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Site Suitability Analysis for Ecotourism Development at the Kirala Kele Partial-Nature-Based Wetland of Southern Sri Lanka

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Abstract

Wetland resources form an integral part of the environment and their management must be pursued in the context of an interaction between conservation and the national development strategies**.** Sri Lanka has a tremendous partial nature based wetland resources that have a great potential for further development in Southern Asia. In this study a literature based spatial model is developed to explain the potential of a partial-nature-based wetland to be developed as an ecotourism site. Analytic Hierarchy Process (AHP) model is used to analyze the site suitability for ecotourism development of the partial-nature-based wetland. Six integrated criteria; biodiversity, water resources, terrain, land use and land cover, road network and settlements are identified. Several evaluating indicators which are based on literature survey, experts' opinions, questionnaire survey from households, and field excursions are used for the preparation of site suitability map for ecotourism development. Classification of criteria and analysis of indicators are employed using satellite remote sensing and GIS.

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This study had identified four suitable sites of high, moderate, marginal and low for the ecotourism development. The central part of the study area is more sensitive and highly suitable for ecotourism with high biodiversity and water resources. Eastern and southern parts of the wetlands are also found as prominent for ecotourism activities. Since the Kirala Kele wetland can be part of a tourism travel network together with surrounding destinations, it has great potential to be developed as an ecotourism site.

Keywords: Ecotourism; Criteria; Remote sensing; Site suitability; wetland.

I. Introduction

Wetland visiting natural areas with the ecotourism is a multi-disciplinary field which comprises of natural and cultural environment. Ecotourism may involves objectives of learning, studying or participating in activities that do not harm the environment; whilst protecting and empowering local communities socially and economically [1, 2, 3, 4, 5, 6, 7, 8] The International Union for Conservation of Nature (IUCN) and The International Ecotourism Society (TIES) both had made statement that ecotourism activities can be implemented in the natural environment. Nevertheless, Nelson in 2004 added that man-made areas can also be created for the purpose of ecotourism after resilience of the natural environment. Proper management and a conservation plan of the ecotourism can enhance the socioeconomic and eco-friendly environment of the local community. This provides local economic benefits to the host country such as, employment opportunities, infrastructural improvement, rural and urban productions and natural resource for tourism activities. Ecotourism brings closer to rural local market due to low cost mechanisms [11] and can provide foreign exchange and economic rewards for the preservation of natural systems and socioeconomic development of coastal wetlands.

Natural and partially natural environment can be considered for the development of ecotourism, if the particular areas have sufficient requirement for that development [12, 13]. In southern Sri Lanka, there are some potential resources of coastal wetlands that can be useful for the ecotourism development. Partial-nature-based wetlands are areas characterized by a high percentage of artificial environment, which are saturated with water, either permanently or seasonally, that determines the nature of soil development and the types of animals and plant communities in the soil [14]. Concentration of partial-nature-based wetland has the ability to produce a large amount of resources for the development of ecotourism. Humans are part of the natural world, just like all other living things and therefore, human behavior contributes to the natural evolution of all kinds of living things. So, humans are parts of the natural processes. As a result, they are literally unable to behave unnaturally. So these natural and unnatural types of ecotourism include nature based environment and culture based environment.

The Kirala Kele wetland enables a rich tourism potential with attractiveness, with various activities, boating, fishing, camping, bird watching, nature photography, and picnicking, visiting traditional villages, visiting traditional farming, as a solitude and a research center [15, 08]. Thus, the main objective of this study was to identify and examine the suitability to develop an ecotourism site in the partial nature based wetlands along the southern coastal belt in Sri Lanka.

2. Study area

The Kirala Kele revering partial-nature- based wetland composed with sub ecosystems in a narrow zone next to Nilwala River. It is a coastal wetland located near Matara town area in the Southern province of Sri Lanka. It was evolved as a back swamp behind the Nilwala River in the right bank of the basin and then it had changed as a partial nature based wetland as a consequence of inappropriate changes in the physical properties of water and soil in the area. It is located between (5, 58' 38" N – 5, 59' 35" N and 80, 31', 27' E – 80, 34', 25" E) has a geographical area of 1800 hectares (Figure 1). A total of about 4880 hectares (12390 acres) land, including low lying wetland which occupies 300 hectares (750 acres) is identified as Kirala Kele sub watershed. Out of 2000 hectares or 5000 acres were possessed under the flood protection scheme [16].

