



CONSERVATION & DEVELOPMENT STRATEGY FOR DEGRADATION OF WETLAND ECO-SYSTEM: A CASE OF KORALAIPATTU DS DIVISION IN BATTICALOA

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Abstract

The case study in this paper highlight, the many ways in which wetlands support and improve the lives of this study area people in koraliapattu DSD of Batticaloa district. In writing this paper's main objective on research need to identify the core issues in this wetland eco-system. Therefor assume conservation & development strategy for sustainably protect Wetlands ecosystem in this study area. Wetland are one of world's most important environment assets, containing a disproportionately high number of plant and animal species compared with other area. Wetland eco-system have been integral to human survival and development of people livelihood. Wetland provide a range of resources, but there are limits to which they can be exploited. This wetland resource help to Successful income-generating activity. This research rely on both quantitative and qualitative data. This paper fundamentally based on primary research methods such as field survey, direct observation, questionnaire survey and interview with local people to obtain data. Through this research and innovative ideas, it would be easier to provide appropriate information for conservation & development strategy for degradation of wetland eco-system. 6.7% area represented wetland in Koralaipattu DSD with a physical and human environment. As well as wetland area represented 16.06 sq.km in Batticaloa district. According to this study can be found more than 26% people livelihood depend on this wetland ecosystem. The wetland also suffered further damage as people exploited its other resources to replace those they had lost. As population increase and people need more food and water or aspire to having more money, the demands on wetlands escalate. To ensure the future of wetlands and sustain the many benefits they provide to local communities and the growing population. Improving the livelihoods of regional people. Approaches will change as people's needs change. The best conservation & development strategic approaches will be inclusive, negotiated and flexible, empowering local people to conserve wetlands in their own landscapes, to the benefit of both current and future generations.

Keyword: wetland eco-system, conservation, development strategy, sustainably, exploitation

1. Introduction

The term "Wetland eco-system" define wetlands are transitional areas between land and water. According to the Ramsar conservation on wetlands; Wetlands are areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters. Wetlands are among the most productive ecosystems in the world. Today, we know that wetland provide many important services to the environment and to the public. They offer critical habitat for fish, waterfowl and other wildlife, they purify polluted waters, and they help check the destructive power of floods and storms. They also provide a variety of recreational opportunities such as fishing, hunting, wildlife, and agriculture. As these and many other wetland functions and values described below have become more widely known, wetlands are increasingly seen as productive and valuable resources worthy of protection and restoration. A major threat is the draining of wetland for commercial development, including tourism facilities, or agriculture land. In addition, unwise use of freshwater to feed these developments poses a further thread. Climate change is also taking its toll. Increase in temperature are causing many problem will occur. There are three type of wetland can be identify in koraliapattu DSD region: Inland nature fresh water wetlands (along with valaichchenai lagoon), marine and salt water wetlands (North part of koralaipattu-coastal region), and man-made wetlands (for shrimp product) therefor can be identify marsh &



mangroves. About 7802 ha extent of the total surface area of this region (116,033 ha) is covered by wetland and they are unique transient ecosystem. A majority of the wetlands in srilanka are facing various threats that are posed by harmful human activities. In the eastern province more than 90% of the wetland is located in Batticaloa (CEA, 2009). More than 6430 fishers depend on wetland fishery for livelihoods and food security. And also some wetland areas destroyed for some industrial purpose because particular study area established under the tourism region. So many recreational activity & after tsunami resettlement projects also done by filling wetland in this area.

This study area is located in the east latitude of 7° 55' 42" N and north longitude of 81° 33' 42" E in the Eastern part of Batticaloa district, Srilanka. Which is obtained rain from north east monsoon during the period November to February. The mean annual temperature varies from 25° C to 35° C. The maximum temperature averages around 32° C. The warmest time period of the year is recorded from March to May and the minimum temperature is recorded in November /January. The annual average rainfall variation within this area. This study area include five major DS division. There are:

