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Assessment of Impact of Tourism Development on Water Quality in Kollihills by Using GIS

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***Abstract* - The present study on assessment of impact of tourism development on water quality in kollihills using GIS emerged with the objective of assessing the current status of water supply services and its impact in hotspots, identifying the intervention done in the service delivery. And finally armed all the existing policies to manage tourism development in Kollihills. The study was done in six hotspots identified as Agayaganga, Arapaleeswar temple, Botanical garden, Boat house, Masiaruvi and Semmedu in Kollihills, Namakkal district. Then using purposive sampling technique 50 samples were collected. To understand the current status of water quality an analysis on physical, chemical and biological parameters was done to determine the different levels of contamination using Bureau of Indian standards. The sources of water facilities in Kollihills was evaluated on the basis of adequacy, accessibility and reliability using Service Level Bench mark standards. Participatory Rural Appraisal tools such as Transect walk, Key Informant Interviewand Time trend was used to study the sources of water supply services, the gross and net utility, disposal and treatment.GIS is used as the tool for predicting Tourism Resource Inventories, Identifying most suitable locations for tourism development, Measuring tourism Impacts, Analysing relationships associated with resource use.Then policies were collected from the planning commission. Apart from the above the remedial measures on the people was analysed. Based on the results a detailed measures were given.**

***Keywords:* Sampling technique, physio-chemical parameters, Transect walk,Key informant interview.**

I.INTRODUCTION

Tourism has been one of the fastest growing industries since it was formally recognized at the global level 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, the environmental 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. Nevertheless, the positive impact of tourism industry provide the opportunity for income, employment, regional development,cultural understanding between host and guest etc, where as the negative impacts create various ecological and environmental hazard and socio-cultural erosion. 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 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. Tourism though a high revenue recreational activity due to dwindling fund and unregulated governance in the maintenance of hot spots, the profits to the sector is shrinking in the recent days. So to give face lift to tourism it is imperative to manage water resources which serve as means to sustain tourism in future. 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 quanlity 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.

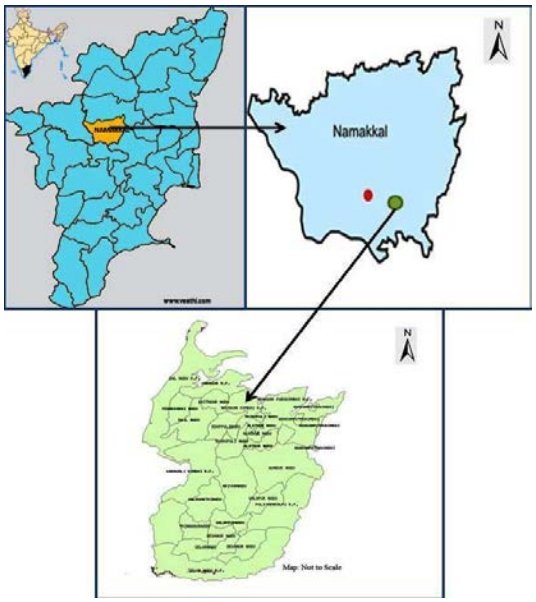
Transect walk is a tool used to describe the location and distribution of resources, the landscape and main land uses.

It further allows the participants to identify constraints and opportunities with specific reference to locations and particular ecosystems situated along the transect.Through Transect Walk the social and resource maps are to be prepared with the help of key informant. Using GIS tool the resources are mapped.

Key Informant are interviews undergone with specially selected individuals who have long been experiencing in a certain community or specialised knowledge or skills in a certain topic. One should be aware of possible biases of the persons interviewed and the information should be crosschecked with information from other sources. 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 collected informations from the key informants are tabulated clearly and the efficiency, adequacy are calculated.

