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RESEARCH ARTICLE

WATER TOURISM A NEW STRATEGY: ASSESSMENT OF WATER QUALITY, LANDSCAPE AND AESTHETIC VALUE OF SELECTED TOURIST DESTINATIONS IN INGIRIYA, SRI LANKA

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ABSTRACT

Though tourist destinations in Ingiria are popular among domestic tourists, lack of well-managed tourism strategy has exploited the landscape. Water and landscape are as precious resources have the potentiality to implement an integrated regional alternative tourism development plan for Ingiriya. Identifying water tourism as a strategy to manage water-based ecosystems sustainably,this study assesses the physical-chemical quality of water and landscape quality and their suitability in selected destinations for water tourism. The study mainly depends on the primary data. Using various data collection methods primary data were obtained while Leopold method, Environment Area Analysis used to analyze primary data. Water samples were collected randomly in order to assess the water quality for tourism activities. Among six destinations four were selected while Nachchimale selected as a suitable destination for water tourism. Using Nachchimale as the core destination of the water tourism a regional water tourism zone can be implemented in Ingiriya. The study has identified a few constraints where government intervention is highly required to implement water tourism.

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INTRODUCTION

Tourism is one of the fastest growing industries in developed as well as many more developing countries. The tourism phenomenon is an extraordinary occurrence, which developed historically from the activity of the privileged few to a mass cultural lifestyle (Hudman and Hawlins, 1989). This phenomenon has become accepted as a basic need of the modern world. Mobilization is the main crux of the tourism activities, without this experience there would be no tourism. Tourism is synthesized from mass tourism to alternative tourism. Alternative tourism is referred to as 'special interest tourism' or in other words 'responsible tourism' and is usually taken to mean alternative tourism which gives emphasis on the contact and understanding of inhabitants' way of living and the local natural environment (Smith and Eadington, 1992). Mieczkowski (1995) identified few other specific forms of alternative tourism such forms as agro-tourism, adventure, cultural or heritage, scientific, rural along with ranch and farm subsets. The salient characteristics of alternative tourism are minimal environmental and social impacts, help to develop other sectors of the local economy and foster the involvement of local people as it is widely supported as being essential for sustainability. Tourism in Sri Lanka has a long history (Miththapala, 2010). However, the country is said to have officially entered the tourism industry in the 1960s -1970s (Ranasinghe and Deshapariya, 2010). Currently, typologies of tourism are also growing in the country. The alternative tourism has identified as a tool for regional development in the country. Past governments of the country have identified few places for tourism development located in Kalutara district. Ingiriya was among them. However, Nachchimale, Madakada Aranya senasanaya, Paraithota, Dombagskanda forest reserve (Bodhinagala Aranya senasanaya), Bodhinagala bird reserve, Horakele reserve, Kura uda Ella and Mawak Oya are already popular destinations among domestic tourists.

Tourism and water: Water offers a very wide range of opportunities for recreational and tourist activities. The dual understanding of water 1) as a precious resource 2) as an attraction has created a good relationship between tourism and water. Grossling *et al* (2015), Cole and Ferguson (2015) and LaVanchy (2017) clearly pointed out how this relationship between water and tourism end up with sustainability. Water consider as valuable as well as a scarce resource, many studies have focused on identifying practical and business initiatives through which water-based tourism can be developed without jeopardizing the quality and availability of water resources. Different types of bodies of water can sustain several types of water tourism. Such as beach tourism, river tourism, tourism of reservoirs, lakes and natural pools and tourism of thermal waters (Fernandz *et al*., 2018). The history mentioned the use of thermal waters for bathing purposes where thermal tourism was the first gave significance rise for water tourism which

