International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.10 No.11, pp 155-166, 2017

Study of The Impact of Anthropogenic Activities on Water Quality on Kollihills using GIS and its Social Consequences

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Abstract : The present study on Study of the impact of anthropogenic activities on Water quality in Kollihills and its social consequences emerged with the objective of assessing the current status of water supply services and its impact in hotspots, identifying the consequences. The study was done in four hotspots identified as Agayaganga falls, Arapaleeswar temple, Namakkal district. Then using purposive sampling technique nearly 60 samples were collected. To understand the current status of water quality and consequences an analysis on physical, chemical and biological parameters was done to determine the different levels of contamination using Bureau of Indian standards. Participatory Rural Appraisal tools such as Transect walk, Key Informant Interview.GIS is used as the tool for predicting Tourism Resource Inventories, Identifying most suitable locations for tourism development and analysing relationships associated with resource use. Apart from the above the consequences due to the contaminated water and remedial measures on the people was analysed. Based on the results detailed measures were given.
Keywords : Sampling technique, physio-chemical parameters, Transect walk, Key informant interview.

1. Introduction

Tourism has been one of thefastest growing industries since it was formally recognized at the globallevel in the 18th Century (Mitra and Chattopadhya, 2003). The advent of mass tourism in the second half of the 20th Century faced direct protest and criticisms by the rise of environmental movement across the world. With the increasing scale of tourism activities in the natural areas, theenvironmental conditions at some stage could not absorb tourism development and increased the adverse impacts on the functioning of ecosystem caused by the tourism development (Ross and Fennell, 2003). It is no doubt that the growth and development of tourism industry has been causing positive and negative impacts at the tourist destinations ever since it was considered as a means for economic development.

Besides the unavoidable adverse impacts, tourism also enhances the protection and transmission of cultural and historical traditions, thereby contributing to the conservation and sustainable management of natural resources, the protection of local heritage and a revival of indigenous cultures, cultural arts and crafts**.**The quality of water samples and its consequences were discussed with respect to these parameters and

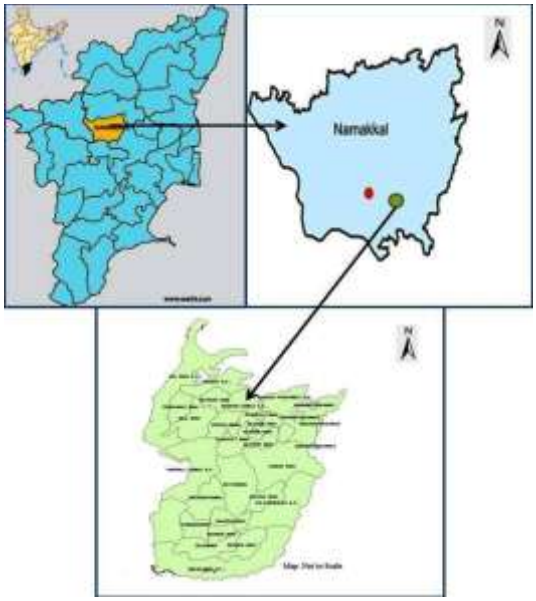
thus an attempt were made to ascertain the quality of water used for drinking and other purposes in the sampling spots by the people.

Water is most vital liquid for maintaining the life on the earth. About 97% water is exists in oceans that is not suitable for drinking and only 3% is fresh water wherein 2.97% is comprised by glaciers and ice caps and remaining little portion of 0.3% is available as a surface and ground water for human use. Safe drinking water is a basic need for good health and it is also a basic right of humans. Fresh water is already a limiting resource in many parts of the world. In the next century, it will become even more limiting due to increased population, urbanization and climate change. Water is increasingly becoming a scarce resource. Water management in tourism needs discrete planning as many tourist hot spots are already in the state well below its mark. Unfortunately,due to the development of tourism in kollihills, the drinking quality of water is continuously being contaminated and hazardous for human use due to high growth of population. According to recent estimates, the quantity of available water in hotspots becoming deteriorating and causes many hazards to the environment.The water samples were collected from the different hotspots and analyzed. The physico-chemical properties were compared with WHO and BIS standards.

Key Informative interviews undergone with specially selected individuals who have long been experiencing in a certain community or specialised knowledge or skills in a certain topic. Key informants should be carefully selected. The informants might be members of the target group e.g. local leaders or staff of support organisations and development programmes in the sector concerned.From the key informant interview the quantum of water supplied for tourist spot, and the amount of solid waste collected are to be quantified, and disposal methods are analysed. The questionnaire survey was conducted among the people and their problems were enquired.The collected information's from the key informants are tabulated clearly and the solutions were given.