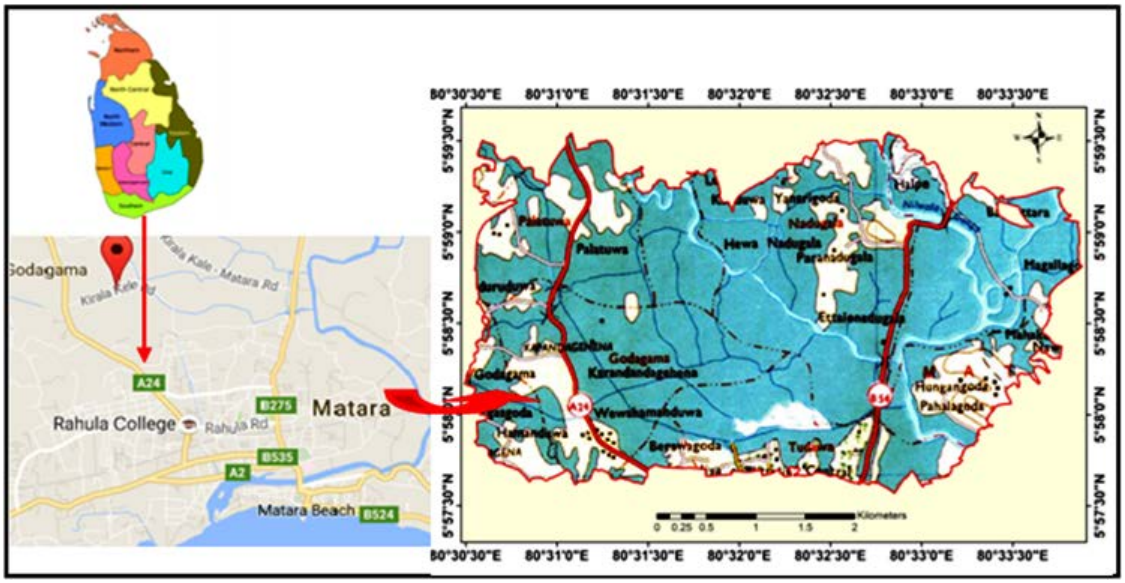

Figure 1: Geographical Location of the Kirala Kele partial-nature-based wetland

3. Methodology

This research design was about prioritizing criteria and indicators of the land suitability and selection for the ecotourism development site in the partial nature based wetland in the Kirala Kele based on the sustainability approach. The study first developed literature based conceptual models and tested the model that explains the suitable sites for ecotourism development for the partial nature based wetland using Analytic Hierarchy Process (AHP) and Geographic Information System (GIS). Based on the characteristics pertaining to the design of the research, this study applied a survey research with field work and findings from pre-studies for the data collection in order to accomplish the main objective of the research.

This study identified six main criteria (Biodiversity (BI), Water resources (WI), Terrain (TI), Land use and Land cover (LI), Road network (RI) and Settlements (SI) of suitability within the Kirala Kele partial-nature-based wetland in Sri Lanka. Assuming four suitable areas, each key criterion is then disaggregated into twenty nine sub indicators, which are further described in more detailed characteristics that apply to each factor. Determination of criteria and indicators set up were selected based on the experts' opinion, experience of

households, literatures, first ecotourism project data in this area and field observations (Table 1).

