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Optimization of Ecotourism Opportunities within Freshwater Environments: A Multi-Criterion Planning Outline for Water-Based Recreation at Lake Victoria, Kisumu County

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ABSTRACT

Water-based recreation is an ecotourism genre that attracts participation in most developed countries, but seldom cuts a niche in developed nations. This paper presents synopsis of concepts from a study conducted in four beaches of Lake Victoria, Kisumu County in Kenya, with the aim of demonstrating challenges and opportunities of recreational ecotourism within the shore areas of the fresh water lake. To ascertain the dynamics that control recreationists' involvement in recreationable activities at the waterfronts, a triangulation methodology was used. As such, observations were employed on environmental features at the lake shores to demonstrate their aesthetic status; confirmatory tests were performed on shore waters (beaches) to determine their quality integrity; and household survey was conducted on local communities to establish their ecological risk perceptions. Results point at poor observable status of the shores environments; adverse water pollution; and high risk perceptions. These significantly demonstrated influences against the recreational dormancy at the study sites. The paper discusses Pollution on recreational waters; risk perceptions and community participation; nexus between observable status, water quality and risk perceptions on recreational waters ; policy and Management Implications of the Study; and SWOT Analysis as a conclusive presentation of study focus . The authors suggest an outline of multi-criterion approaches for optimizing ecotourism opportunities within freshwater environments. These entail: management hierarchies for enhancement of recreational ecotourism; a recreational opportunity spectrum model; levels of progressive maturity for recreational ecotourism development; a dummy checklist for water pollution control; and decision trees for recreationable site location and water quality examination.

Key Words: *Multi-Criterion Optimization, Ecotourism Opportunities, Planning Outline, Water-Based Recreation, Shore Environments*

1.0 Introduction

Water-based recreation is an ecotourism genre that attracts participation and income in most developed countries. Today there are a number of established water-based ecotourism destinations which exhibit potentials for recreationable activities (Keys, Barron, & Lannerstad, 2012). Some of the water-based activities encompass swimming, boating, sunbathing, skiing, recreational fishing, sunbathing, water rafting, racing, visual amenities among others (Godbey, 2009). It is estimated that foreign and local tourists spend around two billion shillings annually at coastal recreational resorts world over, due to these activities and related ones (UNWTO, 2013).

In several European countries water-based ecotourism assumes significance in the national economies, which have thousands of lakes with appropriate tourist infrastructure (Ranade, 2008). In the United States of America, it is estimated that 129 million people travelled and visited beaches or watersides between the year 2000 and 2001, an increase of about 6 percent from the year (NOAA, 2005). In the Caribbean Islands, the United States and the Middle East, water-based ecotourism are appropriately exploited to the advantage of nature conservation and economic gains through suitable policies, plans, management systems and budgets (UNWTO, 2013). Recreational use of inland and marine waters, as a result, increased in these countries over the years. In Canada, the Great Lakes are among the world's largest freshwater bodies that are useful for recreation by more than 30 million people (Wong *et al.*, 2009). There are more than 1,300 beaches along these Great Lakes that are involved in recreational ecotourism, though they experience risks of contamination by domestic pollution.

The success stories of sustained water-based ecotourism development, however, only compares in contrast with developing nations, some of which are endowed with recreationable water resources in the form of lakes and rivers (Ngunyi, 2009). In Africa various marine beaches, specifically those of lakes, demonstrate little development in the ecotourism sector (UNEP, 2012). This is despite the abundance of ecological features and water resources that can be harnessed for enhancement of recreational activities. Lack of proper planning, adequate management, and uncontrolled human activities result in water resources and ecosystem degradation within shore environments, and this can be seen in beaches which are active in activities other than traces of recreational water activities. In East Africa, studies have concentrated on conservation of aquatic species and economic sustainability of the fishing community around the lake region (Wanjohi *et al*., 2011, Muyodi, Bugenyi, & Hecky, 2010) but with little focus in recreational ecotourism (Water Services Providers Association (WASPA), 2013). This is an evident of the unsustainable use of the lake water, or the under-exploitation of recreationable shore areas, which also lead to continued poverty levels in most lake regions.

In Kenya tourism, for a long time, has been exclusively centered on three geographical areas namely: coastal area for beach tourism, Nairobi for business or conferences; and Maasai land for game viewing and Safaris (Ngunyi, 2009). Even with the existence of agencies advocating for environmental conservation matters in Kisumu and its environs, little traces of recreational ecotourism activities can be accounted for. This is despite the mass of fresh water resource available in Lake Victoria. Lake Victoria, which has otherwise only been under intense pressure from the threats of pollution and unsustainable use (East Africa Commission, 2011). Kisumu County is interfaced with the Kenyan side of Lake Victoria within a spatial zone known as Winam-Gulf, having a shore line stretch of about 108 km. Much of its observable arena from a substantial spatial distance constitutes an atmosphere that ought to be serene and attractive for ecotourists (East Africa Community, 2007). The available water mass within the entire vicinity exhibits an extensively exploitable resource for ecotourism by both inhabitants and prospecting visitors. The lake has had a long and fascinating history with friendly traditional communities living along the waterfronts, running livelihood errands like fishing, transportation, domestic and animal watering, and other cultural events (Lake Victoria Initiative, 2006).

Recognizing the enormity of significance that is placed on Lake Victoria as a natural fresh water resource, it is imaginable that it's environs, specifically Kisumu County, would be a great economic hub. Conversely, unlike its counterpart port cities in developed countries, Kisumu has not been able to show off large masses of tourist arrivals due to the limited tourism products within its environs. Vastly interfaced with Kisumu County, Lake Victoria ought to bridge this gap, but is seldom a preferred ecotourist destination (WTO, 2012). The state of affairs of the lake as a likely recreational surface water resource has long been imprecise and this has resulted into the discussion of whether the activities that can be optimized should be regarded as 'recreational' or 'recreationable'. *Recreational* applies if they truly exist, and *Recreationable,* if they have the potentials of being undertaken (Okungu, Hayombe, Lagat, & Maujih, 2015). Lubovich (2009) observes that Lake Victoria's ecosystem has been under immense threat from multiple pollution sources, each posing its own challenges. The lake's ecosystem has undergone substantial and alarming changes that have accelerated over the last three decades (Kayombo & Jorgensen, 2006). Massive algal blooms have developed, becoming increasingly dominated by the potentially toxic blue-green variety but the extent to which they threatened recreation, until this study, had not been clearly established. Reports indicate that the Lake Victorian water is polluted from a variety of sources (Kisumu County Fiscal Strategy Paper, 2015).

The pollution menace in Lake Victoria had not been linked to any recreational standards, neither have their magnitudes been evaluated against people's participation in the recreationable activities. No clear study had been conducted around Lake Victoria on physical, chemical and microbial water quality that inform potential ecotourists of their risk status whenever they visit beaches for purposes of water-based activities. There existed unclear records on any advisories previously issued against water contact activities, neither has any related measure got implemented. It remained hypothetical that the dismal (and the unclear) extents of engagement by people in the recreationable activities at the waterfronts could have arose all the while because of the perceptions that they could have held. It was also possible that any such perceptions might have been held against the observable status of the shore environments, and the probable high magnitudes of water-borne risks (gestational and skin illnesses).

The thesis that this paper summarizes was premised on the general objective: *to demonstrate the challenges and opportunities of recreational ecotourism in fresh water lake shore areas, with a focus of putting forward steadfast planning and management mechanisms that would optimize recreational development in Kisumu County.* Optimization involves enhancing optimal achievement of results from a scenario involving more than one objective function, whereby the objectives should be achieved simultaneously. In the case of this article optimal decisions are needed to be taken in the presence of trade-offs between the following specific objectives: (i) to ascertain the observable status of beach environments and demonstrate their relation to actual participation in water-based recreationable activities; (ii) to determine the quality of the recreationable water at Lake Victoria, and demonstrate their implications on recreationable activities; (iii) to establish the influence of ecological risk perceptions on public participation in water-based recreationable activities. The fourth Objective, which brings to a conclusion the answer to the general objective, was to recommend sustainability options that can enhance opportunities of recreational ecotourism in water resources within shore environments in Kisumu County.