1.1 Study Area

Kollihills is a small mountain range, an out liner of the Eastern Ghats located in central Tamilnadu in India. The mountains are about 1000m to 1300m in MSL and cover an area of 280km^2 located at East Longitude 78º 17'05" to 78º 27'45" and North Latitude 11º 55' 05" to 11º 21'10". The hill is located 55KM away from Namakkal. The selected hotspots are Agayaganga falls, Arapaleeswar temple, The Agayaganga falls in Kollihills gushes down from a height of 300 ft into the River Aiyaru. Peak season recorded is from the months of August to September .Arapaleeswar temple is one of the best known temples in Kollihills and this is scenically located on the top of the hills, and it was constructed 12th century.



(Source: national informatics centre, 2014)

Figure1. Index Map of Kollihills

2. Materials and Methodology

Water samples were collected from four hotspots. The samples were analysed for its pH, dissolved oxygen, alkalinity, hardness, turbidity, total dissolved solids, chloride, potassium, magnesium and trace elements like copper,arsenic,lead,etc.,with a view of finding out the quality of water deteriorated due to Tourism development.Electrical Conductivity (EC) and pH were measured electromagnetically in the field using digital meters immediately after sampling.After testing the parameters, the consequences were found out for the respective parameters. According to the parameter values, mapping were done for all the four respective hotspots by using GIS. The GIS mapping shows the contaminated region of each parameters for individual hotspots. Finally the consequences were found out and the necessary actions for the consequences were given to make the water safe against future contamination.

3. Results and Discussions

By testing the water quality parameters, in the inlet of Boat house where surface water is taken.The chloride content present is 350mg/l which exceed the BIS standard limits.Total dissolved solids present are 84ppm which does not exceed the standards.The Electrochemical, Sodium, Calcium, Magnesium, Fluoride and Phosphate does not exceed the permissible limits.

By these values of parameters it is concluded that chloride content and turbidity present in the water is high which exceed the permissible limits.In Boat house outlet, where surface water is taken. Here Magnesium present is 4.2mg/l, Chloride present is 350mg/l which exceeds the permissible limits. Total Dissolved Solids present is 52ppm which does not exceed the permissible standards.Solids present is 151ppm, Sodium found is 83.4mg/l,

In chloride test,the samples taken from inlet, outlet and centre of the boat house exceeds the permissible limits i.e.,in the inlet of boat house, chloride = 310mg/l,in the centre of boat house,chloride = 430mg/l and in the outlet, chloride = 380mg/l .In turbidity test, the inlet and outlet of the boat house also exceeds the permissible limits of Bureau of Indian standards i.e.,. Therefore the quality of water decreases in this area.The parameters values were tested and tabulated below.GIS can be a powerful tool for developing solutions for water resources problems for assessing water quality, determining water availability, preventing flooding, on a regional or large scale.

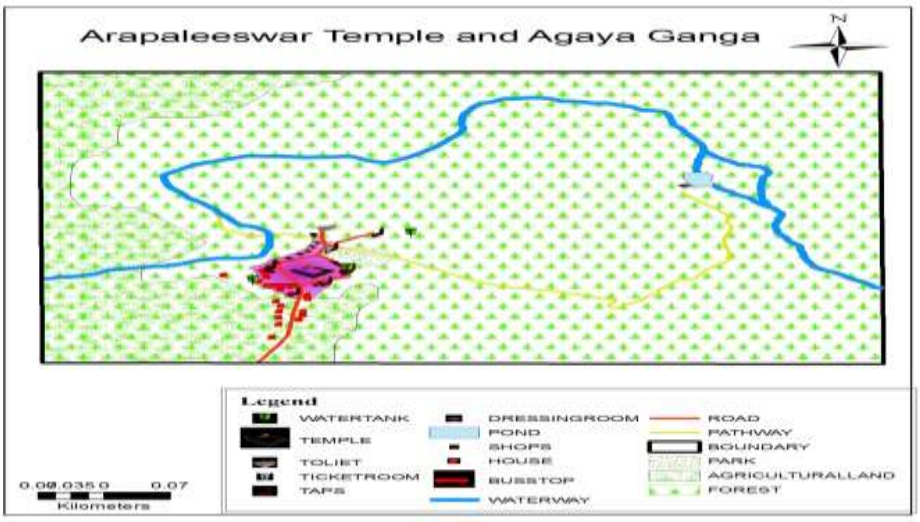
Spatial interpolation technique through IDW approach has been used in the present study for obtaining spatially interpolated water quality map for the hotspots namely, Agayaganga falls and Arapaleeswar temple. The spatial interpolation of all the hotspots for different water quality parameters like pH, EC, TDS, Total hardness, Alkalinity, Chloride, Fluoride, Sulphate, BOD, DO. For all the parameters, surface water has been interpolated clearly because, surface watersamples are collected at four points within the boundaries of selected hotspots.