Table 1. GND, extents (ha) and Population of Koralaipattu DS division

DS Division	GN Divisions	Extents(ha)	Population
1. Koralaipattu (KP)	Nasivanteevu, Pethalai, Kalkuda, Karuwakerni, Chunkankerni, Kinnaiyadi	3109	23,376
2. Koralaipattu west (KPW)	Oddamavadi	2502	22,182
3. Koralaipattu north (KPN)	Uriyankaddu, Kattumurivu, Mathurankernykulam, Kirimichchai, Kathiraveli, Paalchenai, Ammanthanaaveli, Kayankerni, Panichchankerni, Vattavan, Mankerny South, Puchchankerny, Punanai East, Vakara North, Mankerny Central	50988	2537
4. Koralaipattu center (KPC)	Punanai East 282, Thiyavedduwaan	324	25,687
5. Koralaipattu south (KPS)	Kallichchai, Punanai West, Santhiveli, Thikiliveddai, Vadamunai, Uthuchenai, Kiran West, Vahaneri, Perilaveli, Muruthanai, Koraveli, Poolakadu, Kudumbimalai	59110	26,143

Source: Planning Branch, Kachcheri, Batticaloa (2016)

6.7% area represented wetland in Koralaipattu DSD with a physical and human environment. As well as wetland area represented 16.06 sq.km in Batticaloa district. There are three major lagoon consist in Batticaloa district, which are Valaichchenai lagoon, Vakara lagoon and Batticaloa lagoon. The Valaichchenai lagoon is the major physical feature in this study area. The length of Valaichchenai lagoon around 15km. which is very useful this village people, because some of the people livelihood depend on this lagoon. So this lagoon mainly use to inland fresh water fishery and agriculture activities. The wetland is highly productive for inland fresh water fishery and rich in biodiversity. Extensive mangroves & marsh are found around the estuary while extensive beds are also a feature of this region. Numerous areas of freshwater swamps are found along with dry scrublands. Fresh water in mostly use for irrigation purpose for agriculture land. Not only the rice production more probably doing corn and vegetable production. Land degradation, land filling, land reclamation, water pollution and degradation of wetlands are threatening the biodiversity and hydrological function of the wetland. Several small irrigation



infrastructure are used for rice cultivation and a few aquaculture ponds (shrimp pond) have been constructed in Koralaipattu DSD. Farming shrimp production in Batticaloa district in 2009 was 19,600kgs. Mainly our study area have shrimp farm production are: Koralaipattu North (KPN), Koralaipattu South (KPS), Koralaipattu (Valaichchenai), (NARA, 2007). Farmed shrimp export account for approximately 50% of total export Earnings from Srilankan fisheries. More than 90% of the harvested cultured shrimp are exported to Jappan, USA and European Union (FAO, 2004).

Even though this wetland eco-system providing more economic benefits, social well-being and standard of living. Sustainability of wetlands depends largely on the dynamics of water supply and loss. The ecosystem function of a wetland is dependent on its biogeochemical processes. There are some negative challenches have been identified in the study area. The study are facing more problem. Such as: climate change, flooding, biodiversity, environment degradation, Invasive species, Pollution, etc. Therefore this study area has been conducted to identify the core issues and find the suitable solution as well as development strategy for the identified issues. There is a main objective and a sub objective lead the research:

- **The main objective** of this study is identify the core issues in this wetland eco-system. Therefor assume conservation & development strategy for sustainably protect Wetlands ecosystem in this study area.
- **Sub objectives**
 - To use the wetland resources in this area to be balanced as to improve the living standards of the people and reducing the environment issues.
 - To analysis the ecological & socio-economic benefits of this wetland ecosystem as well as to find the native and diverse effect on society.

Managed wetland resources carefully, protect these resources sustainably for future generation. Which is help to reduce the core challenge on this wetland ecosystem.

2. Literature review

This research mainly focus on “wetland eco-system” in koralaipatru DSD of Batticaloa. There are some books, journals, publications, research article have been updated regarding the wetland and the conversion. But this study only concern about this study area. So this study mainly focused to fulfill the gap of contemporary need of the study in this selected wetland eco-system.