II.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 Longitud 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.As per Census 2001, the population of Kollihills is 36,852. The selected hotspots are Agayaganga, Arapaleeswar temple, Botanical garden, Boat house, Masiaruvi and Semmedu. 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. Botanical Garden is a picnic spot that has a park, rose garden, eco-friendly cottages, Herbal Park and a view point.The Boat House, situated in Vasalurpatty on the Solakkadu-Thinnanurpatty Road, is a picnic spot where boating can be done. Masi falls is 12 km away from Semmedu, which is easily reachable.Masi falls is the second important water fall in this hills. Here also visited population is around 4 lakhs per year.Semmedu is the head quarters for the Kollihills. Here also visited population is around 5 lakhs and above throught the year.



(Source: national informatics centre, 2014)
Fig.1 Index Map Of Kollihills

III.MATERIALS AND METHODOLGY

Water samples were collected from six hotspots.Thesampls 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 detoriated due to Tourism development.Electrical Conductivity(EC) and pH were measured electromagnetically in the field using digital meters immediately after sampling.

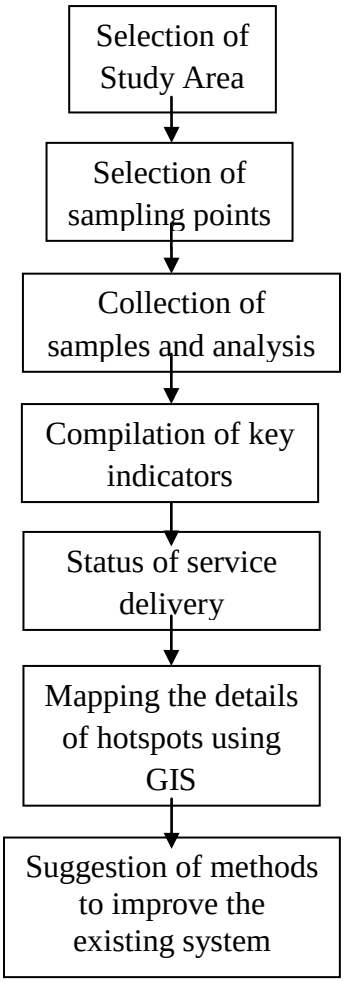


Fig.2 Framework of Methodology

IV. 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 300mg/l which exceed the BIS standard limits.Total dissolved solids present is 61ppm which does not exceed the standards.The Electrochemical, Sodium, Calcium, Magnesium, Flouride 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 excedd 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.In Semmedu where syntax tank is taken as the sample. Here, Chloride content is 200mg/l,Total dissolved solids present is 151ppm, Sodium found is 83.4mg/l, Calcium present is 5mg/l, Magnesium present is 7.8mg/l, Turbidity is 2.72NTU where all the paramaters does not exceed the Bureau of Indian standard values.

In chloride test,the samples taken from inlet, outlet and centre of the boat house exceeds the permissible limits ie, in the inlet of boat house,chloride = 300mg/l,in the centre of boat house,chloride = 450mg/l and in the outlet,chloride = 350mg/l .In turbidity test, the inlet and outlet of the boat house also exceeds the permissible limits of Bureau of Indian standards ie,. Therefore the quality of water decreases in this area.