Table 1: Water quality parameter test values

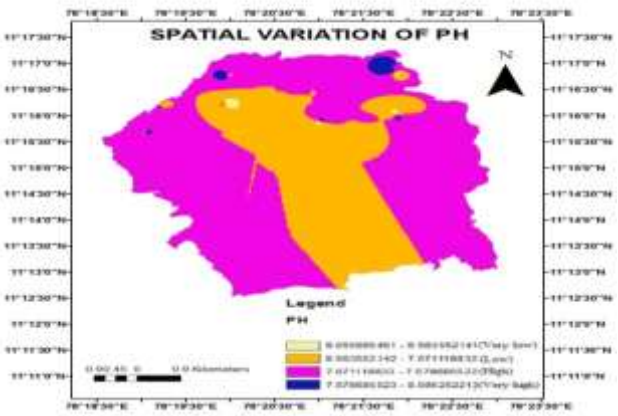
Sample Location/ Parameters	Chloride (mg/l)	TDS (ppm)	EC (µS/cm)	Sodium Na (mg/l)	Calcium Ca (mg/l)
BIS Std Limits	< 250	< 500	< 2500	< 200	< 75
Agayaganga Inlet (S.W)	380*	49	54	45	12.2
Agayaganga Outlet (S.W)	100	65	87	45.2	5.8
Arapaleeswar Temple (S.W)	500*	95	112	89.2	5.6
Arapaleeswar Temple (S.T)	150	82	158	103.3	8.5

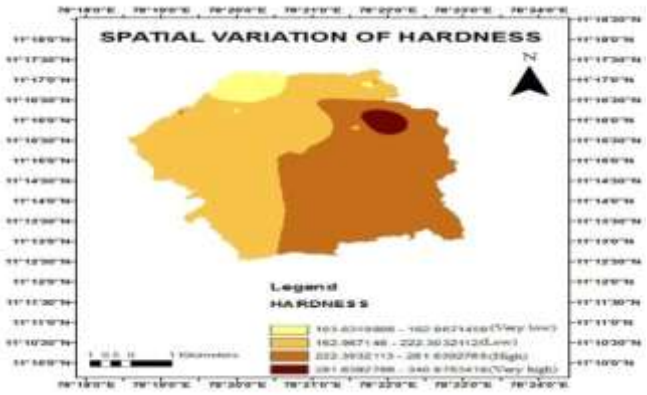
Sample Location/ Parameters	**Magnesium (Mg) mg/l**	**Ph**	**Turbidity (NTU)**	**Fluoride mg/l**	**Phosphate mg/l**
BIS Std Limits	< 30	6.5-8.5	< 3	1-1.5	< 1
Agayaganga Inlet (S.W)	4.8	8.4	6.52*	1.4	0.14
Agayaganga Outlet (S.W)	11.56	8.9*	8.2*	1	0.22
Arapaleeswar Temple (S.W)	4.8	7.9	4.8*	1.3	0.28
Arapaleeswar Temple (S.T)	8	7.7	2.72	1.2	1.22

***** The water quality exceeding permissible limits.
SW- Surface Water, GW-Ground Water, ST- Syntax Tank



3.1 Spatial Variation of various parameters for summer season




SPATIAL VARIATION OF HARDNESS
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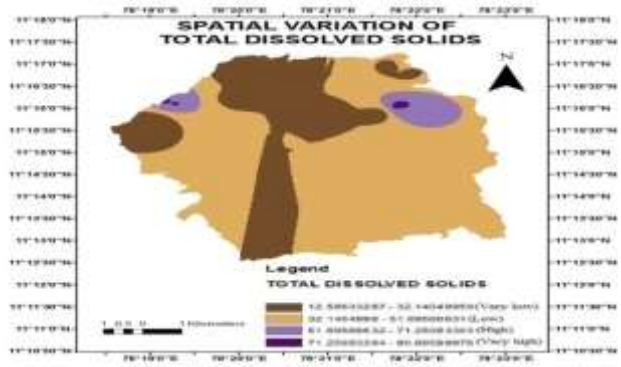
HARDNESS