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extended today up to medical tourism or spa tourism in some destinations. However, the emergence of water tourism goes back to the development of vehicles suitable for water transport, as well as man's various leisure time activities done in the vicinity of a water surface (Banhidi, 2013). By the activity water tourism again identified as water adventure tourism, extreme water sports tourism, angling tourism and kayaking, canoeing, boating and sailing. Sri Lanka highly experienced nautical tourism as beach tourism is one of the main sector of mass tourism in the country. Although there are a few destinations related to water tourism, such as Kithulgala white water rafting, camping and boat riding in Kala Oya, other destinations are not well documented. Ingiriya is also rich in natural water bodies where the Kalu River flows in the area. Though there are a number of studies carried out assessing the tourism impacts on the environment, the importance of water bodies and their relationship with tourism has also not documented well. Though there is no well-planned and managed strategy or framework to implement or maintain tourism in Ingiriya, most of the destinations are popular among domestic tourists and some destinations have been degraded due to unplanned and mismanaged utilization of natural landscapes in Ingiriya. Water-related tourism activities, in particular, bathing has taken place for many years without concerning the quality of water. Since some of the water bodies and adjacent areas have degraded it is important to assess the water quality in order to decide the suitability of these destinations for water tourism in future, thus, prepare a sustainable tourism management plan for Ingiriya.

Objectives: The main objective of the study is to assess the physical-chemical quality of water and landscape quality and their suitability in currently used tourist destinations for water tourism, as a strategy for conservation, while utilizing the ecosystem responsibly. In order to fulfil the main objective of the study following sub-objectives were also focused;

- ✓ Identify the most appropriate destinations for tourism in Ingiriya
- ✓ Asses the physical-chemical quality of water as it is an outstanding indicator of human utilization of ecosystems
- ✓ Assess the appropriateness of selected destinations for water tourism in future

MATERIALS AND METHODS

Study area: Ingiriya is located 24km from the coast and extends further approximately 9km inland within the western province of Sri Lanka (Fig.1) between 6°44'38''N and 80°10'20''E coordinates. Between the administrative boundaries of Western province and Sabaragamuwa province, Ingiriya town has created as a nucleated settlement demonstrating many patterns of settlements. The population has reached 55,133 in the year 2015 (Ingiriya, 2017). The topography and the drainage pattern of the area have influenced for the attractive landscape naturally created in Ingiriya. The river Kalu is the source of this drainage pattern (Fig. 2), which overflow during the south-western monsoons. There are several large streams flow into the river Kalu. The largest of them is Nambapana stream in the east. Another is Mawak Oya, starts in the north and flows along the west side before meet the Kalu river in the South. The metric map of the area clearly shows the rolling terrain and monadnocks or isolated hills to the eastward of Ingiriya.

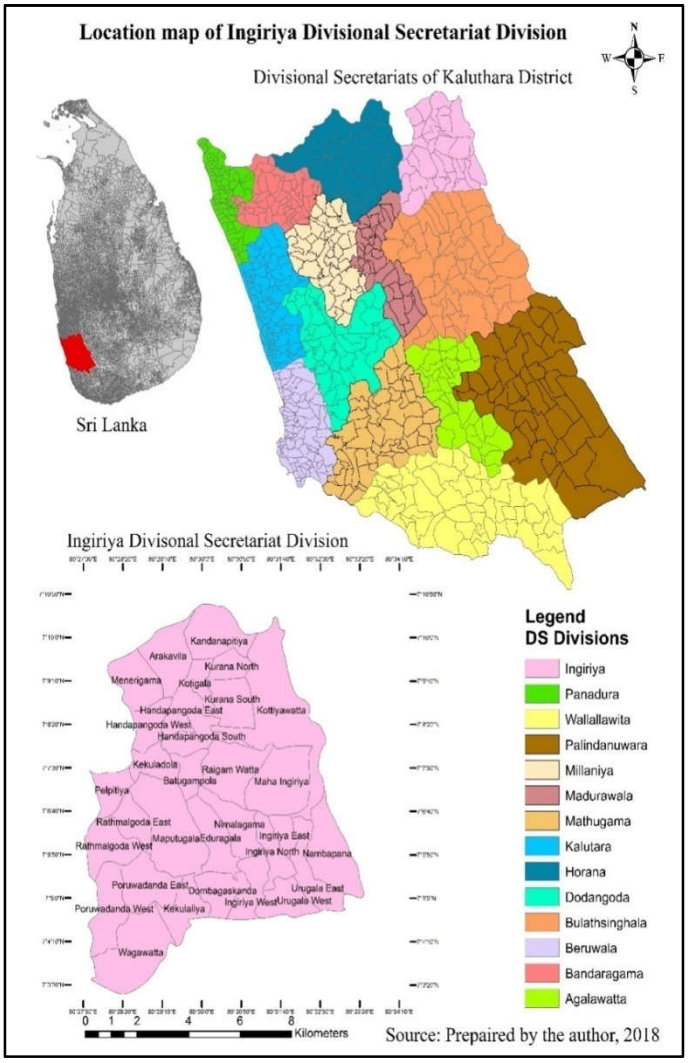
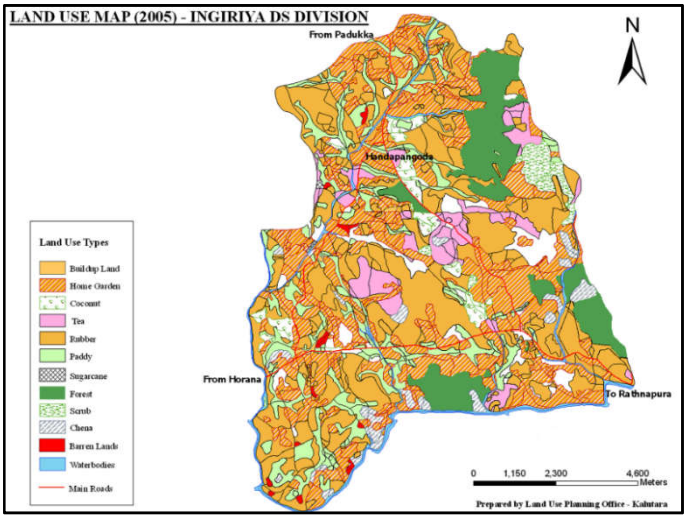


