Development of a city and disappearing urban water bodies
a case from Palakkad city of Kerala, India

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Abstract:

Development of civilization has a coinciding, convergent and matching relation with urbanization and city development. The development of a city can be looked upon from different points of view and could be analyzed from different perspectives. Geographical Information System (GIS) is one effective tool for studying urban sprawl. Urban sprawl in the state of Kerala is extending in a fast pace, exerting pressure on most of the natural ecosystems of the state. During the last couple of decades the state has experienced drastic urban growth due to several factors, of which socio economic changes are one of the foremost. We examined the temporal variation in urban wetlands located in Palakkad city (South India), using Topographic sheets and imageries of two different time periods (falling within 1974 to 2008) using ArcGIS 9.3. It was found that the individual wetlands diminishing in area as time progress. Apparently the loss of the wetlands is highly correlated with the growth of the city.

About the Author:

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Introduction:

Geographic information system (GIS) and Remote Sensing (RS) are serving as the best tools to study Spatio temporal changes in a landscape. Due to the population explosion coupled with the globalization, rising purchase power of the public most of the Indian cities are emerging in to complex physical and socio-economic system moving in the path intricate development and spread that can be an attribute of the ‘urban sprawl’. The city insidiously gnaws into its vicinity subsuming the rural and natural landscape in the process. The growth in infrastructure development triggered by global exchanges of various natures played crucial role in the hasty growth of Indian cities. In the population a 3% annual urban growth is reported from in Indian cities (Sudhira and Ramachandran 2003). In India the unprecedented population growth coupled with unplanned developmental activities has led to urbanization devastating many natural areas especially wetlands. Given that wetlands and river courses were the pioneer sites of human settlements and cradles of civilization all over the world, they were among the foremost natural systems that faced the ensuing pressures of development.

Among the various ecosystems of the world, wetlands are the most threatened ones (Turner1991). Urban wetlands of the world are undergoing constant degradation due to different levels of anthropogenic activities like encroachment and so called ‘reclamation’ that in fact is the destruction and depletion of several invaluable ecosystem services that we derive from those systems. The hydrological realms of the wetlands are vulnerably affected by inflow of domestic sewage, pesticides, fertilizers and industrial effluents. Over fishing, boating, aquatic weeds and eutrophication, disturbances from excessive recreational activities and tourism, diversion of water for irrigation, domestic use or industrial uses are also among the major threats to these natural ecosystems (Verma 2001). Over all, social prejudice, perhaps for the ignorance about their values, of wetlands as ‘wastelands’ apparently accelerate the pace of transformation either in to built up area or diversion to other uses of short term economic returns.

Compared to other Indian states, the state of Kerala is bestowed with huge proportion of wetland area. Its geography, the unique location in the lap of Western Ghats, and the topography with undulating terrain with a wide range of altitude (from below mean sea level to 2,694 meters above mean sea level) provides the state this unique setup. Both the monsoons providing more than six months extended rainy season also ensure a vast wetland stretch in the state. From time immemorial, the state was provided with numerous water bodies and artisan ponds which played a crucial role in the culture and traditions of the state and in the traditional system of agriculture especially in the drier months. These water bodies, although originally held under private
ownerships by the feudal lords, were regarded as community based water storage tanks and served the community very well round the year, particularly during the summer months. These water storages or wetlands also served in sustaining the natural biota of the area, of course offering several other ecological goods and services unwittingly utilized by humankind.

Human settlement in Kerala is distributed in a very unique manner. There are no clear cut demarcated villages, except in later year’s revenue records and documents, in the state. The habitations are more or less randomly and uniformly distributed throughout the state especially in the coastal low lands. The consequent city development also has the reflection of the pattern to a large extend. The urbanization in a large part of the state during the 19th and 20th centauries was a result of confluence of several micro urban centers; points of traditional meetings and trades. Subsequently the earlier urban centers of the state Kochi, Thiruvananthapuram and Kozhikode have gained well-defined characteristics of cities and manifest distinctive urban features. The urban growth in the recent years is being in other locations in the state, such as Kollam, Trissur, Alappuzha and Palakkad. Presumably, the state’s unique infrastructure and demographic features would have a direct influence on these developments. The demography of the state, especially in death rate and birth rate, apparently follow a trend similar to some developed countries (www.planningcommission.nic.in). The state occupies first position in Human development index, literacy rate (90.9%) and sex ratio (1058 female: 1000 male, www.ibef.org). The population density of the state is 819 persons per Km2. The road density is 374.9 km/ 100 Km2, far ahead of the national average of 74.9 Km/100 Km2. Length of road per one lakh population is also much higher than the national average (462.6 km against 259.2 km, www.planningboardkerala.nic). 25% of the total population of the state is urban. Above all Kerala is one of the states in India having very high remittance rate (about Rs. 24000 crore / year) from abroad (Zachariah et al., 2000; Kannan & Hari, 2002).