SPATIAL VARIATION OF
TOTAL DISSOLVED SOLIDS
N
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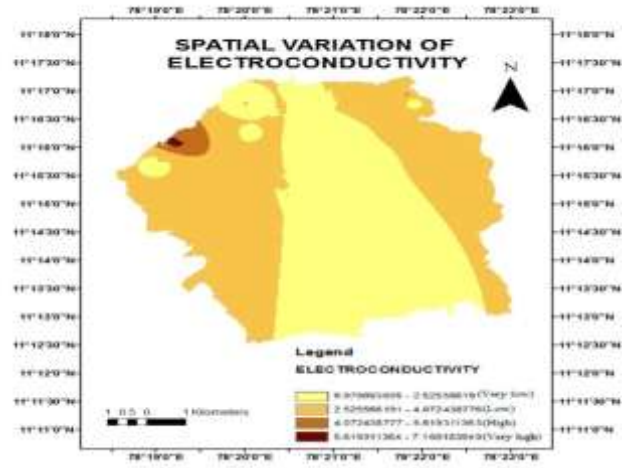
TOTAL DISSOLVED SOLIDS


SPATIAL VARIATION OF ALKALINITY
N
Legend
ALKALINITY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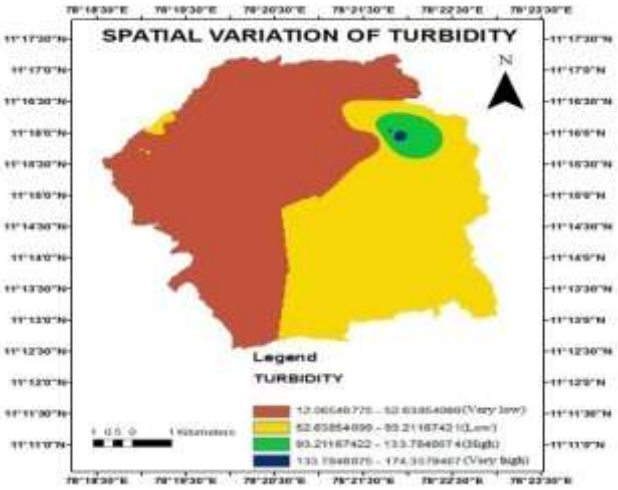
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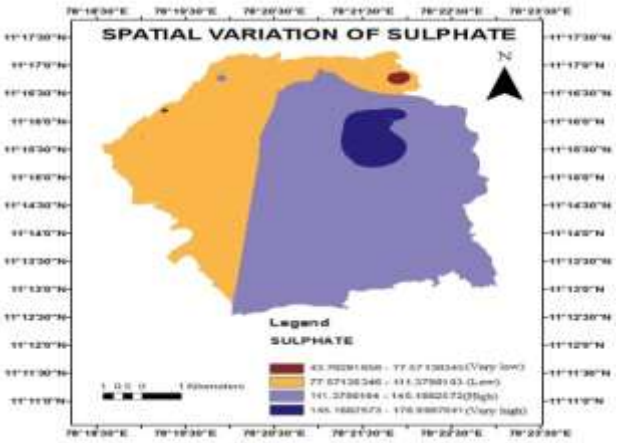
TURBIDITY


SPATIAL VARIATION OF SULPHATE
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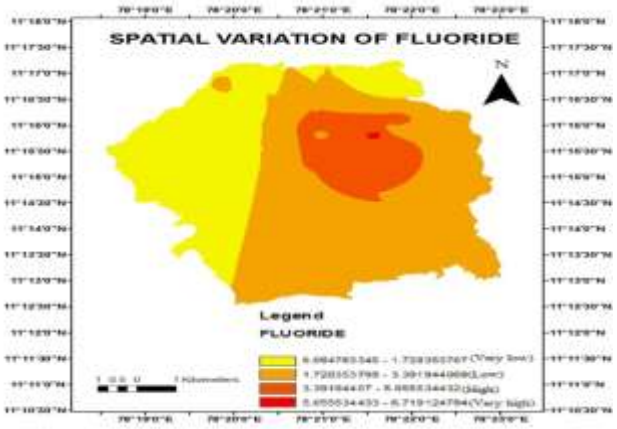
SULPHATE