Table 1: Description of the data sources

Criteria	Data	Data sources and descriptions
Biodiversity	Species and ecosystem diversity	1. The data of the relative frequency, relative density and dominancy of flora species by using Quadrat method data in the field. 2. Field observation method 3. List and number of the species [17]. 4. Selected site studies of transect [18] 5. IUCN Reports
Water resources	Data of the water sources in the wetland	1. Selected attributes of rivers, streams, canals and water bodies from the shape files of land use, land cover in 2011 and exported to AOI data from the Survey Department in Sri Lanka. 2. River discharge data were collected from the Irrigation Department of Matara, Sri Lanka under this category. 3. The meteorological data used in this study was given by the Meteorological Department of Sri Lanka. The data compressed with rainfall (1980-2013), temperature and Relative Humidity (RH) of the study area in the Excel format. 4. Salinity data were gathered for this study from the Faculty of Agriculture and Department of Geography, University of Ruhuna, Matara, Sri Lanka. 5. Used a literature survey to prove the hydrological sources into the wetland [19, 20, 21, 22, 23, 16, 24].
Terrain factor	The Geomorphological, soil, Geological and contour data	1. The shape file of contour data was derived from the digital data of the Survey Department of Sri Lanka in 2003. 2. Geological and Geomorphologic data were collected from ancillary sources and field observations during the field work. Soil content and layers were identified by the soil profile in the in situ beds and soil colors were recognized by the Munsell Soil Color chart. 3. Field observation of the soil layers across the in situ beds and human made profile 4. A cross section method using Iron Auger in the field 5. Literature survey [25,26, 27,28].
Land use/land cover	Remote sensing and ancillary data	1. The satellite images were provided by the Survey Department of Sri Lanka. The images were radio metrically and geometrically corrected and co-registered Transverse Mercator Projection with UTM zone 47 North and WGS 84. The spatial resolution was 4*4 meters. They were acquired between January and February in 1983, 2003 and 2011. 2. A Pair of black and white aerial photographs with the scale of 1:20,000 taken in 1983 was provided by the Department of Geography, University of Ruhuna, Matara, Sri Lanka. 3. The topographic map in 1984 (amended) was acquired from the Survey Department of Sri Lanka, with a scale of 1:50,000. 4. Field observations and field checking with 25% of land use land cover area. 5. Resource profiles of Regional Secretariat Divisions in Matara and Thihagoda, 2013. 6. Land use, land cover mapping in Nilwala basin [29. 30, 21].

Road network	Transport network data	1. The linear features of the main roads and the expressways were selected by attributes from the shape files of the transport network of the digital data in 2011 from the Survey Department in Sri Lanka.
Settlement	Settlement location data	1. Exported the polygons of settlements by selected attributes of land use and land cover map in 2011. 2. Shape files of settlement and point map of geographical locations were derived from digital data in 2011 of the Survey Department of Sri Lanka. 3. Demographic data in 2013 was acquired from the offices of Grama Niladari Divisions, Secretariat Divisions and the web sites of the Census Department of Sri Lanka in 2014.

3.1 Data analysis procedure

The data analysis procedure was employed with two stages of both Arc GIS 10.0 window and Arc GIS 10.0 with the extension of AHP. By using criteria maps, the AHP model was prepared on the Arc GIS 10.0 window using 'Geospatial analyses'.

Geo spatial analysis was done to obtain the result of the analysis. It involved creating a 'mosaic of classified maps' of the entire area in 'the Data Management Window' and calculating the total areas of every land use category using 'zonal statistics in the GIS environment'. For more distance analysis, 'Euclidean Distance' and 'Buffering' were used by analytical method on the Arc Map 10.0.

3.2 Criteria of suitability range

Each factor has a suitability range, which is determined by the distance from the variables of the entire area and coverage of the land area of the study site (Table 2). The distance factor affects the suitability ranges of biodiversity, water resources, Settlement and road network. Moreover, terrain factor is based on the elevation of the selected area. Relative weights of biodiversity (BI) were assigned in the literature, experts and householders information with regards to the species and ecosystem diversity found in the Kirala Kele wetland area.

With regards to suitability ranges, input data set is made as a raster layer in the GIS database. The attribute factors are represented by raster map layers, which contain attribute values for each pixel in raster data [31].

3.3 Assessment of land suitability

Multiple criteria and various methods had been used to determine indicator weights for evaluating site suitability of the ecotourism [32, 33, 34, 35]. AHP provides proper organizing and analyzing complex decisions, based on the mathematics and psychology.

All criteria used for this analysis are compared in a pair wise comparison matrix. With regards to the pair wise comparison with standard values ranging from 1 to 9 preference scoring scale is used (See Table 3) [35, 36].