The study was conducted along the beach areas of Lake Vitoria in Kisumu County, Kenya (*Figure 1*). Lake Victoria is the second largest fresh water lake in Africa with a shoreline of 3,440 km. Entirely the lake is 412km long and 355m wide, an average depth of 40m, maximum depth of 80m and a water volume of 2,750 km^3 (EAC, 2011). It is situated at an altitude of 1,134m above the sea level. It lies between latitudes 00^0 30` N and 355 km from west to east between longitudes 31^0 37' and 34^0 53' E (Lake Victoria Initiative, 2006). Kisumu County is one of the 47 Counties in Kenya. It lies within longitudes 33° 20'E and 35° 20'E and latitudes 0° 20'South and 0° 50'South. The County is bordered by HomaBay County to the South, Nandi County to the North East, Kericho County to the East, Vihiga County to the North West and Siaya County to the West (*Figure 1*). The County covers a total land area of 2009.5 km^2 and another 567 km^2 covered by water (Kisumu County Fiscal Strategy Paper, 2015). The four beaches are situated along the Kisumu County's 108km long shoreline. They include Asat, Ogal, Usoma and Lwangni.

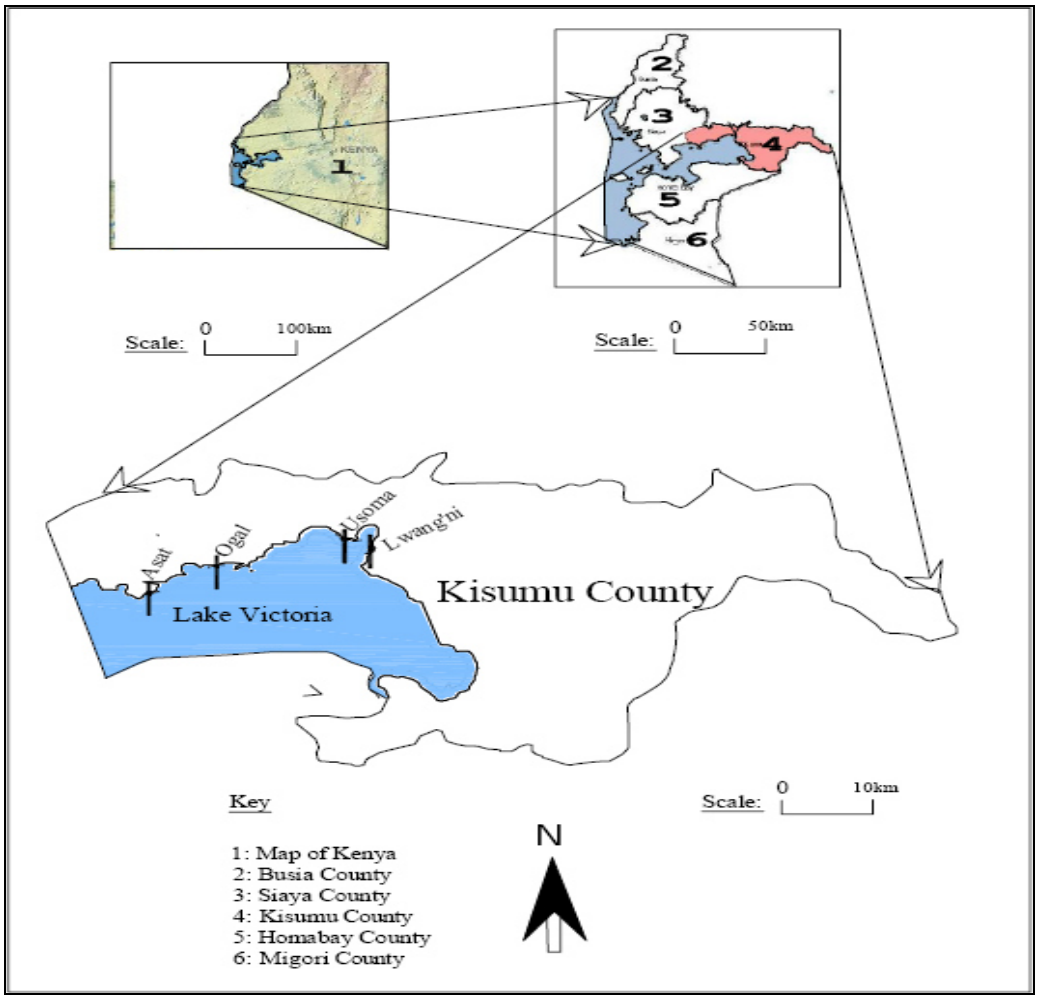

Figure 1: Maps showing study area (Source: Author's Modification using Qgis and AutoCAD, 2014-15)

2.0 Materials and Methods

The study was conducted at the beaches along the Lake Vitoria in Kisumu County, Kenya. It was designed on the basis of a descriptive case study approach, which focused on developing an in-depth analysis of multiple mini-cases within one major case – in this scenario, four study sites within one reference area (Winam Gulf) of Kisumu County. Qualitative data were obtained from observations, key informants and focus groups, while quantitative data were obtained from household surveys. Data collection incorporated four data collection phases: (1) observation, (2) confirmatory tests of quality of recreational waters, (3) household survey and (4) focus and key informant interviews. While observations were arbitrary and features recorded depended on actual site scenarios, water samples for confirmatory tests were 128 in total, and the sample size involved in the house-hold survey was 248 in number . Observations were made on natural and artificial features, behaviours, practices and water-based recreational activities by people at each of the beach sites. Using a distinct schedule of activities the researcher visited each of the 4 sites for 4 days from 9.00 am to 5.00 pm each day and conducted consultative observations using checklists.

On the Quality of the Recreationable Waters at Lake Victoria, the recreational water quality parameters that were subjected to the internationally recognized water quality standards entailed physical, chemical and bacteriological attributes. Physical quality parameters identified were pH, Turbidity and Total Suspended Solids as the test indicators with 7.0 to 8.0, 50 NTU, and 200 – 250 mg/L respectively as recreational unit standards. Chemical Quality was determined through Dissolved Oxygen (DO_i-DO_5>4 mg/L), Total Phosphorus, Total Nitrogen and BOD^{20}_5 (5 – 15 mg/L). Sampling points were identified at each of the four study sites (Asat, Ogal, Usoma and Lwang'ni beaches). Water samples were taken for physical tests *in-situ, and* chemical and microbial analysis at the laboratory. Numbers were assigned, upon which statistical operations were performed. Scale variables, were used to identify quantitative measurements differences of observed quality attributes.

On Risk Perceptions and Public Participation household questioners were administered to 352 adult household respondents living within the communities. Out of them, a total of 101 household questionnaires were administered in Asat, 112 in Ogal, Usoma (109) and Lwang'ni (29) Interviews were conducted using structured questionnaires. In total 348 (99.4%) household questionnaires were successfully completed. Descriptive analysis was employed to understand distributions of variables for independent cases. In the cases of joint variations of more than two variables, Correlation Analysis was performed to determine the amount of correlation between variable for the third objective, in the cases of ordinal data. Since the third

objective occasionally had at least one dependent variable which was presumed to be a function of two or more independent variable, Multiple Regression Analysis was adopted for analysis. This was so as to make a prediction about the dependent variable based on its covariance with all the concerned independent variables. Similarly, Multivariate Analysis was used to analyze more than two variables simultaneously using ANOVA, aided by SPSS and Microsoft excel software.

3.0 Results

Observation results demonstrated conducive natural occurrence of the beach sites for recreation but with low levels of facilitative infrastructure. Engagement in recreational activities was lower than 15% when compared to other activities at the beaches, hence attributing to the low aesthetic appeal observed. Confirmatory test results of the lake water indicated higher levels of all parameters tested against recommended standards, except temperature and pH, signifying the impact of upstream and point pollution sources. When compared with historical data of between year 2000 and 2005 (which were slightly above recommended standards), the current status had an increase of 2.9%, 22.1% and 13.5% for temperature, turbidity and TSS respectively. The DO, BOD^{20}_5 TP and TN had increased by 8.8%, 19.8%, 24.1% and 27.3% parameters respectively. E. Coli was observed at 14.9% increase from the previous data. The high levels of these parameters were regarded as a hindrance to recreation. Household survey results demonstrated high ecological risks perception by the local communities, pitting them against engaging in recreational activities.

Risk factors influencing levels of participation included attack by wildlife, fear injury/drowning, fear of water borne illnesses and poor aesthetics. Kruskal Wallis Test demonstrated dissimilarity of levels of participation among the studied sites. Similarly, extents of risk perceptions were not similar across all the study sites. Results further demonstrated some correlation of perceptions concerning nature of environmental risks with participation in recreational activities. Perception attributes entailed possibility of pollution (.522); extents of impacts of pollution (.581); severity of disastrous consequences (.437); and previous experiences (.467). Moreover, only 16.4% of the respondents in had previously seen or heard any news or stories about water quality at the beach; about 7.2% had heard about beach closures as a result of water quality risks; while 4.6% ever saw warning signs. In conclusion, the presence of water surfaces is essential to or enhances the satisfaction of recreationists that might want to get engaged in recreational activities.