SPATIAL VARIATION OF FLUORIDE
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Legend
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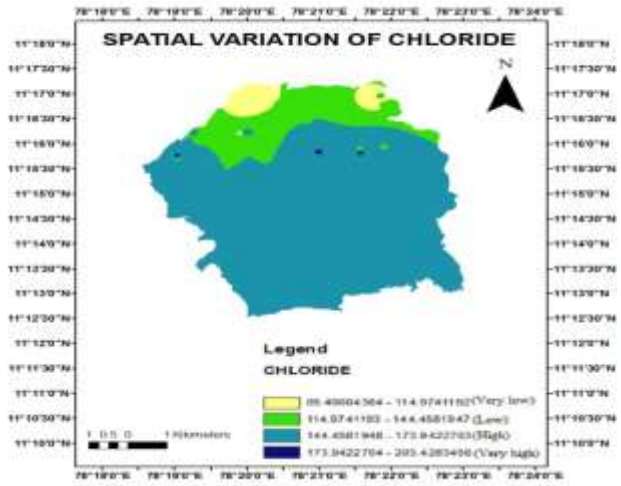
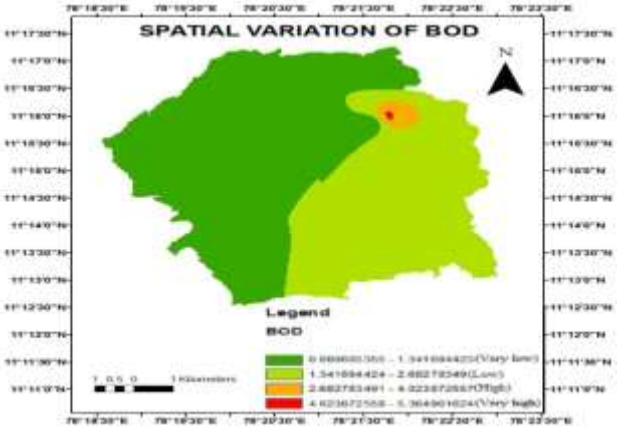
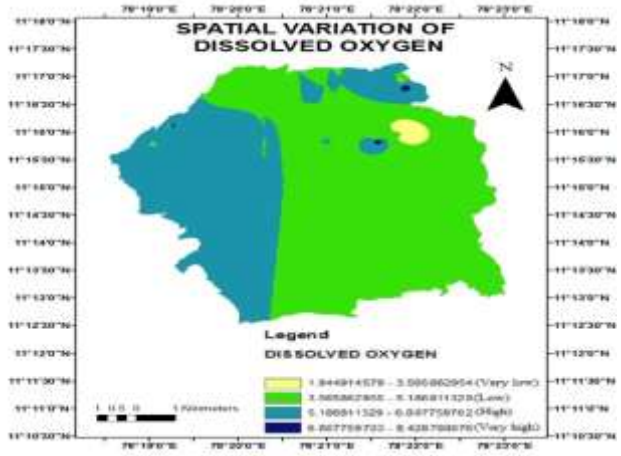
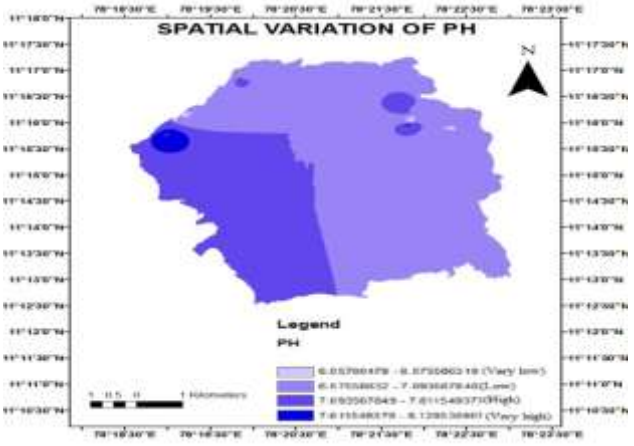






3.2 Spatial Variation of various parameters for winter season


SPATIAL VARIATION OF PH
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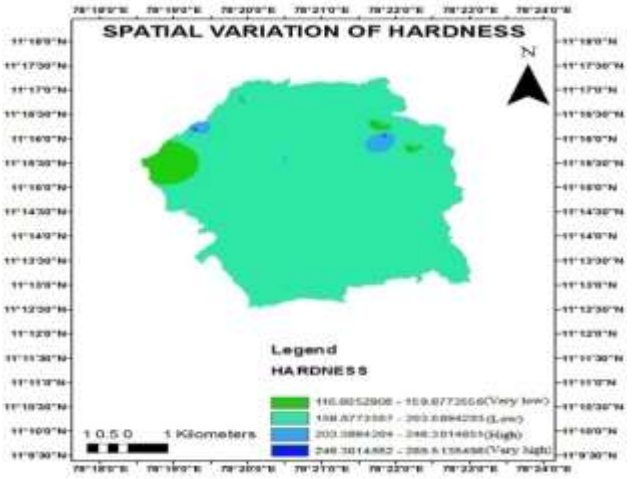
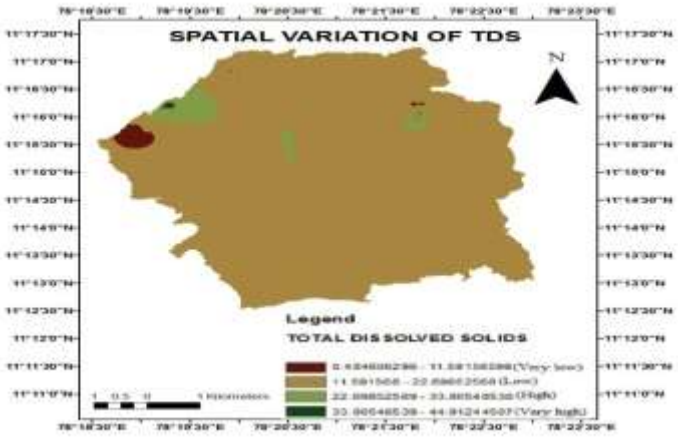
Legend
PH