Figure 1. Location of Ingiriya, Sri Lanka

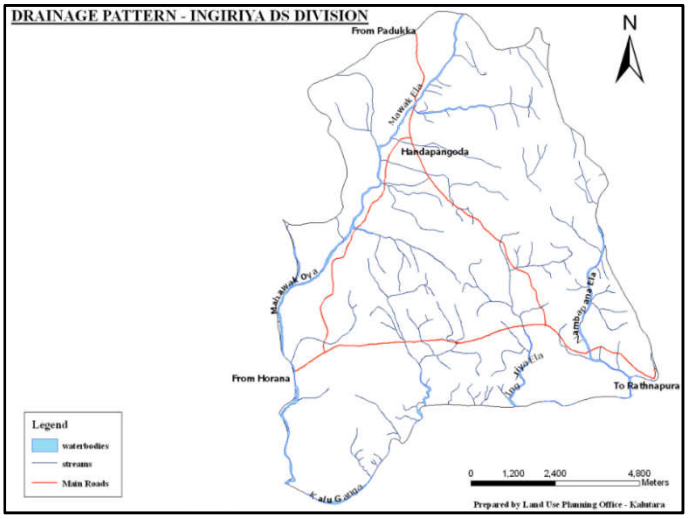
The highest peak is Madakada Giranchi mountain, 335m high. Edurugla mountain is also over 2010m high. The scattered mountains in the eastern part over 150m high. The land use of the study area has also added extra value for alternative tourism. Paddy, tea, rubber and coconut cultivation cover approximately 55 per cent of the area while forests, scrublands and water bodies distributed 12 per cent of the land area. Another 25 per cent covers home gardens in Ingiriya (Fig.3). This land use has created a serene environment for various types of alternative tourism.

Data collection: The study mainly based on primary data obtained via applying various data collection methods. A total of six popular destinations were selected as study areas. Selection of study areas was based on the existing information. The suitability of destinations assessed having comprehensive and direct field observations. Each study area; Nachchimale, Pareithotha, Bodhinagala, Kura uda Ella, Horakele reserve and Mawak Oya was studied for physical factors, biological factors and quality of water used to find out the most suitable destination for water tourism. Qualitative data was based on personal perception while quantitative data obtained by measuring. Randomly water samples were collected from each study area; Nachchimale, Pareithota, Bodhinagala and Mawak Oya to study the water quality for water tourism activities. The physical-chemical parameters used to analyse water quality are limited to basic parameters and identified this as a limitation of the study.