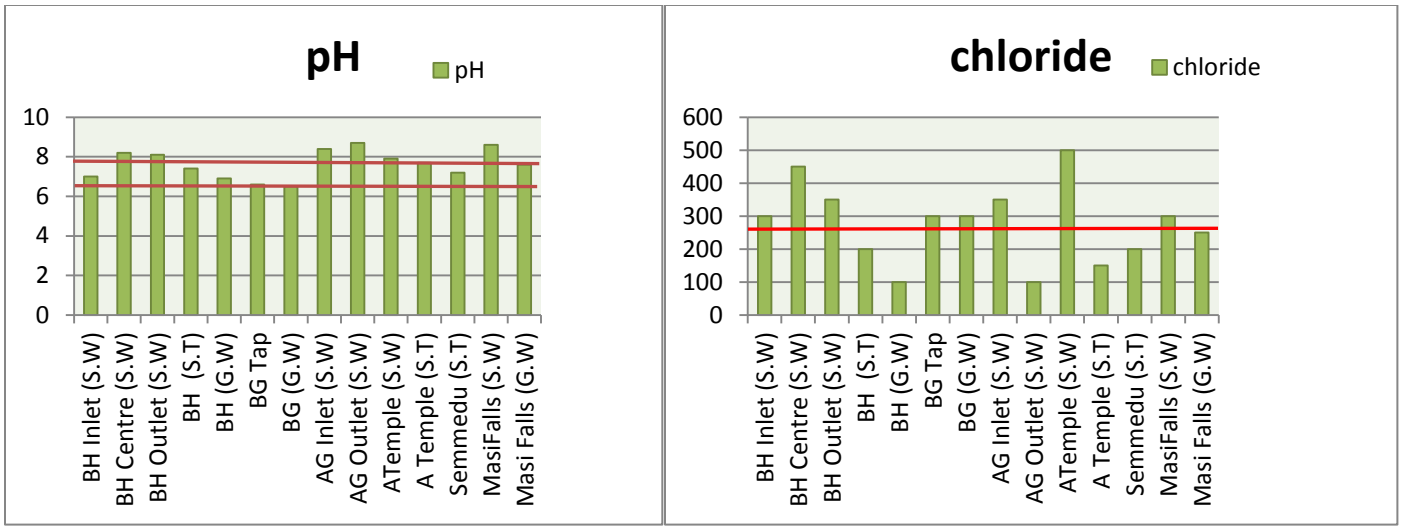


Fig. 3 Graphical representation of pH and chloride

TABLE I SAMPLE LOCATION AND CHLORIDE CONTENTS

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
Boathouse Inlet (S.W)	300*	61	124	101.2	3
Boathouse Centre (S.W)	450*	56	115	63.9	4
Boathouse Outlet (S.W)	350*	52	105	18.3	3
Boathouse (S.T)	200	52	103	73.8	5.5
Boathouse (G.W)	100	63	124	95.8	2
Botanical Garden Tap	300*	27	54	83.4	4.5
Botanical Garden (G.W)	300*	25	51	80.1	4
Agayaganga Inlet (S.W)	350*	47	93	36.9	3
Agayaganga Outlet (S.W)	100	60	95	12.3	4.5
Arapaleeswar Temple (S.W)	500*	48	93	79.9	3
Arapaleeswar Temple (S.T)	150	74	148	86.8	5.5
Semmedu (S.T)	200	151	298	83.4	5
MasiFalls (S.W)	300*	24	53	89.7	4
MasiFalls (G.W)	250	14	58	100.8	7

TABLE II SAMPLE LOCATION AND MAGNESIUM CONTENTS

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
Boathouse Inlet (S.W)	2.4	7.0	8.6*	1.2	0.1
Boathouse Centre (S.W)	4.8	8.2	2.85	1.2	0.4

Boathouse Outlet (S.W)	4.2	8.1	3.19*	1.3	0.28
Boathouse (S.T)	4.8	7.4	1.86	1.1	0.4
Boathouse (G.W)	3.6	6.9	1.3	1.2	0.28
Botanical Garden Tap	2.4	6.6	2.43	1.3	0
Botanical Garden (G.W)	2.5	6.5	2.94	1.3	0
Agayaganga Inlet (S.W)	4.8	8.4	5.58*	1.4	0.6
Agayaganga Outlet (S.W)	3.6	8.7*	4.5*	1.5	0.14
Arapaleeswar Temple (S.W)	4.8	7.9	3.78*	1.3	0.28
Arapaleeswar Temple (S.T)	6	7.7	2.72	1.2	0
Semmedu (S.T)	7.8	7.2	2.72	1.1	0
MasiFalls (S.W)	3.6	8.6*	2.71	1.3	0.16
MasiFalls (G.W)	9	7.6	2.53	1.3	0.3

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

Continuity of water supply is obtained in terms of efficiency of the functioning taps that are capable of supplying continuous water supply. The result shows that in two waterfalls no water pipe connection, other places 60% to 75% of efficiency. Because of the improper maintenance the efficiency is less. To summaries, although there is available quantum of water for supply, 100% continuous supply is not ensured in any hotspot, which creates non availability of water during the time of requirement which can also termed as Pseudo-inadequacy.