3.0 Discussions

3.1 Pollution on Recreational Waters

The challenges facing Lake Victoria, Kisumu County and its catchment areas are numerous, complex, and interrelated. Declining water quality, increasing nutrient and pollution loads comprise a list of serious environmental concerns that threaten to undermine the ecosystem of the lake, as well as the health and livelihoods of potential recreationists. Rapid population growth is transforming the long-term outlook for the lake, simultaneously increasing the pressures on the lake and its resources. The lake water most often receive agricultural wastes and industrial effluents that are not properly pre-treated. This escalates the levels and rates of eutrophication because of the increasing presence of nitrogen and phosphorous. Eutrophication will eventually result into algal bloom, odour, bad smell and lack of clarity of the recreational waters. In such conditions, recreationists cannot get attracted to participate in swimming, boating, fishing and sunbathing.

The presence of nutrient-rich wastes enables bacteria to use the available oxygen (Biochemical Oxygen Demand) so as to survive and multiply. This multiplication causes oxygen depletion, resulting into the chocking and die-off of aquatic plants and animals. This brings another round of decay and eutrophication scenario that similarly becomes unattractive to the ecotourism industry. Higher levels of *E.Coli* counts are a further detriment to humans (recreationists) against ingestion, because it causes diarrhoea. This is because swimmers most often experience unintended ingestion of water. The recreational waters that are depleted by the release of hazardous elements will incubate toxins that, other than ingestion, may pose danger to human skin, eyes and ears. No conscious recreationist prefers to be associated with any water that does not support any aquatic life. Such waters are an evidence of toxicity, which in their high levels, do not permit stability of aquatic life.

Waterfronts within or near municipalities are confirmed to experience high levels of water pollution compared to those in the rural areas. The urban waterfronts have incidences of slightly higher concentration levels of pH, turbidity, total suspended solids, *E.Coli* concentrations and BOD_5 levels. This stressful scenario is due to the presence of unplanned settlements, which do not have organized wastewater disposal systems, and their raw wastes are disposed into the lake indiscriminately. By releasing a lot of Nitrogen and Phosphorous into the lake, agricultural sector bear the responsibility for high eutrophication rates, leading to the algal bloom and high BOD_5 levels. This is also a sure contribution to the high levels of turbidity in Lake Victoria. High turbidity levels advances invisibility of the shore waters, and is one major cause for the current non-attractiveness of lake water for recreation purposes. On most of the parameters observed and tested, rainy and dry days did not display perfect linear correlations with pollution levels. Turbidity levels are, however, mostly associated with rainy days, while high chemical concentrations are synonymous with dry days. Because of the high solvency properties of water it easily dissolves nutrients and trace elements during rainy days, and with the increased high volumes, the dilution effect of water reduces pH and chemical concentration levels of the lake water. Pollution loads in the beach waters tend not to be skewed towards time of the day. This is because of the inconsistent manner in which such loads are posted across various times of the day. As a result of these, the shore waters lacked clarity; the waters are full of suspended solids; shores have a lot of settleable solids; foams are spread at the recreationable areas in water; and decayed organic matter and algal bloom occupy a lot of space.

The above scenarios are multi-attribute complexes that if not optimized for favourable quality conditions, enable the shore waters not to be conducive for recreational purposes Hence, pollution stresses at the recreational waters pose negative

impacts on participation in recreational activities. The low extents of participation in recreational activities can be related to the high levels of quality of the recreational waters. Like a rolling gear, the pace and size of quality can be proportionately compared to the extents of participation in water-based recreational activities. Diverse factors and indicators can eventually be placed into appropriate positions that depict sustainability levels with improved quality parameters, which correspond to increasing extents of participation.

The general perception that a recreationable shore area (beach) has been dirty keeps many people from enjoying recreational venture. Poor perceptions about recreational water quality may lead beachgoers to travel further than necessary to avoid beaches that are perceived to be non-aesthetic or dirty, though clean beaches might be available closer and even more accessible. The perceptions further drive people away from dirty beaches because of the risks attached to them. As a result people choose to go to shore areas or beaches that have fewer amenities simply because they believe they are safer and cleaner. Levels of participation in recreational waters by local communities are not similar in every beach site, neither are they similar to extents of ecological risk perceptions. This is because the factors leading to the skeptism by the potential participants (including fear of water borne illnesses, poor aesthetics, and access, attack by wildlife or fear of injury/drowning) come into play with divergent magnitudes from site to site, especially in consideration to urban and rural clusters. The forces enhancing these factors, including the perceived inability to control the risks, previous experiences and the doubt among the community on the possible benefits from recreational activities should constitute fundamental considerations.

The effective participation in recreational ecotourism at the waterfronts of Lake Victoria can potentially be realized if urban communities are satisfied with *aesthetic conditions of the beaches and adequate ecological sanitation* which is devoid of pollution impacts of the beach waters.

3.2 Risk Perceptions and Community Participation

Additionally, urban people must be assured of sites that are free of *injury or drowning* risks. Rural communities will quite participate if they are assured of sites that are devoid of *wildlife*, *injuries/drowning* and *water-borne illness* risks. Oil/chemicals, raw sewerage/domestic wastes, and solid waste constitute the most of the aesthetic conditions at the waterfronts with urban areas exhibiting more prominence compared to rural areas. The same exhibit most likely attributes that repulse eagerness to participation in the recreational activities by members of the community. Both urban and rural communities at the waterfronts of Lake Victoria are not able to control the sources of ecological risks since such control require policy implementations and a culture of responsibility among source quarters. Risks associated with them can only be avoided by none-involvement in activities that necessitate significant contact with water at the lake waterfronts or beaches. Previous experiences with the above risks do constitute a noteworthy basis for the very little participation.

The deficiency in information regarding water and environmental (ecological) quality at the beaches, or lack of caveat enforcement against probable disastrous consequences of various risks, as established, is an indication of the foregoing dominance on the part of water and tourism sector players. This also exterminates branding spirit that may well motivate participation in the water-based recreational activities at the lake waterfronts. It sheds light on the reason why communities are not aware of the potential benefits from recreational activities as found out by the study. There is, hence, a proven consideration that local population is a key factor to the desirability of ecotourism products, and an important participant in the initiation and approval of the outcome of ecotourism concept. The exploration and ultimate suggestion by this study is that ecological status supply risks that influences actions or involvement by the people who have first-hand experience with the waterfronts prior to inviting visitors to embrace water-based recreational activities. The researcher developed a model that can guide planners and manager in understanding the relationships that exist between perceptions and participation in recreational activities.

3.3 Nexus between Observable Status, Water Quality and Risk Perceptions on Recreational Waters

Results of the first objective were synonymous with that of the second in their presentation of poor surrounding conditions and poor water quality status alike, due to human activities. While the human activities can easily be changed and corrected within a few weeks through policy enforcements, the physical, chemical and bacteriological pollution occurrences and processes at the lake may take several years because of the residence and travel time of water as it gets discharged out of the lake This, hence, require integrated water resources management approaches. Since the lake water is difficult to be disinfected, it is important to note that only serious planning and management efforts can sustain the healing of the ecological environment over time. This has been discussed under recommendations. This introduces another dimension of relationship: that the physical environment may be made to appear conducive and aesthetically good for supposes recreation, but may not meet the quality criteria on the actual waters meant for bodily contact during recreation. A responsible authority should always issue warnings, alerts or bans against the same, hence a definite pointer towards little or no participation.

This eventually makes the surrounding communities not to exploit the opportunities of their natural water resources for ecotourism. To note further is the fact that universal standards for observations do not exist, hence, correlations and regressions between the two objectives could not be done.

The low extents of quality conditions of physical environment within beach surroundings bear negative implications on people's attitudes on recreation. Generally, potential recreationists wish to broaden their experiences by engaging in specific activities. Active or passive participation in water-based recreational activities are known to offer outstanding experiences to ecotourists. In spite of the levels, recreationists generally seek experiences concerning a range of aspects including entertainment, edutainment, aestheticism and escapism with diverse levels of integration.

The poor perception of risks by the local community on their ecological environments against engaging in water-based recreational activities is positively related to poor quality of the recreational waters. This is partial because, other than some experiences with health risks e.g. water borne and water-related illnesses, the community members, most of whom are lay people, do not comprehend the aspects of chemical, physical and bacteriological parameters, neither do they understand the standard parameters against which health participation advice should be issued. Notwithstanding the experiences, if the tests are not carried out and advisories not issued, community members would involve themselves in the activities with the detriment that the poor quality offers, even if the assessed parameters on the first objective are assured conducive. This is because water clarity and environmental appeal do not ascertain good chemical and somehow bacteriological quality.