The publication has been jointly prepared by the Central Environmental Authority (CEA), The World Conservation Union (IUCN) in Sri Lanka and the International Water Management Institute (IWMI). The preparation summarized a book title “National Wetland Directory of Sri Lanka” (2006). It’s mainly focused on the national wetlands. As well as the overview of the Srilanka’s wetlands. The main objective of this book to identify overall Srilanka’s wetland eco- system and their Physical features, Ecological features, Land use, Possible changes in land use, Hydrological and biophysical values, Social and cultural values, Scientific research and monitoring, Conservation, Recreation, Disturbances and threats. So this book refer overall Srilanka’s wetlands. But this study area focused only this particular region.

3. Materials and Methods

This research rely on both quantitative and qualitative data. This paper fundamentally based on primary research methods such as field survey, direct observation, questionnaire survey and interview with local people to obtain data. Through this research and innovative ideas, it would be easier to provide appropriate information for conservation & development strategy for degradation of wetland eco-system.

Focused group discussions with key stakeholders such as local residents and community based organizations. Two type of different focus group interview were held among wetland based stake holders and area related people. By promoting various forms of wetland ecosystem conservation with different strategies to reduce core challenge and conserve wetland sustainably. Many researchers concluded successful ideas about wetland ecosystem. Therefore secondary data; such as books, report, journals, publication, article and internet sources have been used for wetland eco-system related study. Further, the data been tabulated and analyzed by Excel 2016 software for systematic



analysis, create some graphical representation features and Data base management system (DBMS) to store the data. Google earth image have been used for the identification (Arial view of study area), analysis the changes through the land use by period of time and spatial information and integration of map and for the identification of special information for the study.

The study area is Koralaipattu Divisional Secretariat Division (DSD). The total population of the Koralaipattu DSD is 99,925 through field observation and survey ten people have been identified for running survival. This region people affected through the issues in this wetland ecosystem. There for according to the stratified random sampling method 150 questionnaire issued among this study related people with the help of GS officers. The systematic survey made with one person per household. And identifying one person is a chance to find another one through snowball sampling method. In this case all data have been analysis by Enumeration technique.

4. Result and discussion

Wetlands typically offer a wide variety of benefits to society and they have played a vital role in people economic development throughout history. Wetlands are degraded ecosystem, changing naturally over time as a consequence of processes such as erosion, sedimentation and coastal flooding. However, human activities, and accelerate the rate of change, threatening the wetland's continued existence. While threats vary between regions and even within wetlands, agriculture is considered to be the most significant. This is partly due to the scale of wetland agriculture, which has increased dramatically in recent years and damaged wetlands across the world. But it is also due to its nature: many wetlands have been extensively and irreversibly modified as humans try to increase agricultural productivity. Other impacts include diverting water via irrigation canals and the over extraction of water for intensive agriculture. Fertilizers, pesticides and other agrochemicals can pollute the water in a wetland. Agriculture is not the only activity that damages wetlands. Populations around wetlands often grow quickly, leading to pressure on natural resources. Population predicted to continue rising, human demands on wetlands are likely to increase further. Urban development and water extraction for industry can also have extreme impacts on wetlands located downstream. Climate change is also expected to escalate the pressure on wetlands. More variable rainfall could affect the natural replenishment of many wetlands. Since the study is based on can be found wetland eco-system facing variety of threads. Such as:

4.1. Ecological threads of Wetlands ecosystem

This wetland ecosystem high ecological sensitivity of this region. Wetland ecosystem services improve water security, including security from natural hazards and climate change adaptation. But now wetland affected under the more threads. Through this study can be identify many ecological threads in this study area.

- I. Affected the quality and quantity of water flowing downstream.
- II. Climate change
- III. Loss of bio diversity
- IV. Land degradation & land filling
- V. Pollution of inland Water bodies
- VI. Wetland agriculture damage
- VII. Flooding threads
- VIII. Loss of soil fertility
- IX. Endangered fish species

If compared wetland with another ecosystems, wetlands are one of the most productive ecosystem in the world. With greater species diversity nutrient recycling and niche specialization than most other ecosystems. Wetlands are particularly important providers of all water-related ecosystem services. Our responsibility to protect wetland ecosystem. Therefore, that need to be preserved and protected for further development with population growth. As well as these areas are identified for the degradation due to the high accessibility of people.