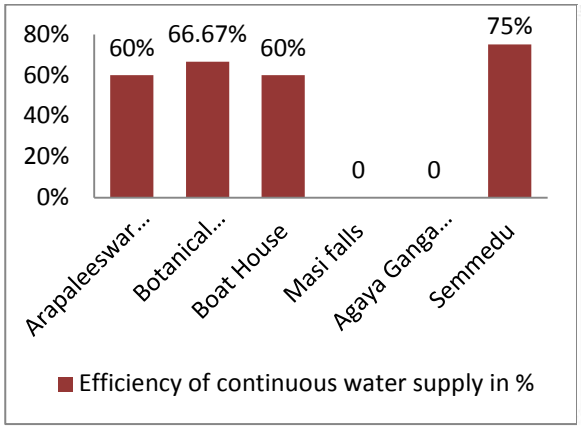


Fig.4 Continuity of water supply

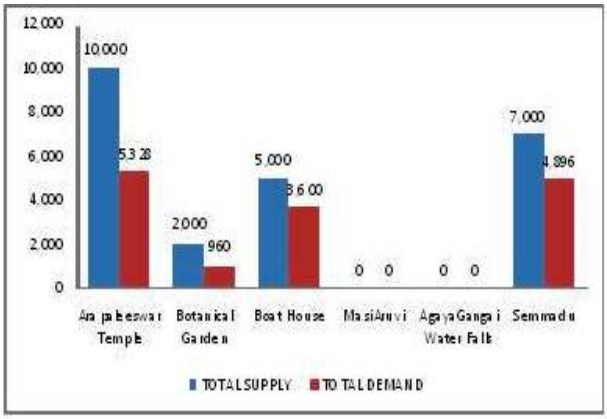
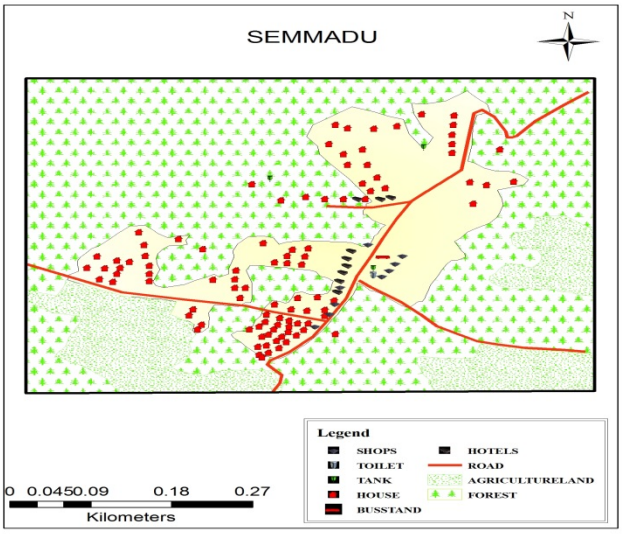
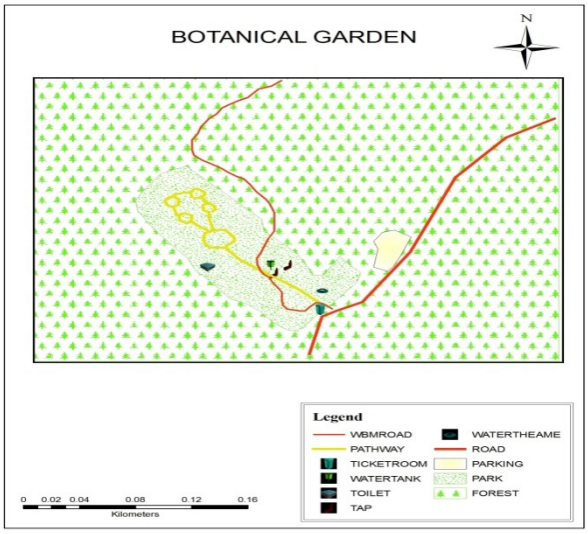
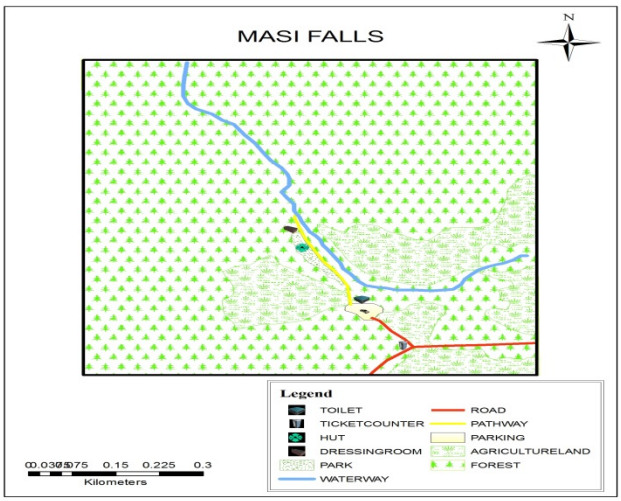
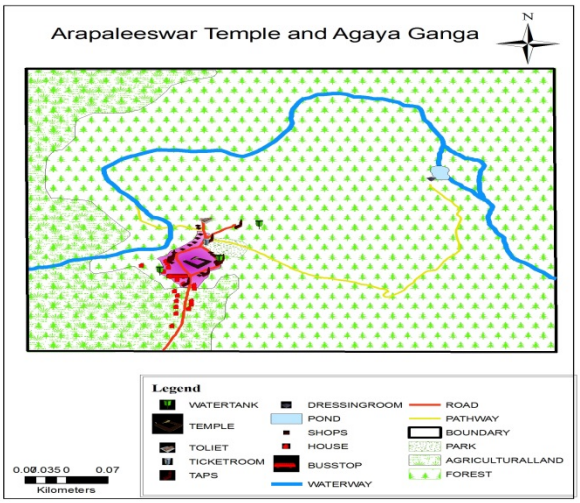