SPATIAL VARIATION OF HARDNESS
N
Legend
HARDNESS
1 0.5 0 1 Kilometers


SPATIAL VARIATION OF TDS
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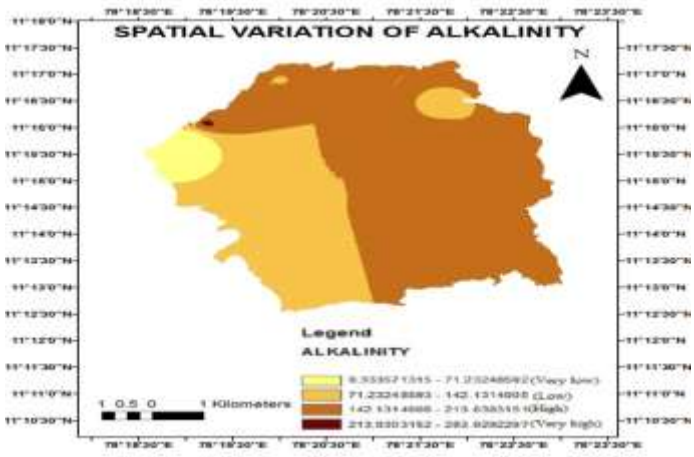
Legend
TOTAL DISSOLVED SOLIDS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N
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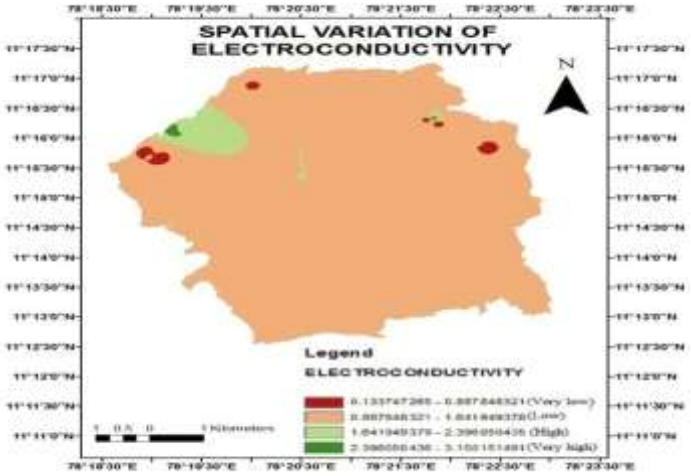
ALKALINITY
1 0.5 0 1 Kilometers


SPATIAL VARIATION OF
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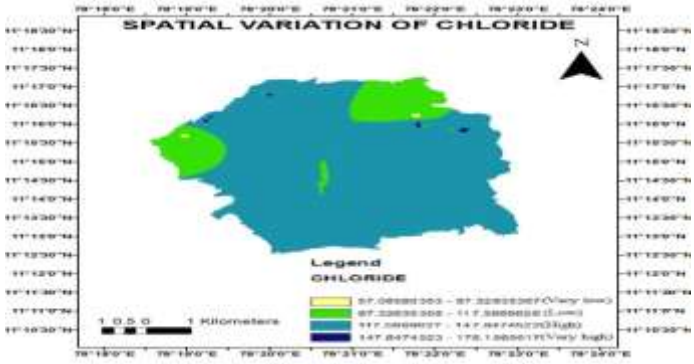
Legend
ELECTRICCONDUCTIVITY
1 0.5 0 1 Kilometers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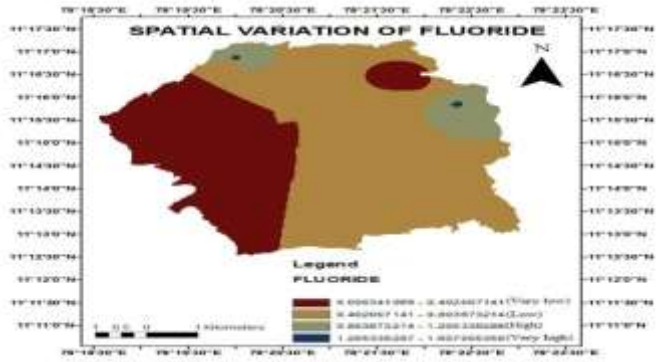
CHLORIDE
1 0.5 0 1 Kilometers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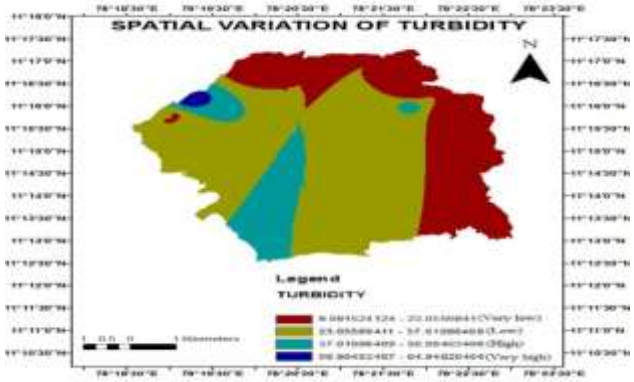
FLUORIDE