Paradoxically it has been noted that the poor chemical quality, especially nitrogen and phosphorous lead to enrichment of the waters and eutrophication will thrive. This will eventually lead to algal bloom and growth of aquatic weeds. The lake water would then be as dirty as that exhibited by the poor physical quality (color, turbidity, suspended and dissolved solids). Other than the local population, whose participation is otherwise dismal, the alien recreationists are unlikely to take part in adversely polluted waters. This is likely because alien ecotour alien get advice from tourism agencies or organizations on designated recreational areas before they travel to the sites. They also get branding communication from a variety of sources, which seldom exist in areas that have no experience with water-based recreation like Lake Victoria, Kisumu County.

3.4 Policy and Management Implications of the Study

At its simplest, Integrated Water Resources Management (IWRM) is a logical and appealing concept. It is a systematic process for the sustainable development, allocation and monitoring of water resource usage in the context of social, economic and environmental objectives (United Nations Development Programme, 2008). Growth in population, increased economic activity and improved standards of living lead to increased competition for, and conflicts over, the limited freshwater resource. This research's findings have demonstrated concerns of people's argument that the world faces impending water crisis. It is evident that water resources are increasingly under pressure from population growth, economic activity, and intensifying competition for the water among users. For purposes of efficient management of water resources, there is need to redirect focus on managing the existing resources rather than developing technological alternatives, whose sustainability put to test social, political and environmental significance. Also, there is the need to adopt the down-to-top sector approaches to water management, resulting in coordinated development and management of the resource.

Sectoral approaches to water resources management have dominated in the past and are still prevailing. This leads to fragmented and uncoordinated development and management of the resource. Moreover, water management is usually in the hands of top-down institutions, the legitimacy and effectiveness of which have increasingly been questioned. Thus, weak governance aggravates increased competition for the finite resource. IWRM brings coordination and collaboration among individual sectors, plus a fostering of stakeholder participation, transparency and cost-effective local management. Terrestrial ecosystems in the upstream areas of a basin are important for rainwater infiltration, groundwater recharge and river flow. Water-based recreation depends on the ecosystem. The ecosystems depend on water flows, seasonality. But ecosystems are threatened by poor water quality. Land and water resources management must ensure that vital ecosystems are maintained, and that adverse effects on recreational waters (as natural resources) are considered and where possible reduced when development and management decisions are made. IWRM can help to safeguard an "environmental reserve" of water commensurate with the value of ecosystems to ecotourism development.

3.5 SWOT Analysis: A Conclusive Presentation of Study Focus

This sub-section provides a conceptual summary of findings of the research through SWOT analysis. SWOT analysis has its origins in the 1960s (Suh & Nick, 2005), which is a simple yet useful planning tool to the 'Strengths', 'Weaknesses', 'Opportunities' and 'Threats' as part of a strategic planning process. In the planning process various factors influencing an operational environment are diagnosed in details. SWOT analysis is intended to maximize strengths and opportunities, minimize external threats, transform weaknesses into strengths and to take advantage of opportunities along with minimizing both internal weaknesses and external threats (Hong & Chan, 2010).

SWOT analysis can provide a good basis for assessment and strategy formulation, even though it is often left only at the level of pinpointing the issues and describing them in general terms. Shayesteh, Ghasemi, Mohammadi, and Ganjali (2014) reviewed the significance of SWOT analysis and concluded that it is used extensively as an assessment and planning method, particularly in tourism planning. Under the circumstances set up by this study results, SWOT matrix explains various scenarios in which strengths can been used to take advantage of opportunities; weaknesses can be used to capitalize on opportunities; strengths can be used to avoid or reduce the impact of external threats; and internal weaknesses can be used as defensive tactics to avoid environmental threats. Following the outcome of this study, strategic alternatives have been selected and summarized in the light of the strengths, weaknesses, threats and opportunities of recreational ecotourism in water resources within shore environments of Kisumu County.

Strengths:

- There exist favorable geographical position of Kisumu County which interconnects various counties and the entire East African region
- There is the great natural and cultural potential of the county
- Population's hospitality, the rich historical heritage, cultural traditions, customs, celebrations
- Wide selection of local foods and a variety of ecological and products

Weaknesses

- The already polluted lake water with infestation of aquatic weds and predators
- Underdeveloped infrastructure, especially in peri-urban and rural shore areas rural areas
- The laxity in designation of ecotourism destinations and brands has been hindrance to ecotourism development
- The weak economic environment does not encourage the development of ecotourism

Opportunities

- The yet-to-be planned waterfronts provides an opportunity for fresh planning for ecotourism development
- The strategic location of Kisumu county as a connection point for Western tourism circuit, and its strategic position in sharing Lake Victoria with Uganda and Tanzania provides it with the opportunity to grow its ecotourism industry.
- Cooperation with Uganda, Tanzania and Rwanda in other economic and political undertakings gives Kisumu County a good platform for sharing Integrated Water resources and basin Development network for ecotourism development.
- The increasing number of tourists visiting Kenya can be lured to ecotourism ventures once the weaknesses are overcome. The increase of the number of tourists who have ecotourism as motivation
- Improvement of the ecological shore environments can yield the possibility to enhance attractiveness of ecologically sensitive sites and sales of ecological water products
- Plans can be made to enhance waterfront environment (e.g. infrastructure, facilities, hygiene and sanitation) for waterfront development through the support of county, national and international governments

Threats

- Population pressure, contributing to the existence of hot spots caused by human wastes, urban runoff, and effluent discharges from such industries
- Nutrient inflows, including atmospheric deposition, causing a five-fold increase in algae growth, resulting in eutrophication and rendering the water unusable for recreation.
- Proliferation of water hyacinth at the near-shore areas resulting in biodiversity and economic losses. This is a threat to attempt to introduce recreation since the weed infests anywhere at any time, regardless of season.
- Difficulty in attempt to restore the polluted lake due to longer retention time of the shore waters. Additionally, the possibility of near-shore-environmental pollution worsening with time if integrated measures are not put in place through policy implementation
- Increasing international competition and the possibility of riparian states not implementing Integrated plans to salvage ecosystems degradation
- The deep rooted perceptions against water based recreational activities, coupled with the low population awareness about the environment and ecology is an issue that is not easy to deal with.

This SWOT analysis is useful especially in preparing for future scenarios and is economically justifiable in that ecological integrity can be enhanced while depletion and losses minimized.

4.0 General Recommendations

4.1 Management Hierarchies for Enhancement of Recreational Ecotourism.

4.1.1 Management Criteria

This study considers the need to construct hierarchies of management that encompass criteria which can be used to target water-based recreational transformation, especially where they have been dormant because of the physical status, pollution impacts and the resultant perceptions *(Figure 2).*