Table 2: Factors of Suitability range

Criteria	Suitability Ranges				
	High	Moderate	Marginal	Low	Remarks
Biodiversity	Very close to the centre of suitable plots (<250m)	Moderately close to the centre of the suitable plots (250-500m)	Marginally close to the centre of the suitable plots (500-750m)	More distance to the centre of the suitable plots (>750m)	Based on the selected sites.
Water resources	High water area (0-250m from the water bodies)	Moderately water area (250-500m from the water bodies)	Marginally water area (500-750m from the water bodies)	Low water area (>750m from the water bodies)	Based on the river, canals and HWW3
Terrain	Lower slopes (0- 10m elevation from MSL)	Moderate slopes (10-20m elevation from MSL)	Marginally slopes (20-30m elevation from MSL)	High slopes >30 m elevation from MSL	The boundary of the wetland has high denudated hills
Land use, land cover	Less artificial land use and land cover area	Moderately artificial land use and land cover area	More artificial land use and land cover area	The most artificial land use and land cover area	Reclassified the 14 Land use and land cover classes into 4 classes
Transport Network	Highly potential to be suitable (>750m from the road network)	Moderately potential to be suitable (750-500m from the road network)	Marginally potential to be suitable (500-250m from the road network)	Low potential to be suitable (<250m from the road network)	Two main roads, one express way and more minor roads paved through the wetland
Settlement	Highly potential to be suitable (>750m from the settlement)	Moderately potential to be suitable (750-500m from the settlement)	Marginally potential to be suitable (500-250m from the settlement)	Low potential to be suitable (<250m from the settlement)	Most of the settlements are situated near the boundary of the wetland

Table 3: Pairwise standard comparison scales of AHP

Intensity of importance	Description
1	Equally preferred
2	Equally to moderately preferred
3	Moderately preferred
4	Moderately to strongly preferred
5	Strongly preferred
6	Strongly to very strongly preferred
7	Very strongly preferred
8	Very strongly to extremely preferred
9	Extremely preferred

Source: Omid, 2014; Saaty & Vargas, 2008, 2001

The weights based on the preferential levels are given by experts and householders in each pairwise comparison in the matrix. The preference of the each factor used for this process in the AHP is determined by the suggestions of them [38].

3.4 Measures of validity and reliability

All six items (criteria) (Biodiversity (BI), Water resources (WI), Terrain factor (TI), Land use/land cover (LI), Road network (RI) and Settlements (SI) were carried out to test the reliability of each construct of the study. Before proceeding to the AHP analysis, a scale purification process should be performed for the purpose of refining reliable and valid items to the AHP model [39]. Kaiser-Mayer-Olkin measure of sampling adequacy shows a value of .624. A value greater than 0.5 and values between 0.5- 0.7 indicate that the pattern of the correlation is adequate [40]. Moreover, Bartlett's test Sphericity is significant (.000) for all criteria. If the P value is less than 0.05 ($P<0.05$) there is some relationship between the considered variables and allow forward weighted data of this study for the AHP. In addition, all criteria are reported to be above.7 Cronbach's Alpha, was reliable of this study. So, the items that were used for the analysis were highly correlated with an overall score of the scale.

4. Results and discussion

The final comparison was performed among the criteria, Biodiversity (BI), Water resources (WI), Terrain factor (TI), Land use/land cover (LI), Road network (RI) and Settlement (SI). Numerical values of the weights and the calculated weights of pairwise comparison are displayed in Table 5. Having made this comparison, the Consistency Ratio (CR) was calculated by using the highest eigenvalue (λ max) and Average Random Consistency (RI) value. Saaty and Vargas (1991) calculated the Average Random Consistency Ratio (RI) order of 11 metrics as follows; (Table 4).

Table 4: Standard values for the Average Consistency Index

N	2	3	4	5	6	7	8	9	10	11
RI	0.00	0.52	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51

Source: Saaty & Vargas, 2001

As shown in Table 5 the criterion of biodiversity is regarded very strongly preferred over other factors among them. A value of 7 expresses 'very strongly preferred' over settlement sector and 'strongly preferred' (Value 5) than road network and terrain factor. Though, it is 'strongly to very strongly preferred' (Value 6) over land use/land cover factor, biodiversity factor is 'moderate to strongly preferred' (value 4) compared to water resources. Therefore, when comparing all main criteria, biodiversity factor receives the highest weights of criteria; 0.4619 or 46.19% among them. In the direct comparison of these criteria, water resources are 'strongly to very strongly preferred' (value 6 in the second row) over to settlement factor. A value of 5 expressed in the

same row is 'strongly preferred' than road network factor in this matrix. Despite, water resources compared with both criteria of terrain and land use/land cover (value 3 and 4) representing 'moderately preferred'. So, perceived to this combination, criterion of water resources, received the second highest weight (0.2345 or 23.45%) among the given six criteria.