After the civil war 2009 most of the wetland region distorted for the purpose of development activity (road, buildings), grazing, agriculture activities, dumping, draining, diverting flow, devegetation. In these over use of



wetland ecosystem lead to many threads for ecology. These lands were classified according to the previous use. Koralaipattu north some agriculture lands were abounded. Both paddy and high land crops were in the region under the abandoned agricultural lands were identified. These lands abandoned mainly due to sea water intrusion. These are the some ecological threads were identify in this study area.

4.2. Degraded wetland ecosystem & socio-economic relationship

Wetlands have played an important part in people economic development and are of significant religious, historical or archeological value to many cultures around the world. They are also often inviting places for popular recreational activities including hiking, fishing, bird watching, photography and hunting. Wetlands provide a range of resources, but there are limits to the extent to which they can be exploited sustainably. Successful income-generating activities may prove unsustainable if a wetland is too small to support the local population. Fig 1. Indicate Valaichchenai harbour, This harbour help to manage the fishery product in this region and fishery economic.

Some companies lead to import the fishes to colombo and another urban region. In this case harbour is a vital palace in this fishery economic in this region.

The relationship between people and wetlands must be central to wetland. Local communities may want to increase fishing and agriculture in and around a wetland to supplement their income and food supplies; larger businesses may see the potential for generating income from more intensive agriculture; while local governments may be considering the land’s economic value. Following table & figure show wetland based livelihood occupation of kaoralaipattu DSD:

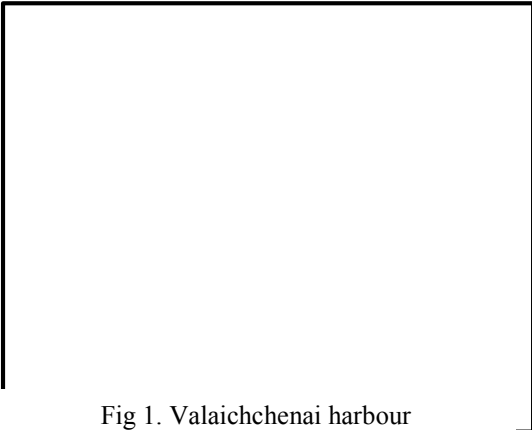


Fig 1. Valaichchenai harbour



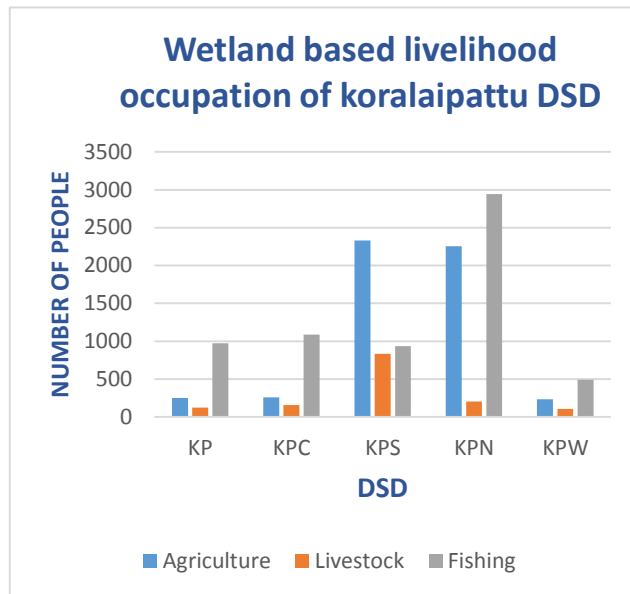
Source: field survey

Table 2 and fig 2: Wetland based livelihood occupation of kaoralaipattu DSD

DSD	Agriculture	Livestock	Fishing
KP	250	124	974
KPC	257	158	1088
KPS	2331	832	936



KPN	2254	204	2943
KPW	234	106	489



According to this data 5326 people depend on agriculture, 1424 people depend on livestock and 6430 people doing fishing. And also Can be see this diagram show KPN, KPS both region highly in economic activities, because which regions highly representing of wetland resources. So if this wetland degrade socio-economic will damage and pollution will increase because people don't seek the wetland environment. Water flowing into the

wetland leading to a decline in fish populations and reducing the socio-economic potential and causing severe damage to

Source: Planning Branch, Kachcheri, Batticola (2016)

livelihoods and increased poverty; as a result, the population declined as people moved to nearby towns finally we will face more crisis from environment.