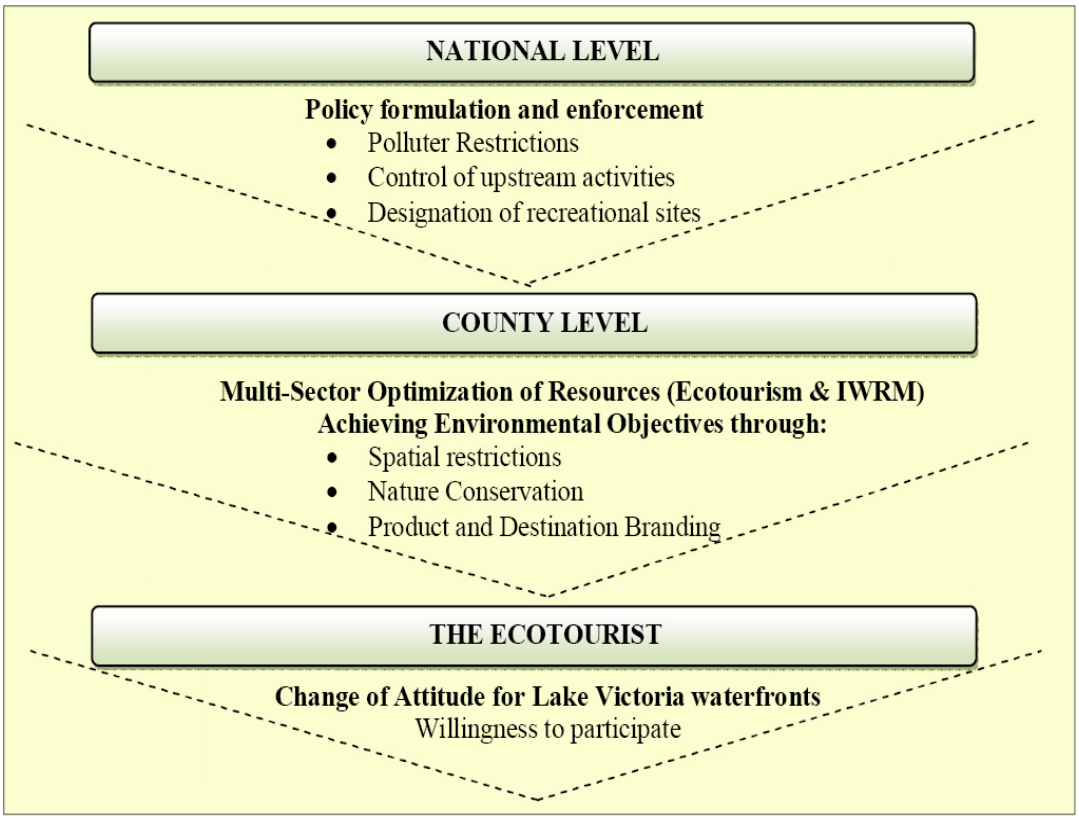

Figure 2: Proposed planning levels for sustainable approach to recreational activities

4.1.2 Levels of Capacity Development

The goal and vision to achieve sustainability of ecotourism, as observed in Lake Victoria, Kisumu County, requires a balance between conservation and use, and calls for the diversity of levels of planning. The author proposes levels of engagement that ought to be employed so as to culminate into enhancement of capacities. This will enable local communities and stakeholders to participate inclusively in environmental transformation. As such, areas can be simplified into System, Organization and Individual levels (*Figure 3*).

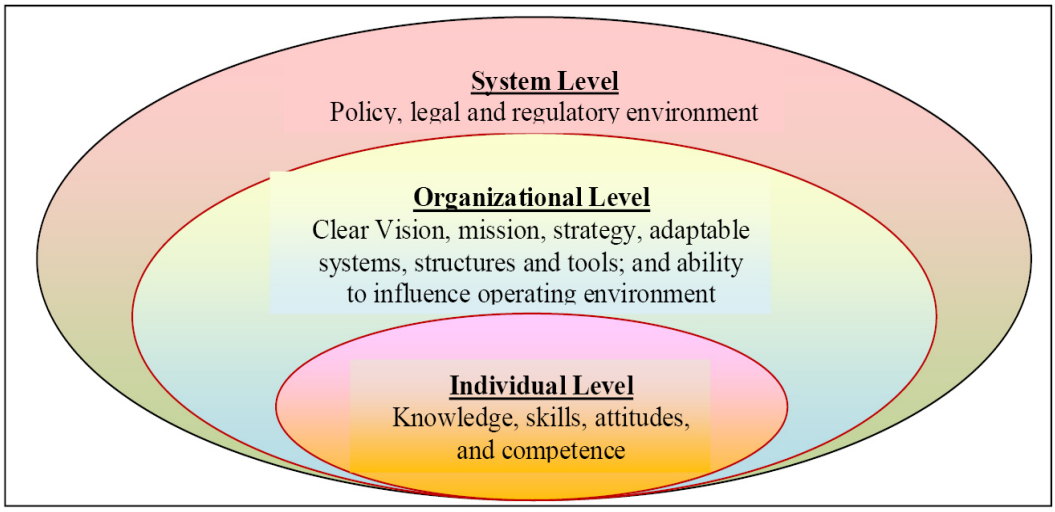

Figure 3: Levels of capacity development

Capacity development, for purposes of environmental conservation, thus consists of, but goes beyond individual and organizational capacity building, and encompasses the wider (system level) operating environment, including policy, legal and regulatory aspects. The System Level provides the enabling environment, which may facilitate or hamper their existence and performance.

At the individual level, capacity development refers to skills, experience and knowledge that are imparted to people (including small networks and groups) to become efficient and effective actors in an institution (i.e. the Beach Management

Units). Some of these capabilities are acquired through formal training, and others through experiential learning. At the organizational level, the aim is to develop an organization with a clear vision, mission and strategy; as well as adaptable systems, structures and tools; and the ability to influence its operating environment in a positive and strategic manner.

4.2 Planning Framework: Proposed Recreational Opportunity Spectrum Model

4.2.1 Introduction

As observed in the shore areas of Lake Victoria, Kisumu County, there exist various human activities, which are mainly geared towards livelihood development. However, little focus is directed towards ecological conservation perspective of ecotourism. From the level of site negligence, pollution, and risk perceptions determined by this study, the impossibility of enabling a shift from normal daily human activities to the transformation into ecotourism-sensitive behaviors, practices and experiences become an eminent fact that requires a planning model.

It is apparent that even if no efforts are made to transform behaviors towards ecotourism, the commercial part of the lives of the beach community will not be easily changed. This is because ecotourism ventures are leisure activities that, in the famous hierarchy of needs, come after fending for family basic needs among low income beach communities. It is these needs that make people settle at beach sites, set up businesses and engage in such activities as fishing, boating, and small scale trade. Though beaches remain the most significant recreational aperture for lake water masses, there may exist some conflicts of having to choose between ecotourism, and commercial and social livelihood as usual, because the mixing of both might be disadvantageous to the other. Specifically for ecotourism, which was the interest of this study, it is likely that the principle of environmental conservation might not be achieved if planning is not properly modeled.

4.2.2 Recreation Opportunity Spectrum Model

This model proposes that recreational activities should be limited within certain areas, especially in areas which are of environmental and recreational value. People's wish for peace and quiet together with nature conservation and environmental use should be the criteria for the selection of the areas with restrictions. Recreation, therefore, requires designation of spatial areas, which should be facilitated with appropriate infrastructure. This is not to say contemporary or artificially constructed facilities. As a key recommendation for this study it, therefore, necessitates zoning and development of recreation experiences - where areas are classified and divided after the environmental conditions and the recreational activities. This can be achieved through application of a planning framework where zoning is applied. But this framework must first be sustainable. A suitable model is Recreation Opportunity Spectrum (ROS) - oriented but with specific modifications to suit water-based ecotourism (*Figure 4*).

In the Recreation Opportunity Spectrum (ROS) planning model, landscape can be divided into factors which are considered to provide possibilities for different leisure experiences (Harshaw & Sheppard, 2013). The environmental conditions include qualities of physical landscape, social conditions, how landscape is used and managerial conditions met. Recreation Opportunity Spectrum incorporates this reasoning into an inventory and planning system by combining mixes of activities, settings, and experiences. Land and water in a planning area is put into one of the classes. The planner does not attempt to inventory experiences directly, but applies five indicator criteria to the setting where the experience takes place: remoteness, size of area, evidence of humans, user density, and amount and noticeability of managerial regimentation or control. These characteristics of the setting can be used to indicate the kinds of experiences the water based recreationist is most likely to obtain.

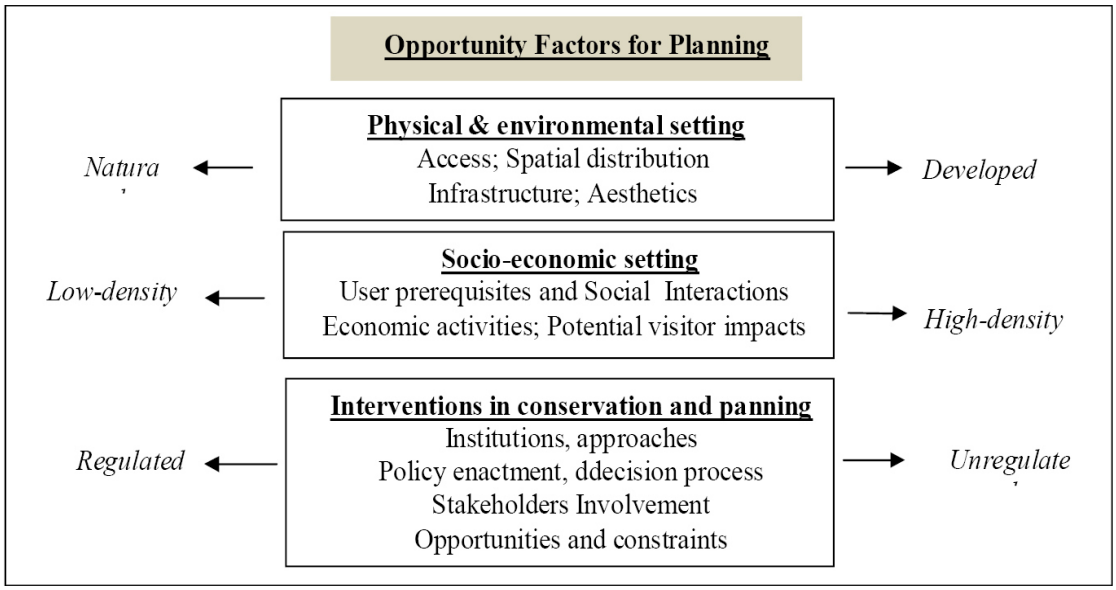

Figure 4: Recreation Opportunity Spectrum Model (Source: Adopted from Harshaw & Sheppard (2013)