Table 5: Pairwise comparison matrix of preference values of six main criteria

Criteria	Biodiversity (BI)	Water resources (WI)	Terrain (TI)	Land use/land cover (LI)	Road network (RI)	Settlement (SI)	**Suitable Weight**
Biodiversity (BI)	1	4	5	6	5	7	**0.4619**
Water resources (WI)	0.25	1	3	4	5	6	**0.2345**
Terrain (TI)	0.2	0.3333	1	4	4	4	**0.1442**
Land use/land cover (LI)	0.1667	0.25	0.25	1	2	2	**0.0645**
Road network (RI)	0.2	0.2	0.25	0.5	1	4	**0.0611**
Settlement (SI)	0.1429	0.1617	0.25	0.5	0.25	1	**0.0337**

λ max= 6.6015, CI= 0.1203, RI= 1.24, CR= 0.097 Source: Analysis results of AHP, 2015

Having made a pairwise comparison matrix, the criterion of terrain factor is 'moderate to strongly preferred' over land use/land cover, road network and criterion of settlement factor. It has represented value 4 for all three factors. Furthermore, criterion terrain factor is less than, equally preferred over biodiversity and water resources for the suitability. As the third important criteria, terrain factor receives 0.1442 or 14.42% of suitability criteria weight among these factors. The value 2 expresses 'equally to moderately preferred' and the value 4 is given to those factors having 'moderately to strongly preferred' over other factors. According to that, road network factor is 'moderately to strongly prefer' than settlement. Land use factor is 'equal to moderately preferred' compared to the road network and settlement factor of them. Therefore, land use factor receives 0.0645 or 6.45% and road network has 0.0611 or 6.11% of criteria weights within these main factors. Settlement factor receives the lowest suitability criteria weights of 0.0337 or 3.37% among the order 6×6 comparison matrix for the range of suitability.

Based on the reciprocal matrix values, the highest eigenvalue and average consistency ratio, CR value was 0.097. It is smaller than 0.10 of recommended values which is acceptable to be in the suitability analysis of this study of ecotourism development. The calculation of the pairwise consistency ratios is given in Table 6. shows

the interrelationship between the relative importance of the factors and criteria involved in the pairwise matrices. All the order 3×3 combinations are related to the final results of the CR values represented by order 6×6 comparatively in AHP. The CR value of BI, RI and SI is much closer to final results of the CR value. However, the most suitable order 3×3 matrix comparison is biodiversity, land use/land cover and terrain factor of the wetland. It receives 0.0026 of CR values, among other comparisons.

The final map of the land suitability has been categorized into four (4) classified groups under the suitability ranges based on the suitable values (Table 7). Four levels; highly suitable area, moderately suitable area, marginally suitable area and Low suitable area can be observed, which have an own significance in the management of ecotourism [33].

Table 6: Suitability classes of suitable value range

Suitable classes	Suitable value range	Remarks
Highly suitable area	3.252-2.108	All the relative preference criteria are highly satisfied areas
Moderately suitable area	2.108-1.712	Represented area of the most preference criteria is satisfied and some are not satisfied
Marginally suitable area	1.712- 1.396	Representing zone of partially unsatisfied criteria
Low suitable are	< 1.396	The zone where the most relatively preference criteria are not satisfied to ecotourism activities.

Source: Analysis results of AHP, 2015

The map represented with final result was generated in AHP with an integrated approach of main criteria and twenty nine indicators of the ecotourism development in the Kirala Kele wetland area (Figure 2).