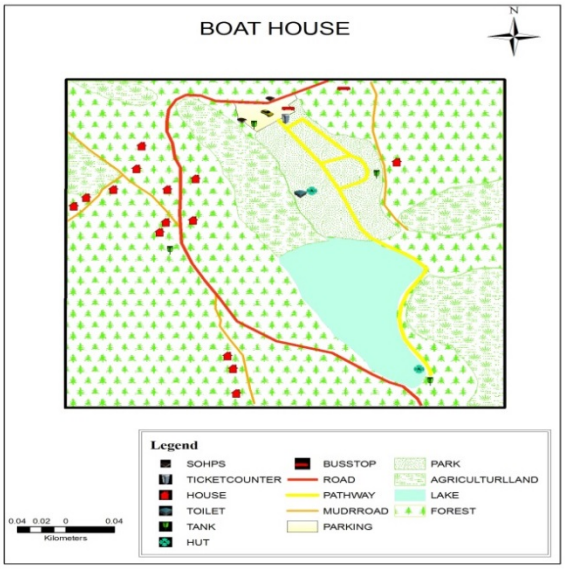
Fig. 5 Adequacy of water supply











V.CONCLUSION

The study revealed the current status of water supply services and current polices in the Kollihills. The findings exhibit a state of pseudo adequacy, to comprehend; adequate water supply however reliable supply has been interrupted. With respect to quality, despite the samples meeting the BIS standards, there were also samples with presence of chlorides. Hence, ground water and surface water must be used for drinking only after proper treatments viz., softening and defluoridation due to the development of tourism.The solid waste is dumped near the forest land because it is too low. In future it effects the environment so proper collection system must implement for maintaining the Eco-tourism. Drinking water pollution in the studied area should be controlled by the proper environment management plan to maintain proper health conditions of people.All the above results confirm that the groundwater quality is not up to the mark and is slowly degrading. Even though at present the condition is not very bad but if the same continues in future, the groundwater source will be completely polluted and become unfit for drinking and other purposes.

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