heat discharge due to energy consumption, increased land surface coverage by

artificial materials having high heat capacities and conductivities, and the associated decreases in vegetation and water pervious surfaces, which reduce surface temperature through evapotranspiration.

Loss of aquatic ecosystems:

Urbanization has telling influences on the natural resources evident from the sharp decline in number of water bodies and also from depleting groundwater table. Figure 1 illustrates the loss of aquatic ecosystems (70 % decline during 1973-2009 in the erstwhile Bangalore city limits) and vegetation with the increase in built-up area. 632% increase in built up area from 1973 to 2009 leading to a sharp decline of 78% vegetation, 79% area in water bodies in Greater Bangalore mostly attributing to intense urbanization process.

Table 1: Status of Waterbodies in Bangalore city limits and Greater Bangalore.

	Bangalore City		Greater Bangalore	
	Number of Water bodies	Area (in ha)	Number of Water bodies	Area (in ha)
SOI	58	406	207	2342
1973	51	321	159	2003
1992	38	207	147	1582
2002	25	135	107	1083
2007	17	87	93	918

Note: SOI, Survey of India topographic maps (published in 1973)

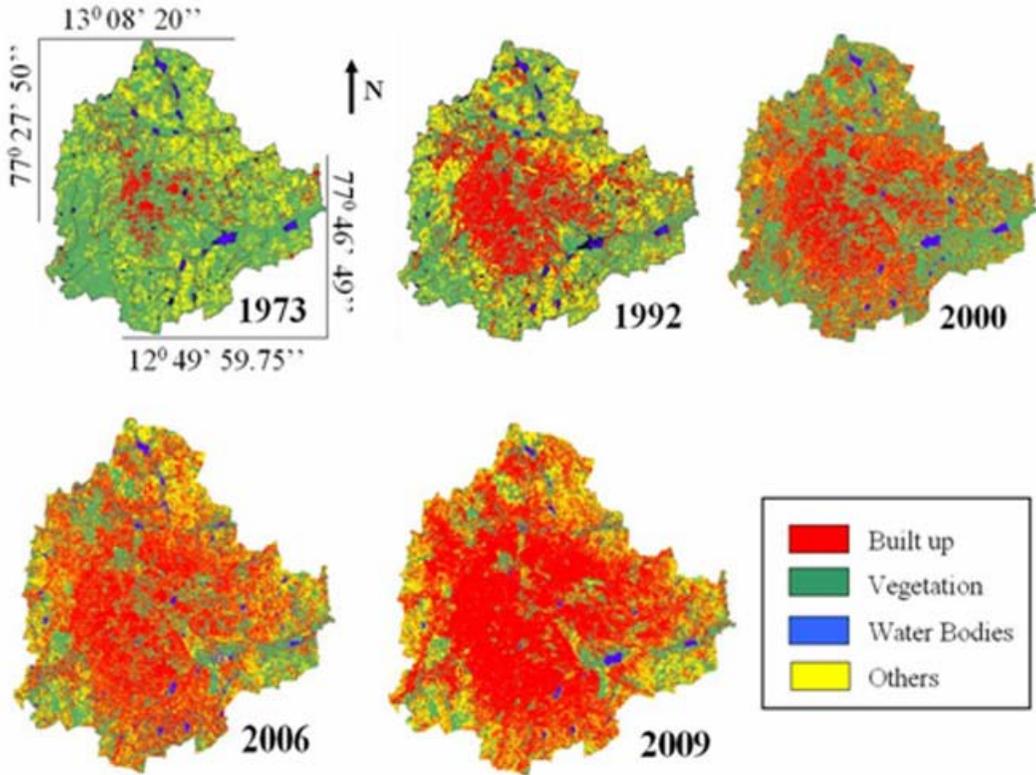


Figure 1: Greater Bangalore in 1973, 1992, 1999, 2006 and 2009

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They Said It...! (about Wetlands and Water)

- A lake carries you into recesses of feeling otherwise impenetrable!
-William Wordsworth
- A lake is the landscape's most beautiful and expressive feature. It is earth's eye; looking into which the beholder measures the depth of his own nature.
-Henry David Thoreau
- The lakes are something which you are unprepared for; they lie up so high, exposed to the light, and the forest is diminished to a fine fringe on their edges, with here and there a blue mountain, like amethyst jewels set around some jewel of the first water, - so anterior, so superior, to all the changes that are to take place on their shores, even now civil and refined, and fair as they can ever be.
-Henry David Thoreau
- I believe that water is the only drink for a wise man.
-Henry David Thoreau
- Filthy water cannot be washed.
-African Proverb
- We never know the worth of water till the 'well' is dry.
-Thomas Fuller, Gnomologia, 1732.
- Every time we walk along a beach some ancient urge disturbs us so that we find ourselves shedding shoes and garments or scavenging among seaweed and whitened timbers like the homesick refugees of a long war.
-Loren Eiseley
(Source: "Quote Garden")