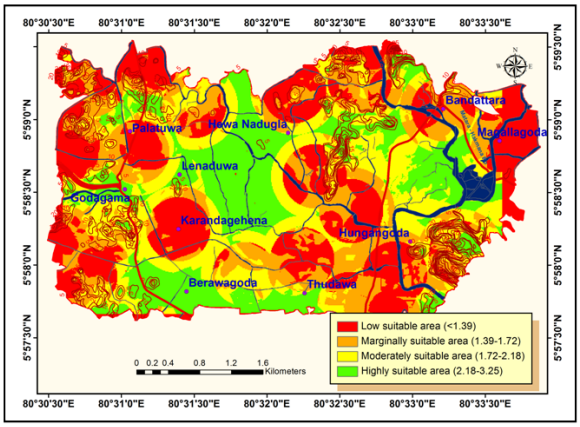

Figure 2: Comparative relationship among all the criteria in the AHP

It is evident that, the areas in light green color of highly suitable are about 24.75% (999.99 acres) of the entire area and are located in the central, east and southwest parts of the Kirala Kele wetland area. The proportion of high suitable area made up almost one fourth of the total area. The site with a low land and a non-polluted environment and immediate vicinity sites were proposed as sustainable site settings for the ecotourism development of the first ecotourism project (2001) in the Kirala Kele [41]. Therefore, some factors identified by FEPKK (2001) can be overlapped into the highest suitable areas in this study.

Out of the four categories, moderately suitable areas in yellow color are noticeably higher than the other categories. It has a proportion of 26.92 % (1086 acres) and makes up more than one quarter of the area. The least number of areas represented in gold color in the map is marginally suitable areas where is covered with 23.50% or 949.58 acres of total area. Marginally suitable areas are located in the West; Southeastern and North-eastern parts of the Kirala Kele wetland where more denudated hills are situated. The statistics on the map shows that low suitable areas colored in red are located at the boundary of the wetland and near the southeastern portion of the area. It consists with 24.83 or 1003.45 acres of the total coverage.

Ecotourism activities can be implemented based on associated elements such as, naturally, conservation, environmental education, sustainability, distribution of benefits, and ethics or responsibility [42, 43, 5,]. Ecotourism activities of this wetland can easily be developed in the highly suitable areas based on the relative preference factors [53]. Thus, the highly suitable area with appropriate combination of biodiversity, water resources and terrain factor could serve for birds and butterfly watching, nature observation along the river and canals, canopy walkway through the footpath and education and research-related activities as the main ecotourism attraction [49]. In the Kirala Kele, the area demarcated by the circle in Fig. 2 is the most suitable site with low elevation (below 5 m) for the acquisition of required water and sediments for biological processes of the wetland. The plots of huge number of species and ecosystem diversity are situated along the canals and water bodies of the central part of the wetland, where approximately 35 acres of true mangrove consisting of *Sonneratia caseolaris* and *Rhizopora mucronata* constitute around 5% of the entire area.

The wide expansion of moderately suitable areas was evident in the east part of the Kirala Kele wetland and were characteristically endowed with marshlands, water logged areas and wetland vegetation belt along the water bodies. Findings indicate that regarding ecotourism capacity, this part has more wetland resources such as; marsh lands with water breeds, plots of bird availability, high ecosystem diversity, near the Kadawedduwa River basin, easy access from the main road (From Hakmana to Matara), near to the Bandaththara entrance point, low human intervention, far away from settlements and close proximity to highly suitable areas for the development of ecotourism activities in the wetland. Most of these areas are free from settlements and road network with natural beauty, attraction of biodiversity and bird watching plots. With respect to the evaluated criteria for the suitable site selection, moderately suitable sites have great potential resources for the development of ecotourism activities, since the areas are predominantly located in neighborhood of highly suitable sites of the wetland.

The marginally suitable area consisted of 23.50% of the total area covered in the wetland where can be observed in the higher elevated zone close to the settlements and main roads with gold color in the suitable map. The

settlement areas with home gardens are situated on the denudated hills where the lack of water and natural vegetation has negatively affected the development of ecotourism activities.

