Towards Surveillance of Watershed and Its Multidisciplinary Impact: A Case Study

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This material is based upon work partially supported by the National Science Foundation under Grant No. 0307010. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the agencies.

[Presented at the 7\(^{th}\) Annual International Conference on Digital Government Research]

Technical Report Number 2006-0538
TECHNICAL REPORTS AND REPRINTS SERIES
May 2006
TOWARDS SURVEILLANCE OF WATERSHED AND ITS MULTIDISCIPLINARY IMPACT: A CASE STUDY

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ABSTRACT

Water has become a major crisis in Afro-Asian countries and the most important issue for developing countries like India. The major factors, which govern the availability and appropriate utilization of water resources, are multidimensional. Vagaries of monsoon have adversely affected the availability of this precious resource. Scarcity of water has direct and indirect impact on vitally important aspects like poverty, education, public health and environmental crimes. Hence, multiple indicators can be applied to detect hotspots using tools of Geoinformatics.

Maharashtra is one of the progressive and industrialized states of India. It is the second largest in terms of area and population. Jalgaon district is located in the North-West region of the state. It’s geographical position is between 74° 55’ to 76° 28’ East longitudes and 20° to 21° North latitude. It is bounded by mountain ranges in North, namely ‘Satpuda’ (a local name), Ajanta hills in South (famous world historical monument). The district receives an average rainfall of about 690 mm with 40 to 100 rainy days per year in the months of June to September. The temperature varies from 20 °C to 35°C in normal conditions. Extreme ends are in between 10°C and 48°C. It is highest during April - May and lowest during November - December. Jalgaon district hosts a population of about 3.6 million in the area of about 1176500 H. Total land under cultivation is 908548 H. The district has four major rivers viz. Tapi, Girna, Waghur and Panzara and it covers a total of 33 priority watershed areas out of which 22 watershed areas are falling under Draught Prone Areas Program.

Jalgaon district has rich fertile regur and alluvial soil, well suited for Cotton, Sorghum and Pearl millet crop production. In last few decades, irrigation projects governed by Government were initiated and cropping pattern was shifted from conventional to cash crops such as banana, sugarcane and wheat, which need more water. The overall irrigation area covered in Jalgaon to date is 1,40,000 H. of which major crops are Banana (1,05,429 H), Sugarcane (11,119 H) and Wheat (20,206 H). Whereas in rainfed crops, cotton is a major crop and source of livelihood for masses. It occupies 3,42,567 H i.e. 37.70% of total agricultural land. Vagaries of mansoon has converted cotton into a non-profitable crop and is making a direct impact on the basic source of livelihood leading to escalation in poverty.

Ironically, overexploitation of water from aquifers in the district has increased ultimately resulting in lowering of water table at the rate of 20 cm per year (pre monsoon 1983-2004). In total, the water level has decreased more than 4 meters in last 20 years.

Lack of awareness about water conservation among agricultural community has led to adoption of non-profitable cropping patterns in recent past. Inconsistency in agricultural income is a peculiar characteristic of the region for last two decades. Continuation of same trend may lead to eruption of poverty patches in certain parts of region in future. The effect can be seen in terms of migration of people towards urban area with the major reason being uncertainty of rainfall and insufficient water availability. The current district population for rural and urban area is 1 million and 2.6 millions respectively. It invariably indicates migration towards urban area in last two decades.

In addition to this, pollutants contaminate water resources and groundwater reserves. Inadequate sewage treatment and improper solid waste disposal contributes for incidences of water-related diseases in the district. The ground water in many areas is crossing the permissible limits of parameters like fluoride and hardness. Incidentally, it focuses the issue of water quality for public health and hygiene. Occurrence of water related diseases in certain parts of the region time and again is a matter of serious concern.

The non-availability of water is directly affecting the biodiversity of the local area and there is threat to regional ecosystem health, which demands for immediate bio surveillance.

Water resources and everything related to water assumes prime importance among the farmers, agro-industries, Government agencies, policy makers, environmentalists, academicians and
researchers.

KCE Society's MJ College is a 60-year-old institution committed to research and education. It has been accorded "A" grade by National Assessment and Accreditation Council (NAAC), India and has been honored with a rare status of being a "College with Potential for Excellence" by University Grants Commission (UGC), India.

The college recognizes watershed as inter disciplinary thrust area and hence has decided to undertake synergistic and collaborative studies concerning the issue. It will help Government / Public agencies and departments in policy formulation and planning for sustainable use of water resources and thereby prevent adverse effects on health, hygiene, economic stability, education and environmental balance.

**Categories and Subject Description**

H. Information System; H3. Information Storage and Retrieval; H3.3. Information Search and Retrieval

**General Terms**


**Key words**

Surveillance, watershed, cluster analysis, Geoinformatics tool, socioeconomic impact

1. **INTRODUCTION**

The primary thrust of proposed work is three-fold.

a) To undertake synergistic and collaborative studies concerning the issue. In the first phase, six major parameters (climatic, topographic, edaphic, biotic, economic and public health in relation to water) and their sub factors are arranged in appropriate cluster to analyze their effect through correlation in order to propose correct and computational model.

b) A model system will be designed to identify the hotspots and their impact. The statistical Geoinformatics tool will reckon the hotspots along spatio-temporal dimension with multiple indicators. To develop a novel prioritization scheme based on multiple indicators and stakeholder criteria, GIS sensor network through surveillance will be established. It will lead to strengthen and accelerate in-house research in academic institution with development of knowledge based human resource and Geoinformatic database.

c) In second phase, it is envisioned by the college to progressively institutionalize this research. It shall function as a "center of excellence" committed to research in the area of water and its impact. Institutional setup help in continuous datacollection, collation, correction and analysis with appropriate model based on multivariate analysis method.

2. **RESEARCH**

Our research activities is focused on correlating the various factors and understanding the linearity of multiple indicators to plan for sustainable use of water resources and thereby minimizing adverse effects. The system has three methodology components : surveillance, correlation and hotspot detection.

3. **ACKNOWLEDGEMENT**

Authors acknowledges the guidance of Dr. G. P. Patil; Pennsylvania State University; University Park; PA 16802-2112, Khandesh College Education Society; Jalgaon and Researchers Team of M. J. College for their support.

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