Each Recreation Opportunity Spectrum class provides a set of experience opportunities that are a function of the kinds of settings (setting opportunities) available. In addition, each setting provides for appropriate recreation activities (activity opportunities). Appropriate is defined as activities which the resource can physically accommodate and sustain, and on the basis of the experience outcomes. Expecting solitude and isolation in an urban setting is usually inappropriate, for instance. The indicator criterion functions interdependently within the system to categorize the effects of the setting characteristics upon the experience opportunities. It is the manner in which Recreation Opportunity Spectrum categorizes the effects of setting characteristics on the recreation experience that markedly distinguishes Recreation Opportunity Spectrum from other recreation resource inventory systems.

Once the inventory of existing opportunities by ROS class is completed the planner may take a more detailed look at the areas within each class, assessing area attractions, maximum recreation capacity, or other items relevant to the issues, concerns, and opportunities being planned for. Mapping into Recreation Opportunity Spectrum classes provides an inventory on which areas of land and water can provide what kinds of recreation opportunities. All open shore areas of Lake Victoria in Kisumu County should be included in such planning inventory. The same can be replicated in similar places.

Planners and managers should be able to use this model to identify recreational opportunity trade-offs associated with structures proposed. Spectrum class to facilitate inter-agency and sector coordination should be able to identify gaps or overlaps in the provision of recreation opportunities. This approach may further enable agencies and entities to communicate descriptions of settings and activity opportunities, and facilities they contain. Such information may aid visitors to select settings that meet their preferences. The spectrum can be presented by elements that include**:** physical and environmental setting of waterfronts; socio-economic setting; and policy frameworks and management setting.

This planning model should be geared towards: (a) meeting demands of different environments for recreation; (b) attaining easier valuations of effects and consequences of socio-economic interests and recreation; (c) and putting management and policy on a behavioral foundation to make the recreationists' values more valid. With this model, shore area can be can be divided into factors considered to provide possibilities for different experiences: The environmental settings are qualities of physical landscape; social conditions are about how the landscape is used; and managerial settings are about administrative issues, policy enactments, achievements and constraints. The total of the factors creates a *spectrum*. This concept intends that users with different interests and activities should choose recreational areas which correspond to their preferences. The users have to be well-informed and make a choice to achieve their experience goals. Also, management should be part of a rational process to create concrete goals for various areas and have the means to fulfill the goals.

4.2.3 ROS's Simplified Planning Criteria

The Recreation Opportunity Spectrum model generates a simplified Planning Criteria. Planning criteria are short and concise statements that help establish sideboards and parameters for developing a specific type of planning document, and that can take a process. Prior to initiating a planning process, appropriate level of analysis should be determined. In a comprehensive planning process, the inventory of physical and biological resources should include all water-based recreation resources within the space being considered for recreation. Following is a brief discussion of each of the planning steps that can be used by planners. The steps have been adopted by the author from U.S Department of the Interior Bereau of Reclamation (2008, 2011).

Step 1: Scoping
A water-based recreational scoping process should consist of the following assignments:

- Identify significant water-based recreation-related public issues, management concerns, opportunities, and constraints
- Identify recreation stakeholders and develop a plan for collaboration
- Assess quality and quantity of best available recreation-related science and monitoring information;
- Identify and document all recreation-related policies, procedures, and guidelines, as well as applicable laws and regulations
- Identify those areas or times unsuitable for recreation use.

Step 2: Planning Criteria
To establish appropriate water-based recreational planning criteria, planners should accomplish the following tasks:

- Compile the applicable laws, regulations, policies, resource commitments, concession contracts, land use authorizations, maps, and existing plans;
- Assemble relevant professional planning principles;
- Identify long-term resource/administrative programs that may influence or limit recreation development;
- Define planning area, time horizon, available resources, procedural steps, and responsibilities;
- Develop a working base map and determine an appropriate scale of analysis.
- Designate the decision/planning criteria for evaluating alternatives, assessing recreational tradeoffs, and selecting the preferred alternatives;

- Identify other administrative units or projects that have similar recreation situations, uses, and patterns;
- Identify other resources that could be affected by recreation development, and plan mitigation measures if negative impacts seem likely.

Step 3: Inventory
Under Inventory, recreation planners should accomplish the following tasks:

- Conduct land and water resource inventory and assemble a base map that depicts the current type and location of recreation opportunities in a lake setting.
- Identify current and future recreation demand.
- Identify current and anticipated non--recreational use and users in the planning area, location, duration, type of effect, and anticipated changes.
- Compare current responses and social conditions with the desired quality standards.
- Map the locations of known or likely impairment.

Step 4: Formulate Alternatives
The basic goal in formulating different alternatives is to identify a variety of water and land uses and practices that will address the issues identified during internal and/or external scoping. The information collected during the inventory planning step is essential, as it will support and justify the management strategy and associated elements within each of the alternatives. In completing this planning step, recreation planners should, among other things, complete:

- A map generated in the inventory that depicts the current recreation management situation. This alternative is often referred to as the "no action" or "no change" alternative; and
- A matrix developed to highlight key differences and to ensure consideration of a reasonable range of alternatives.

Step 5: Evaluate Alternatives

This planning step requires a thorough evaluation and comparison of each alternative. The decision criteria identified in a previous planning are used to evaluate the positive and negative consequences or impacts of each alternative. In this instance, the planning criteria can also be considered "key indicators" to assess the degree of change from one alternative to another, in particular, to compare the no action (existing condition) alternative to the other alternatives.
During this planning step, recreation planners should complete the following duties:

- Analyze how the different recreation actions in each alternative will address the identified issues
- Determine how each alternative may affect the recreation experiences of visitors and the recreation spectrum of certain areas
- Assess how each recreation action may affect the physical and biological resources within the planning area.
- Determine if the changes to the recreation environment contemplated in each alternative meet public demand and user expectations
- Determine the economic consequences of various recreation-related management decisions contemplated during the planning process.

Step 6: Select Alternative

The preferred alternative should be the one that best meets the planning goals and objectives, falls within the established planning criteria, meets public demand, agency policies, and appropriate laws and regulations. The following are factors to be considered when selecting the preferred alternatives:

- Even if the preferred alternative consists of several recreation modifications to the planning area, it may not change the existing recreation spectrum or the recreation experience.
- The rationale for selecting the preferred alternative should be placed in the administrative record.
- The preferred alternative may consist of combinations of recreation management and administrative actions taken from any or all of the original formulated alternatives.
- The planning criteria can be used to justify the selection of the preferred alternative.

Step 7: Implement and Monitor

This step involves the implementation of both the selected alternative and the preferred recreational strategy proposed in the alternative. Monitoring is a vital tool to help managers learn from their efforts, be responsive, and make good changes during

implementation. The monitoring program need to cover important components such as: (1) monitoring selected guidelines at sample sites, and (2) monitoring the actual versus desired or intended water and land recreation opportunity and experience for an area

Step 8: Evaluate and Adapt

This is an ongoing step of assessing the information gathered by monitoring and taking steps to alter the management strategies to achieve the desired goals and objectives established in the planning document and to resolve any issues identified during the implementing and monitoring planning step. This planning step is an iterative decision-making process that requires managers to continually monitor their actions and make changes based on what has been discovered over time. Depending on the degree of change needed, this step could involve a simple plan amendment that can be completed internally or a major plan revision that may necessitate further scoping, data collection, and external public involvement.

4.3 Planning Framework: Proposed Levels of Progressive Maturity of Recreational Ecotourism Development

The author proposes levels of progressive maturity with specific attributes of strategic orientation towards opportunities of recreational ecotourism in water resources (*Figure 5*).