Source: Ingiriya, 2017

Figure 2. Landuse of Ingiriya, Sri Lanka



Source: Ingiriya, 2017

Figure 3. Drainage pattern in Ingirya, Sri Lanka

Table 1. Water parameters

Physical parameter	Method	Equipment	Unit
pH	Potentionmetric	EUTECH pH610	
EC(µs)	Electrical conduct metric	HANNAHI Conductivity meter	µs/cm
Turbidity (NTU)	Nephelometric method	Turbidity meter	NTU (Nephelometric Turbidity Units), max
BOD	Titrimetric 5210- 5 day BOD test		Mg/l,max
COD	Closed reflux method		Mg/l,max

Data analysis: Field survey data analyzed and ranked according to the 'Leopold method' where the rank range from 1 to 5. This methodology is based on parameters of easy identification and measurement and provides clear, understandable, quantitative and semi-quantitative results. This can be applied to any aspect of the landscape or the environment that the researcher may consider pertinent and useful. There are 46 factors (Table2) to be considered when evaluating aesthetic and landscape value for Leopold method. All field data transform into quantitative data and calculate the total and the mean value of data and ranked them. The first three areas identified as the most suitable destinations for water tourism. Collected water samples were analysed based on a few parameters such as EC (Electric Conductivity), pH, turbidity, BOD (Biological Oxygen Demand) and COD (Chemical Oxygen Demand). Different appropriate methods adopted to check the water quality by using various equipment (Table1). Environmental Area Analysis (EAA) has also carried out to identify the environmental significance of selected destinations identified via primary data analysis. This analysis is a combination of primary and secondary data related to the natural environment. However, the status and quantity of natural values were valued during Leopold analysis. The Arc GIS 10.1 version used to prepare study area map while analyzed results illustrate as tables and graphs.

RESULTS

Suitable destinations: According to the Leopold method selected destinations were analysed (Table2 and 3). Based on the results the destinations were ranked and the first four destinations were identified as the most appropriate destinations for water tourism in Ingiriya (Table4). The highest average calculated in Nachchimale destination and this is the destination that should be prioritized when implementing water tourism. It is required a descriptive environment examination when implementing water tourism through an environment and sustainable approach. Therefore, natural environment characteristics, status and quantity of natural attractions and environment area analysis have also carried out. Natural environment characteristics are discussed in the Environment Area Analysis. Status and quantity of natural attractions assessed through the Leopold analysis.

Environmental Area analysis: Nachchimale or the Madakada forest is popular due to the adjacent hermitage, Nambapana creek and forest reserve. Forest reserve supply a diverse habitat for various medicinal plant species and six native plant species along with ten orchid species and fern species. Rare butterfly and fish species also reported in the area. *Puntius nigrofasciatus* and *Puntius cumingli*, are threatened fish species in the area. Native species such as *Otocryptis wieymanni*, *Lyriocephalus scutatus* and *Lankascinicus fallax* can be seen while *Galloperdix bicalcata*, *Gallus lafayettii*, *Psittacula calthropae*, *Loriculus beryllinus*, *Pycnonotus melanicterus*, *Phodilus badius* and *Centropus chlororhynchos* are the other bird species observed in the area. This destination is located at the proximity of Pareithota, Mawak Oya and Bodhinagala. Pareithota or Nambapana creek located close to the Madakada forest. This is popular among domestic tourists as a place for bathing which is a naturally created shallow pool. White-morph Indian Paradise-flycatcher, Indian Pitta (*Pitta brachyuran*), Indian-paradise flycatcher are particular migrating bird species in the area. Bee honey is easy to find where tourism accommodation and food and beverage facilities also existed. Mawak Oya is a popular location for bathing and currently, a large number of domestic tourists arrive into the area. 'Oru'riding is one specific tourist activity that has facilitated by tourist hotels in the area. Bodhinagala or the Dombagaskanda forest reserve is a small habitat consisted of a total of 178 species of vertebrate fauna and 82 species of invertebrate fauna. Of these species 38 are endemic whilst 10 are nationally threatened. 25 species of fishes which included the endangered and endemic *Lepidocephalichthys jonklaasi*, 17 species of amphibians inclusive of *Nannophrys ceylonensis*