The wetland also suffered further damage as people exploited its other resources to replace those they had lost. The capacity of valaichchenai Lagoon, a naturally shallow coastal lagoon in this study area, is reducing as it fills with sediment washed downstream. The large number of people living nearby increases this sedimentation, as untreated sewage is dumped in the lagoon. These processes affect the lagoon's long-term productivity, in terms of the water and fish it can provide. The dense population also puts pressure on the wetland.

4.3. According to the analysis of secondary data

According to the analysis of secondary data, there are other areas besides the currently protected areas that need to be protected. These areas have to be protected to ensure the protection of biodiversity and economic sites and the protection of environment. The approximate extents of the additional areas that need to be protected. Given in the Table and figure shown Wetland distribution and their DSD locations given bellow:

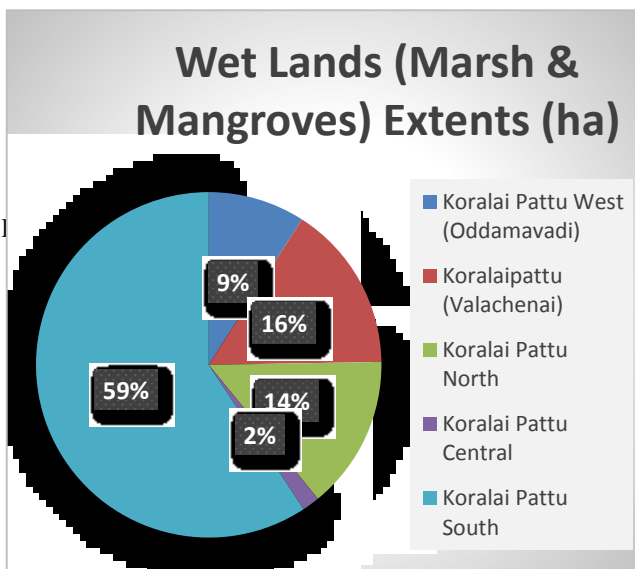
Table 3 and fig 3: Wetland distribution and their DSD locations

DS Division	Wet Lands (Marsh & Mangroves) Extents (ha)
Koralai Pattu West (Oddamavadi)	42.9
Koralaipattu (Valachenai)	74.03
Koralai Pattu North	68
Koralai Pattu Central	7.69



Koralai Pattu South	280.16
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There are several water bodies in this study area including reservoirs, major and minor tanks, lagoons, rivers and streams. The distribution of the water bodies are shown in the Table 4. . . . Shown distribution of water bodies are their used for irrigation & another economic purposes.



Source: Updated Land Use Map of Batticaloa

Koralai Pattu West (Oddamavadi)	2	1	2
Koralai pattu (Valachenai)	8	6	1
Koralai Pattu North	87	-	-
Koralai Pattu Central	3	1	-
Koralai Pattu South	65	1	-
Total	165	9	3

Source: Planning Branch, Kachcheri, Batticola (2016)

4.4. According to the analysis of primary data



Source: field survey

I. Human influence on wetland eco-system

Filling and dredging wetlands for houses, commercial buildings, roads, waste disposal sites, and other construction projects. Paving large areas with asphalt and concrete increases the rate and amount of surface runoff which increases the likelihood of flooding. Development can also cause fragmentation of large wetland systems. For example, road crossings disrupt the continuity of a system and adversely impact wildlife. Numerous, small impacts to wetlands within a watershed can add up to a significant cumulative loss. These all occur by human activities. According to this study can be found more than 26% people livelihood depend on this wetland ecosystem. The wetland also suffered further damage as people exploited its other resources to replace those they had lost. As population increase and people need more food and water or aspire to having more money, the demands on wetlands escalate.

So, humans are having a negative impact on wetlands. Even land development has resulted in wetlands being cleared or eroded. This causes the actual chemical makeup of wetland to be altered, which results in an entire ecosystem being thrown off track. Then, there is waste dumping that pollutes the wetlands, greatly most of the wetlands represent within koralaipattu south DSD. So affecting the life forms that depend on it to live. When humans use wetlands for agricultural drainage, the wetlands are also negatively affected.