This model proposes five levels: Basic, Proactive, Flexible and Progressive. The first level should make attempts to introduce short-term measures (e.g. beach cleaning exercises). The second level is the stage where strategies, policies and objectives are not yet fully defined. On the third level structured process for formulation of strategies and policies are put in place. The fourth level involve strategic planning process, which entail analysis of community needs and expectations, including stakeholders' expectations (especially polluters and direct lake users). Finally, the fifth level entail the achievement of multi-sectoral optimization of ecotourism concept and Integrated Water Resources Management – in which recreation thrives for social pride and economic gains.

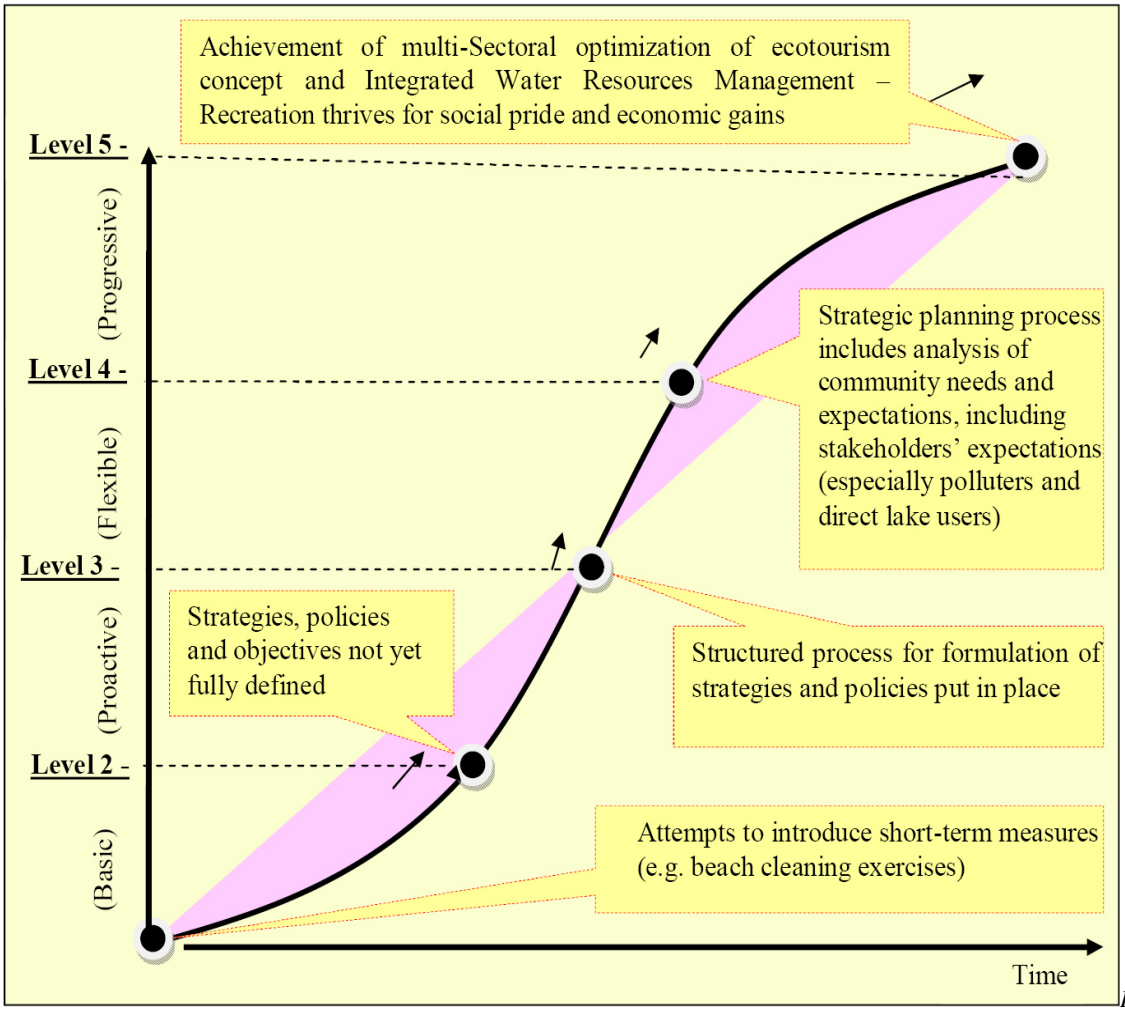

Figure 5: Proposed Levels of Progressive Maturity of Recreational Ecotourism Development (Source: Author's formulation, 2015)

4.4 Dummy Checklist for Pollution Control within Recreational Water Environments

Based on the study findings, it was important to provide a criteria specific for pollution control. This is for purposes of determining sources and mitigating impacts of pollution that were observed by literature to result into loss of biodiversity and by results to be responsible for multiplier effects. The effects, such as reduced levels of participation due to realities, and potentiality of risks, is left unattended to, would eventually lead to low ecotourism development in affected areas. This section presets proposed approaches that enable the check and balancing of recreational water pollution so that they would only occur within recommended levels.

Define the recreational area

- A map that shows the depth of water and currents at each beach;
- The quality of the waters of interest and the time and immediate history relevant to the measurements
- Usage, particularly number of recreationists**;**
- Information on the dilution, dispersion and attenuation of discharges in the recreational waters; information on currents and stratification, temperature, light intensity;
- Previous events relating to the water body that led to closure or illness;
- The significance of the recreational water body, its importance to the community, and community reaction to the water being unsuitable for recreational use.

Identify contaminant sources and assemble relevant information

- Determine, in the relevant catchment:
  - Where pollution discharges may arise from
  - The contaminants that may travel to the water body
- Identify all possible sources of potentially significant contamination so that information gathering can focus on these sources

Likely to be most significant:

- Number of recreationists, Wastewater discharges, major centres;
- Local sewage discharges, Urban development, stormwater runoff;
- Farming, grazing, intensive animal husbandry; Storm events causing high pollutant load; Native animals near waterways; and Algal blooms.

Discharge of stormwater

- The location of urban areas and their main storm water drainage systems that lead to the recreational water body, including storm water retention basins and their storm capacity.
- The location and type of storm water treatment, where relevant.
- The frequency and duration of storm events and the flow rate and quality that results, including any information on the first flush.

Discharges of municipal wastewater

- Information on the sewerage system, particularly where common effluent drainage systems may exist, and information on the frequency and location of overflows from the sewerage system and failure of pumping system.
- The location of dry weather discharges which have a significant potential for contamination, such as discharges from wastewater treatment plants and from broken pipes, and the level of treatment before discharge.
- Areas where reuse of wastewater occurs and situations in which run‐off from these areas may occur.
- The presence and location of any illegal connections from sewerage to stormwater systems.

4.5 Decision Trees for Recreationable site location and Water Quality examination

The author proposes a process in the format of a decision tree, as a guide for recreationable site location (*Figure 6*).