Table 2. Results of the destinations according to 46 factors of the Leopold method

Number	Descriptive classification	Nachchimale	Pareithota	Bodhinagala	Kura uda Ella	Horakale reserve	Mawak Oya
Physical factors							
1	River width at low flow (ft.)	5	5	4	4	-	5
2	Depth at low flow (ft.)	5	5	5	5	-	5
3	Velocity at low flow(feet per seconds)	2	1	1	1	-	3
4	Bank full depth (ft.)	4	3	2	2	-	4
5	Flow variability	5	4	4	1	-	2
6	River pattern	5	4	5	3	-	4
7	Height of the valley (ft.)	3	3	2	2	-	3
8	Composition of the bedload	3	4	3	4	-	2
9	Bed slope(m/m)	4	1	4	1	-	1
10	Basin area (km^2)	5	5	5	5	-	5
11	Stream order	2	2	4	3	-	1
12	Erosion of banks	1	2	1	1	-	2
13	Deposition	2	1	1	1	-	3
14	Width of valley flat	1	1	1	1	-	1
Total		47	41	42	34	-	41
Average		3.36	2.9	3	2.43	-	2.93
Biologic and water quality							
15	Water color	1	1	1	1	-	2
16	Turbidity (ppm)	1	1	1	1	-	3
17	Floating material	2	2	2	2	-	2
18	Water condition	3	5	5	4	-	4
Algae							
19	Amount	1	1	1	1	-	2
20	Type	5	5	5	5	-	4
Larger plants							
21	Amount	5	2	5	2	4	1
22	Kind	3	2	2	2	4	1
23	River fauna	5	4	5	2	-	5
24	Pollution evidence	3	2	1	1	2	1
Land flora							
25	Valley	5	5	4	2	4	5
26	Hillslope	5	5	4	2	4	5
27	Diversity	5	5	5	2	5	5
28	Condition	1	2	1	1	2	2
Total		45	42	42	28	25	42
Average		3.21	3	3	2	1.79	3
Human use and interest							
A number of occurrence of trash and litter per 100 ft. of river							
29	Metal	3	2	1	1	3	1
30	Paper	3	2	1	1	3	1
31	Other	3	2	1	1	3	1
32	Material removable	3	2	1	1	4	2
33	Artificial controls	2	1	1	2	1	2
Accessibility							
34	Individual	4	4	1	2	2	3
35	Mass use	4	4	1	3	1	3
36	Local scene	1	1	1	2	1	2
37	Vistas	1	1	1	1	1	1
38	View confinement	5	5	5	2	1	4
39	Land use	4	4	1	2	4	4
40	Utilities	4	4	3	1	1	4
41	Degree of change	4	3	1	1	2	3
42	Recovery potential	1	1	1	1	1	1
43	Urbanization	4	3	2	1	1	4
44	Special views	3	4	3	1	3	3
45	Historic features	5	1	5	1	1	1
46	Misfits	1	1	1	1	1	1
Total		55	45	31	25	34	41
Average		3.06	2.5	1.72	1.39	1.89	2.28

Source: Analyzed primary data by the researcher, 2018

and *Ichthyophis glutinosus*, 38 species of reptiles including *Lyriocephalus scutatus* and *Trimeresurus trigonocephalus*, 78 species of birds including *Centropus chlororhynchus*, 20 species of mammals including *Rhinolophus rouxii* and *Semnopithecus vetulus*. 14 species of dragonflies and 68 species of butterflies including the endangered *Discophora lepida* are visible in the forest reserve (Sudasinghe *et al*, 2012). A total of 176 plant species identified, among them 64 species are endemic. 30 orchid species and 32 fern species identified including 11 endemic orchid and 2 very rare fern species. *Dipterocarpaceae* is the prominent plant species where this forest consists of a reforested secondary forest of Pines and Albesia, marsh and swamps of the floodplain of the Kalu River and the natural forest. Maha hadaya and Kuda hadaya are two rare medicinal plants that can be seen in the forest.

Water quality of selected destinations

pH value of water bodies: pH value generally stands for the acidity or the alkalinity of water.