5. Conclusion

All six criteria (Biodiversity (BI), Water resources (WI), Terrain factor (TI), Land use/land cover (LI), Road network (RI) and Settlements (SI) were carried out to test the reliability of each construct of the study. With respect to the validity test, all the criteria are reported to be above the recommended threshold of 0.5 or more. According to the KMO and Bartlett's test of the Sphericity scale purification process of the AHP analysis is significant (.000) for all criteria. Distance factor affected to the suitability ranges of biodiversity, water resources, Settlement, land use and road network criteria and terrain factor is based on the elevation and the soil properties of the selected sites. According to the degree of consistency ratio (CR) value (0.097) denote that acceptable to be in the suitability analysis for the ecotourism development in the study area. At this stage, the final composition and zoning was done according to the combinations of each used factor weights. The final land suitability map has been categorized into four classified groups based on the suitable values of AHP analysis highly suitable area, moderately suitable area, marginally suitable area and Low suitable area. Highly suitable area can be implemented ecotourism activities with appropriate combination of biodiversity, water resources and terrain factor could serve for birds and butterfly watching, nature observation along the river and canals, canopy walkway through the footpath and education and research-related activities as the main ecotourism attraction [41]. Moderately suitable areas are too, providing a platform for the development of ecotourism activities due to adjacent locations in the high suitable areas. One of the most important aspects of the model results is low and marginal suitable areas are located in the settlements and close to the road network. Therefore eco-related activities could not be implemented, but could be developed by some infrastructure facilities such as green hotels, lodges, restaurants, communication centers, sales centers for the rural production, cycling service centers, guidance centers, camping possibilities and all other public convenience facilities [41, 32].

6. Recommendation

Environmental sustainability approach is useful for applying to the development of ecotourism in the partial nature based wetland. It is based on the incorporation and promotion of waste minimization, reuse and effective production of resources in the environment. Lawton and Weaver (2007) and Butler (1999) suggested that, environmental sustainability approach, including attraction, market, environment, accommodation; economic status and regulations are close to the ecotourism concept. Therefore, it can develop ecotourism activities and infrastructural facilities for the minimization of land degradation and reuse of the abandoned paddy lands for effective use in combination with environmental sustainability approach. Based on the above mentioned opportunities and resources, the most suitable locations for the ecotourism are situated at the Kirla Kele wetland, already identified. Furthermore, the following can be proposed for the development of ecotourism in the area:

- High suitable sites involve the most sensitive sites which can be recommended as ecotourism activity sites for learning, watching, and research plots.

- There is a need to build tourism facilities and services of communication, green hotel, restaurant, lodges, sales centres, guiding centres, camping facilities, and other services at lower and marginal suitable sites of the wetland.
- Construction should be undertaken only in already identified low and marginal suitable sites and not in a pristine natural environment.
- Offered should be made for an enjoyable experience of nature and local culture for all visitors with eco-friendly approach.
- There should be promoted of traditional agricultural product, organic products and organic cultivation on the marginal and low suitable sites.
- Active partnership should be developed with local communities through encouragement, participation and sharing the benefit to them.

There should be collaboration with responsible authorities like, Sri Lanka Tourism Authority (SLTA), The Central Environmental Authority (CEA), Department of Wildlife Conservation (WLF), Irrigation Department, Agriculture Department, Regional Secretariat Divisional Offices (Matara, Thihagoda and Malimboda), Grama Niladhari Divisions, Universities and Non Governmental Organizations (NGO) like Organization of Nilwala Farmers to support conservation and development of ecotourism in the wetland.

This site can be established as an ecotourism travel network related to surrounding tourism destinations such as, Bundala Ramsar wetland, Rakawa, Kalamatiya, Malala lagoon area, Yala wildlife sanctuary and Madu Ganga estuary community based project, Hikkaduwa coral reef and sandy beach, Sea turtle research project at Kosgoda, Unawatuna golden beach, Tangalle blow hole and Handy craft manufactures in Galle.

7. Limitations of the study

This study was only limited to measure the six indicators (Biodiversity, water resources, terrain, land use, land cover, transportation network and settlement) for the selection of a suitable site among many contextual factors. Even those six factors are related to this study site, future studies could be incorporated with many contextual factors with regards to the ecotourism development in Sri Lankan context in future research. The acquisition of an adequate number of satellite images required by this study became more difficult due to unavailability of real time data on the study site. There was a need for satellite images for the comparison with recent changes with respect to the identification of land use, and land cover of the study area before the implementation of Nilwala Ganga Flood Control Scheme.

This study used the pair wise stereo aerial photographs due to lack of corresponding satellite imageries before 1983 at the Survey Department in Sri Lanka. Previous research findings on partial nature-based wetland related to Sri Lankan context could not be found. Thus, the research instrument and methods were adapted using the Sri Lankan context with a special emphasis on the wetland ecotourism. In the future, scholars can develop regional based methods and appropriate criteria for the ecotourism development of the wetland systems.

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