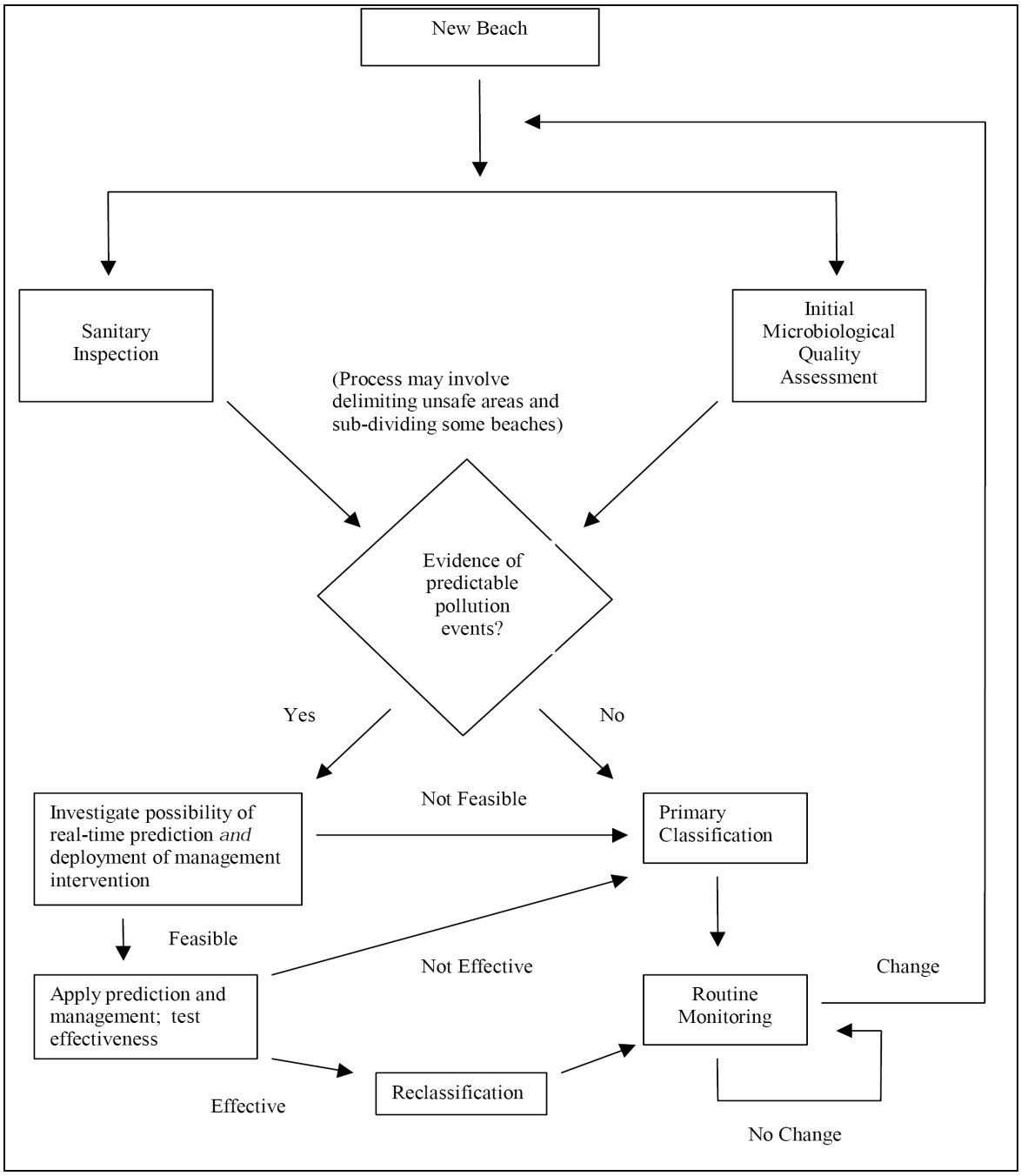

Figure 6: Process Model for Recreationable Site Location (Format adopted from WHO (1999)

The author further proposes a process in the format of a decision tree, as a guide that will lead to grading of a recreational water body (*Figure 7*).

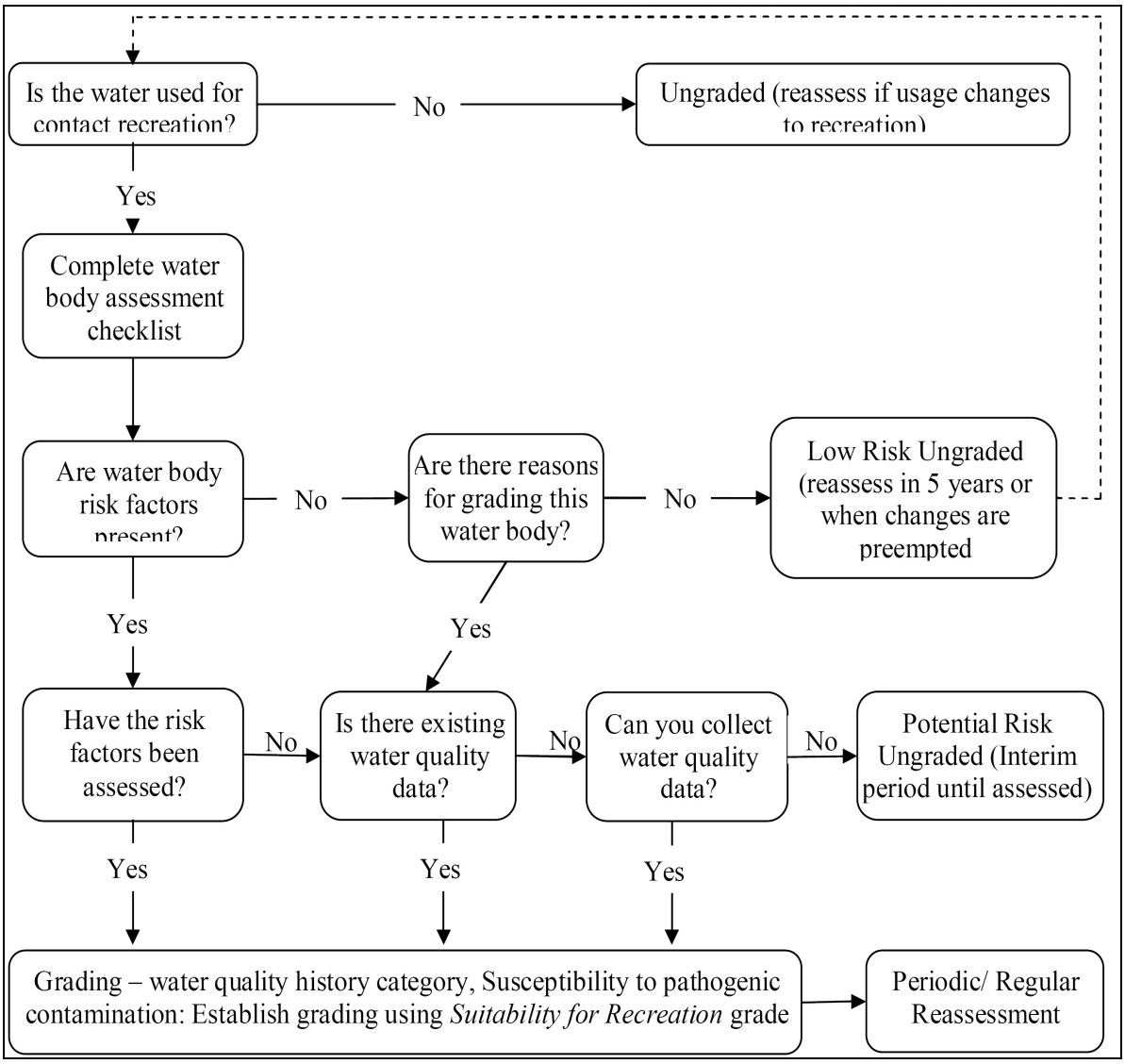

Figure 7: Decision Tree for examining water quality for recreationable sites (Format adopted from (Australian Government (2008)) and formulated by Author).

5.0 Specific Recommendations Based On Study Objectives

A number of objective-oriented recommendations have been preferred, based on the findings of the study, discussions and conclusions. On the observable status of beach waters and recreational activities , before declaring a beach or any waterfront a designated recreational activity zone, there is need to enhance hygiene and sanitation situations at their neighborhoods. The beaches should be developed with facilitative infrastructure and designated recreation zones. Features that occur naturally, and that are ecologically sensitive, should be preserved at every beach then protected from destruction or over-exploitation. This should be dome with the view that the features are additive attractions to recreationists. There is need to promote an Integrated Water Resource Management Framework for upstream activities, beach area residents and beach water users so that each category of these stakeholders has a clear understanding of the rationale for ecotourism. Appropriate hygiene and sanitary behaviour should be promoted among people living around beaches. The people should be sensitized for behaviour change within every beach settlement regardless of the magnitude of recreational activities or ecotourism experiences that can be claimed in those areas. Fishing and boating competitions should be encouraged. Other ventures that are still unpopular like sunbathing and camping should be encouraged by setting up traditional fixtures as facilitative structural facilities. Because swimming has not been quite viable in every beach, it is important that zoning and branding processes be initiated.

On water quality and pollution on recreational waters, the pollution sources should be suppressed through enforcement of existing environmental policies. The sources of hazardous chemicals should be mapped out and pre-treatment processes enforced prior to effluent discharged into the recreational waters. Appropriate farming techniques should be encouraged with a view of controlling nutrient-rich agricultural wastes being transported to the recreational water bodies. The study recommends planning and implementation of infrastructure augmentation and site sanitization, including public sensitization programmes; cooperation among locals, polluters and authorities with an aim of enhancing responsibility towards

sustainability of safe recreational waters; enhancement of institutional capacities so as to enable them respond to pollution prevention policy; image and destination branding of the sites, including designation of beaches for recreational activities. When the geometric mean exceeds 200 E.Coli/100 mL or in the event of a known hazard or spill, an immediate assessment should be made to determine the possible health risks and the most effective approach to protecting the health of recreational water users.

Finally, on risk perceptions and community participation in the recreational activities, local community around recreational waterfronts should be assured of their safety against the fear and perception that hold them from participating in swimming, boating, fishing and sunbathing. This can be ensured by working together with communities to participate in the mitigation against all ecological risk factors. Local community members should also be sensitized to understand and pursue the benefits of ecotourism.

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