Table 3. Landscape and aesthetic value of selected tourist destinations

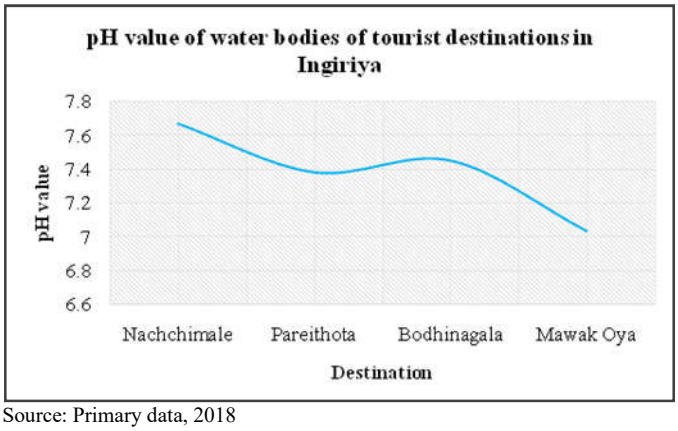
Number	Selected destinations	Physical factors	Biologic and water quality	Human use and interest	Total	Average
1	Nachchimale	3.36	3.21	3.06	9.63	3.21
2	Pareithota	2.93	3	2.5	8.43	2.81
3	Bodhinagala	3	3	1.72	7.72	2.57
4	Kura uda ella	2.43	2	1.39	5.82	1.94
5	Horakele reserve	-	1.79	1.89	3.68	1.23
6	Mawak oya	2.93	3	2.28	8.21	2.74

Source: Analyzed primary data by the researcher, 2018

Table 4. Appropriate tourist destinations in Ingiriya, Sri Lanka

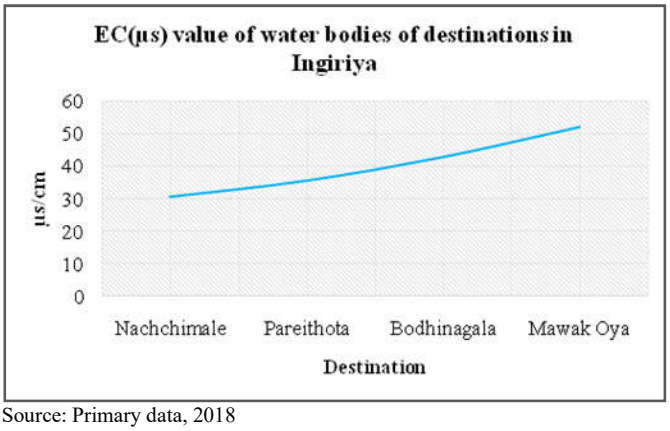
Number	Selected destination	Average	Rank
1	Nachchimale	3.21	1
2	Pareithota	2.81	2
3	Mawak Oya	2.74	3
4	Bodhinagala	2.57	4

Source: Analyzed primary data by the researcher, 2018



Source: Primary data, 2018

Figure 4. pH value of selected tourist destinations



Source: Primary data, 2018

Figure 5. EC value of water sources in selected destinations

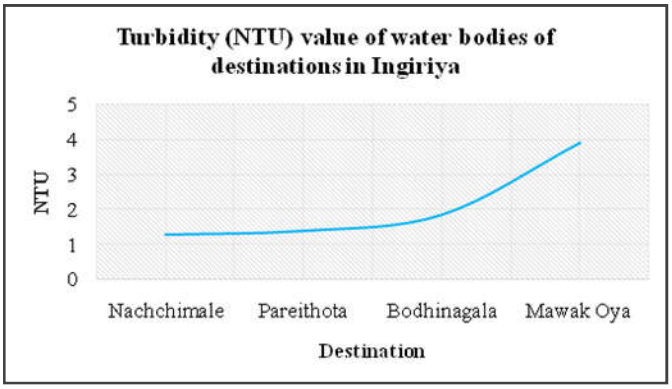
According to the Central Environmental Authority (CEA), a water source is acceptable for bathing purposes if the pH value range from 6.0 to 9.0. The highest pH value has reported in Nachchimale about 7.67 while the lowest was about 7.03 in Mawak Oya. Pareithota and Bodhinagala have reported 7.38 and 7.45 of pH values respectively (Fig.4).