The urban development of the Palakkad city is highly manifested by consumption of rice paddies and ponds. Earlier the area was known for its huge paddy fields and bumper yields. Even during the dry months of a year using artisan ponds the agriculture was in full swing. During the last couple of years Palakkad region is facing severe drought and dearth water (CWRDM, 2004). The decrement in the annual rain fall, and the total rainy days in the region may be a prime reason for the prevailing drought (Raj and Azeez 2008a, Raj and Azeez, 2009a). Disappearing traditional water harvesting methods such as Artisan ponds by the physical pressures from development also worsen the dearth in water in Palakkad region. In this context, the present study attempts to explore the temporal changes that have happened in the traditional artisan ponds in the Palakkad city.
Study Area

The Palakkad city, located between $76^\circ$ 37'- 76$^\circ$ 40'E and 10$^\circ$ 44'-10$^\circ$ 48’N, is one among the 53 municipal areas of Kerala state and its municipal limits spreads to an area of 26.60 Km2 (Fig.1.). Being a first grade municipality it is the biggest among the 4 municipal cities of Palakkad administrative district. The city is located in the plains (84 m above sea level) at the western opening of the Palakkad gap in Western Ghats. The city is well connected by road networks and railways. The total length of the road falling in the municipal area is 268Km. According to national level of classification based on population, the Palakkad municipality fall under class 1 city (Census of India, 1991). The area has more or less pleasant weather throughout the year; the temperature ranging from 20$^\circ$ C to 45$^\circ$ C. The summer season extends from March till June. Average annual rainfall of the area is approximately 2159 mm. The southwest monsoon commences here in June and continues up to September, while northeast monsoon reaches here towards November (Government of Kerala, 2006). However, the Palakkad area is experiencing notable changes in the annual rainfall pattern (Raj and Azeez 2009a).

Methodology

We examined the distribution of artisan ponds / wetlands in Palakkad municipality (10$^\circ$46'2.43"N, 76$^\circ$38'54.49"E) using ESRI software ArcGIS 9.3. The Survey of India Toposheets (1:50,000 scale, 58 B/9 and 58 B/10, 1970) and cadastral maps from concerned government departments were used to delineate the municipal boundaries. The wetlands /ponds present inside the municipal area were digitized and compared with the respective Google earth imagery (GoogleEarth2008). Ground truth data collection and field verification was carried out randomly in the area to strengthen the location accuracy.. The results thus obtained were inspected in view of built up area expansion as well as the decadal population data of the city.
Result and Discussion

The analysis shows a gradual decrease in the total area of water bodies in the city (Fig.1). A significant trend was observed between the area under water bodies in the city with the decadal population as well as the building density (Fig 2. & Fig.3). This decrement may highly associate with the urban development of the city as well as the demographical changes (Boarnet & Haughwout, 2000; Yu, 2002).

The average building density of Palakkad city was 0.50 hectare per hectare during 1970 to 2008 (Raj and Azeez 2008b). The decadal population growth of Palakkad municipality shows a trend of increase with an average annual increment of 833 persons. Compared to the average annual urban growth rate of the whole district (4.81%), the growth rate in the city is almost double of that (9.63%). During the study period the number of artisan ponds fell from 65 to 32 during the same period. This reduction in number as well as in area may possibly due to draining, filling and conversion. In the recent few couple of years Palakkad city has become a salubrious destination for NRIs and NRKs to building residences.

Conversion of wetlands and other low lying lands for real estate venture is common all over Kerala. The neo-rich utilitarian attitude of the people, reallocated most of the state’s wetlands in to dry built
up areas. Most of the wetlands in the state were rice-cultivating areas as is the case of Kole, Pokkali or Kuttanad. Nevertheless, due to low economic returns from agriculture fueled with the pressure from booming real estate business ventures most of wetlands rapidly disappear (Raj and Azeez 2009b).

Fig. 1. Temporal variation in artisan pond area –Palakkad city

Fig. 2. Variation in pond areas and building density
Conclusion

The present study documents the fall in ponds in a developing city. Artisan ponds and water bodies have crucial importance in Kerala’s socio-economy, culture and traditions. However the values and services of these ancient structures are largely neglected and most of them are being filled and converted to dry lands and built up areas. In Palakkad city the number and size of the water bodies are found decreasing rapidly during the last few decades. Conservation of these structures may prevent to an extend the frequent droughts and water scarcity in the area, as they help as effective water harvesting structure in the context of changing rainfall pattern in the area.

References


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**GIS Software Used: ESRI ArcGIS Suite**