SPATIAL VARIATION OF TURBIDITY
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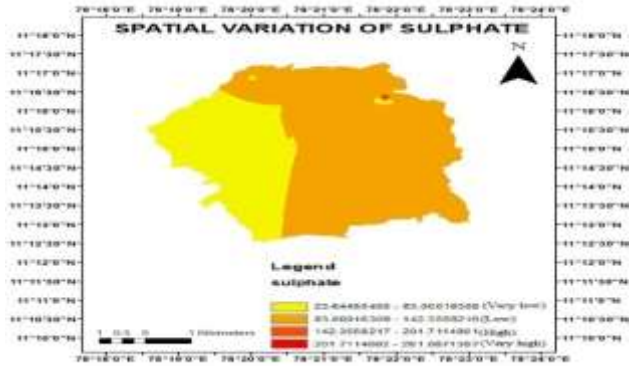
Legend
TURBIDITY


SPATIAL VARIATION OF SULPHATE
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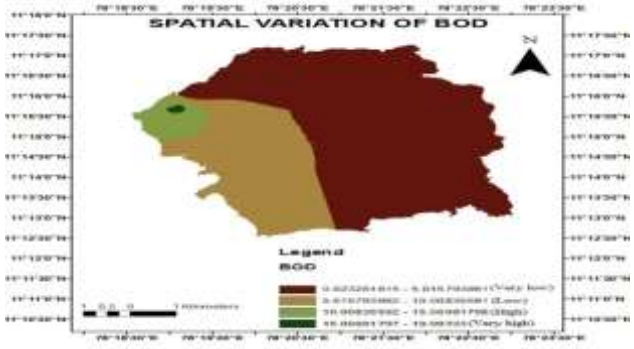
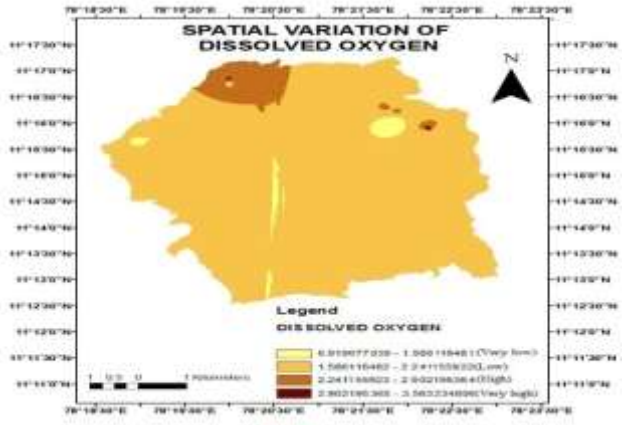
sulphate


SPATIAL VARIATION OF BOD
N
Legend
BOD



4. Comparative Conclusion

In this summary of the analysis various parameters of water such as turbidity, pH, total dissolved solids, total alkalinity, total hardness, concentration of chloride and fluoride, electrical conductivity, dissolved oxygen and sulphate values is tested in laboratory for the samples taken from Arapaleeswar temple and Agayaganga falls. In that DO, BOD, TDS, pH, and sulphate of all the samples were found within the desirable limits. It indicates surface and ground water suitability to drinking water but contains with minimum problems. Values of Total alkalinity, Total Hardness and concentrations of chloride and fluoride ion, Electrical Conductivity values of the ground and surface water samples slightly exceeded the desirable limit. It indicates if the values of samples raises, then the water will not suitable for drinking purpose in the future. So, these values have to be monitored by checking with desirable limit values of WHO and BIS.