Electric Conductivity (EC) of water bodies: Electrical Conductivity reflects the capacity of water to conduct electrical current and is directly related to the concentration of salts dissolved in water. High EC value identified in Mawak Oya as about 52.2µs due to sedimentation of mud with solid wastes. In contrast to pH value, Nachchimale has reported the lowest EC values as about 30.6µs. Pareithota has reported 35.6µs and Bodhinagala reported 42.9µs of EC values (Fig.5).

Turbidity of water bodies: Turbidity is a measure of the degree to which the water loses its transparency due to the suspended particulates. If the suspended particulates are high the water source is not suitable for tourism activities. However, turbidity is generally considered when the source of water is used for drinking purposes. When comparing the turbidity values of selected destinations except for Mawak Oya other destinations have reported lower values for turbidity. The highest reported from Mawak Oya is about 3.91NTU (Fig.6), however, it is also below the maximum permissible level (8NTU) according to the 1983 SLS 614 standards.

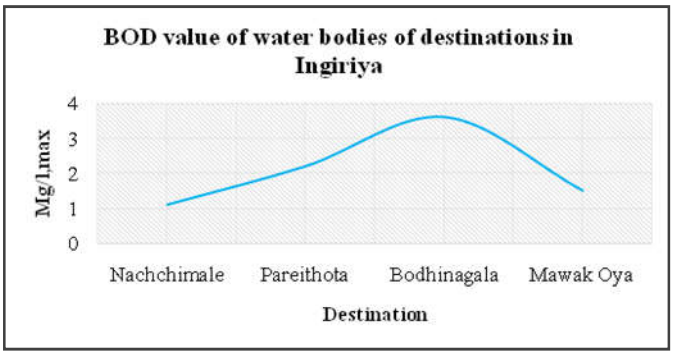
Biological Oxygen Demand (BOD) of water bodies: Biological Oxygen Demand is a measurement of the amount of Dissolved Oxygen (DO) that is used by aerobic microorganisms when decomposing organic matter in water. According to the CEA standards, the maximum permissible BOD level of water is 4Mg/l. The higher the BOD value, the greater the amount of organic matter available for oxygen-consuming bacteria. If the rate of DO consumption by bacteria exceeds the supply of DO from aquatic plants, algae photosynthesis or diffusing from air, unfavourable conditions occur. Depletion of DO causes stress on aquatic organisms, making the water body unsuitable for life. Dramatic deletion can lead to hypoxia or anoxic environments. All four destinations have reported lower BOD levels though, Bodhinagala has reported a bit higher BOD level about 3.6Mg/l compares to other three destinations due to the biological components of the forest reserve. Nachichimale, Pareithota and Mawak Oya reported 1.1Mg/l, 2.2Mg/l and 1.5Mg/l BOD levels respectively (Fig.7).

Chemical Oxygen Demand (COD) of water bodies: Chemical Oxygen Demand is a measurement of the oxygen required to oxidize soluble and particulate organic matter. Higher COD levels mean a greater amount of oxidizable organic material in the water body, which will reduce DO levels. A reduction in DO can lead to anaerobic conditions, which is deleterious to higher aquatic life forms. The COD standard given by the CEA for bathing purposes is 20Mg/l. Except for Bodhinagala, other three destinations have recorded higher COD levels due to higher accumulation of garbage, industrial wastes and artificial fertilizer. Bodhinagala has 0.0Mg/l COD level while Nachchimale, Pareithota and Mawak Oya all three destinations have 32Mg/l of COD levels (Fig.8).



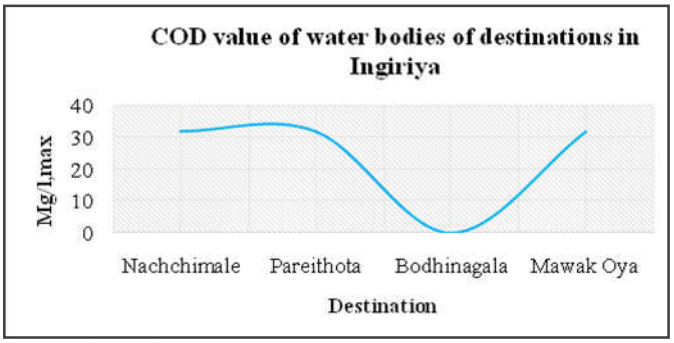
Source: Primary data, 2018

Figure 6. Turbidity of water sources in selected destinations



Source: Primary data, 2018

Figure 7. BOD level of water sources in selected destinations



Source: Primary data, 2018

Figure 8. COD levels of water sources in selected destinations

DISCUSSION

Among the selected destinations Nachchimale has received the priority when concerning the landscape and aesthetic value of Ingiriya. The environment area analysis also showed the importance of Nachchimale ecosystem for several threatened and native species. These selected destinations are already utilized by domestic tourist, thus, the surrounding environment has degraded. Since there is no mechanism to manage tourism in Ingiriya, tourists used to exploit natural resources. While obtaining benefits from the natural serene beauty tourists have forgotten their responsibility to protect the landscape. Throw away of solid waste is a great silent threat to the quality of the environment as well as the water body. A number of occurrence of trash and litter per 100feet of streams is higher in Nachchimale and Pareithota. Without proper management, illegal activities have taken place in Nachchimale, Pareithota and Mawak Oya. However, Nachchimale has reported less illegal activities when compared to Mawak Oya and Pareithota. This has led to a protest from residents as the ill-behaviour of tourists has become a threat to their lives and freedom. Though, Nachchimale identified as the best-fitted destination for water tourism, the current status of the environment must restore prior to implementing thoroughly managed water tourism regional plan. Except for Bodhinagala, environmental deterioration is significant not only in Nachchimale. Parethota and Mawak Oya have also shown signs of environmental pollution. The physical and chemical quality of water is also revealed Nachchimale is better than other destinations. However, the COD levels in Nachchimale is also far from CEA quality standards. Riverbank erosion has taken place in Mawak Oya, thus, turbidity levels have increased. These findings clearly emphasize the requirement of a clear tourism management plan and strategies. Otherwise, the water bodies will degrade more than the present status.

Since there are some water tourism activities, such as bathing, boat (Oru) riding and day time camping these activities can be upgraded by implementing water tourism as a properly managed industry in the area. The future sustainability of water tourism can be obtained by addressing the development challenges in Ingiriya. Among them, displeasure for tourism emerged due to the negative perspective of residents, an unsuitable behaviour of tourists, un-favourability of villagers, disturb hermitage, loss of lives and water scarcity. The cause of all these development challenges is lack of well-planned and managed tourism framework in Ingiriya. If the area managed properly the potentials of tourism can be utilized more than present. All the selected destinations located at the proximity of Nachchimale. Thus, there is a better opportunity to develop this area as a regional water tourism park or village. The hermitage and the calm forest environment provide secondary benefits for those who love to gain therapeutic and medical value of water. Medical tourism and spiritual tourism are the two main secondary benefits that emerged through water tourism in Ingiriya. If further expanded the area is suitable for agro-tourism too. Therefore, implementing water tourism in Ingiriya not only provide one single benefit, but a wide array of benefits are also provided to achieve sustainable utilization of these ecosystems. Looking into the economic value of the destinations government intervention is required to plan the area properly for water tourism. The infrastructure facilities and tourism-based regional development are highly required in order to achieve the utmost benefit of water tourism. Tangible and intangible values of tourism can only be obtained by creating a direct inter-relationship between tourism and water. Ingiriya as a destination of water tourism has the potentiality to provide a multidimensional experience, emphasizing the beauty of the landscape, the relaxation provides, hypnotic sounds in there and irreplaceable value to achieving balance in and sustainability to local tourism while transforming Ingiriya as a destination for both domestic and foreign tourists. The significance of water tourism has also thoroughly expressed by the study carried out in Spain (Fernandez *et al.*, 2018) also illustrate the possibility of ecosystem conservation through water tourism.

Conclusion

Beyond traditional tourism, Ingiriya has the potential to revitalize tourism by implementing a well-planned water tourism framework with other requirements. The sustainability of the present resources only can be maintained by transforming Ingiriya into a destination of water tourism as water and landscape are the basic elements that can make an interrelationship between various types of alternative tourism.

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