As there is no perfect desirable limits for the values of Bio chemical Oxygen Demand & Dissolved Oxygen. So there is no problem with these parameters.Therefore due to development of Tourism in these hotspots the surface water should be checked periodically to avoid health problems in the future.

4.5 Recommendations

- Improper disposal of solid waste contributes to ground water contamination and environmental degradation. So that design needed for disposing the solid waste.
- Sanitation facilities in both the water falls must improve.
- Waste water collection is need in future.
- Most of the places untreated water is to be supplied. Even thoughno problem now, but in future it effect the environment.
- The water supply system needs proper management. So that wastage of pipes may be avoided.
- The proper water management will help in continuous and adequate supply of water in future.

5. Conclusion

The study revealed the Study of the impact of anthropogenic activities on Water quality in kollihills using GIS and its social consequences. With respect to quality, despite the samples meeting the BIS standards, there were also samples with presence of chlorides.

Results of semi structured and key informant interviews enunciated that mismanagement coupled with improper maintenance owing to disowning the system.Therefore the hotspots should be completely inspected by the higher authority and the areas should be kept clean by taking serious actions in order to avoid the poor quality of water from the clean water.Even though at present the condition is not very bad but if the same continues in future, the groundwater source will be completely polluted due to increase in population and become unfit for drinking and other purposes.From the analysed water quality parameters, water contamination for the Arapeeswar temple is more while comparing with Agayaganga falls which has beendetermined using GIS.

Because of more contamination the quality of water becomes poor. Therefore while people use this water, it will cause diseases and problems to their health.

The Water quality parameter determined by conducting physico-chemical test in the laboratory clearly shows that Chloride, Sulphate, Hardness and Alkalinity values are exceeding the desirable limits.Spatially interpolated water quality map was obtained using ArcGIS which would be helpful in viewing the spatial variation along the study area. Spatially varying water quality map for both surface and groundwater samples were separately determined using ArcGIS.

References

1. Annamali (2009), 'Rapid assessment of survey of Kodikanal Lake', *Indian water portal*, accessed on 2 August 2014, <http://www.indiawaterportal.org/>
2. Barkin B. (2006), 'Ecotourism A Tool for Sustainable Development', Equations Dessiers, pp.122-127, accessed on 4 August2014,<http://www.planeta.com/planeta/96/0596monarch.html>
3. Butler R.W. (1990), 'Alternative Tourism: Pious Hope or Trojan', *Journal of Travel Research*, Volume 28(3), pp. 40-45.
4. Deng J., Qiang S., Walker G.J and Zhang Y. (2003), 'Assessment on Perception of Visitors Environmental Impacts of Nature Tourism: A Case Study of Zhangjiajie National Forest Park, China', *Journal of Sustainable Tourism,* Volume 11 (6), pp.529-548.
5. FarsariYianna and Prastacos Poulicos (ananimous) 'GIS contribution for the evaluation and planning of tourism: A Sustainable tourism perspective', *Jobs and economic growth*, accessed on 15 October 2014, <http://www. Gipsynoise>
6. Frick M., 'Impacts of tourism development in Saint Vlas, Bulgaria', MA Tourism Thesis, Environment and Development, King's College London, September 2010.
7. Garrod B. (2003), 'Local Participation in the Planning and Management of Ecotourism: A Revised Model Approach', *Journal of Ecotourism*, Volume 2(1), pp.33-53.
8. Lokman Hussin Md, Sultana Kamrunahida and Iqbal Hossain (2014), 'Water quality status of recreational spots in Chittagong City', *Journal of Water Resources and Ocean Science,* Volume 3(3), pp. 38-44.
9. McNeely J. and Kuenzi C. (2008), 'Nature-Based Tourism', *Global Risk Governance*, Volume 1(1), pp. 155-178.
10. NagarajSitaram (2014), **'**Impact of Urbanisation on water quality parameters – a case study of ashtamudi lake kollam', *IJRET: International Journal of Research in Engineering and Technology,* Volume 03, Special Issue: 06.
11. Narasimmaraj R., 'Carrying capacity and community participation for sustainable nature-based tourism in Ooty an evaluative study', Ph.D Thesis, department of tourism studies, school of management, Pondicherry University, 2012.
12. Raja P., Muhindhar Amarnath A., Elangovan R. and Palanivel M. (2008), 'Evaluation of physical and chemical parameters of river Kaveri, Tiruchirappalli, Tamil Nadu, India', *Journal of Environmental Biology,* pp. 765-768.
13. Rajkumar N., Subramani T. and Elango L. (2010), 'Ground water contamination due to Municipal solid waste disposal-GIS based study in Erode city', *International journal of environmental sciences*, Volume 1.

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