- Agricultural activities - ditching, draining, and clearing wetlands for farming.
- Pond and another construction - diking, excavating, and flooding wetlands for water supply, flood protection, recreation, and other purposes. Some shrimp ponds constructed in Karalaipattu area. These activities lead to some threats to environment.

II. Degradation of wetland & Land degradation

Koralaipattu DSD region developed after the civil war 2009. More development activities occurred in this region. Human activities cause wetland degradation and loss by changing degrade of land. These change occur when wetland ecosystem are disturbed and/ or non-native species are introduced to a habitat. Pollution from pesticides, heavy metals, sediments, domestic sewage, and fertilizers discharged



from a variety of point sources (e.g., direct discharges from industrial complexes) or nonpoint sources (e.g., runoff carrying road salt from highways) degrade the quality of wetland and land fertility.

Land degradation is caused by human activities that pollute or degrade the quality of soil and land utility negatively affecting food production and provision of other ecosystem good and service. Agriculture and livestock production (over-cultivation, overgrazing, and forest conversion), urbanization, deforestation and extreme weather events such as droughts and coastal surges which salinity land. Desertification, is a form of land degradation, by which fertile and become desert.

III. Loss of bio diversity

This study area is endowed with rich biodiversity. Can be found varies species in earlier period of time. But now most of the species distorted. Which is threatened by increasing population and expansion of the human activities directly effected on wetland. More specifically negative impact on biodiversity can be seen by various factors. Coastal area is an environmentally sensitive which lay between the land and sea characterized by a very huge amount of biodiversity. They include some of the richest and most fragile ecosystems on earth, like mangroves and coral reef.

- Very beneficial mangrove forests and sea grass meadows have been removed to create open beaches for develop the tourism region.
- Development based recreational figures and other structures have been built directly on top of biodiversity
- Nesting sites for endangered marine turtles have been destroyed and disturbed by large numbers.

It's also said that these types of environmental changes and livelihood of the people of the region was not present at the earliest time, There were more wildlife species could be able to encountered such as Peacock, Deer and sparrow Butterflies, small birds, fresh water fish, dragonflies, and some plants. This made the clear idea that the most significant environmental impact occur.

Wetlands are among the most bio-diverse ecosystem types. They are home to a very diverse range of animal and plant species which live permanently in wetlands or rely on wetlands for at least part of their life cycle. They are particularly important for migratory species, especially migratory waterbirds. Because of the threats to wetlands they support a disproportionate number of high conservation priority species.

IV. Water quality & quantity

Wetlands improve water quality in nearby rivers and streams, and thus have considerable value as filters for future drinking water. When water enters a wetland, it slows down and moves around wetland plants. Much of the suspended sediment drops out and settles to the wetland floor. Plant roots and microorganisms on plant stems and in the soil absorb excess nutrients in the water from fertilizers, manure, leaking septic tanks and municipal sewage. Wetlands act as natural water purifiers, filtering sediment and absorbing many pollutants in surface waters. In some wetland systems, this cleansing function also enhances the quality of groundwater supplies.

Human activities cause wetland degradation and loss by changing water quality and quantity. One of the most important benefit that wetlands provide water quality. When healthy, wetlands have a rich natural diversity of plants and animals. Theses can act as filtering systems, removing sediment, nutrients and pollutants from water. When a wetland functions properly, it provides water quality protection, fish and wildlife habitat, natural floodwater storage, and reduction in the erosive potential of surface water. A degraded wetland is less able to effectively perform these functions. For this reason, wetland degradation is as big a problem as outright wetland loss, though often more difficult to identify and quantify.

V. Waste disposal on wetland & Pollution of inland water bodies

River, lagoon and village lowland often services sinks for village waste. For example, the wetland takes up the effluents waste from oddamavai, which is a developing village, while toxic chemicals from industrial and organic waste including sewage are often released into village water causes. In this case inland water bodies polluted. Most human waste, like animal waste, consisted of organic materials and



could simply be scattered and left to decompose and return to soil. It has only been fairly recently that waste produced by human has grown to such epic proportion that it has become an environmental and social problem.

The activities of municipal solid waste (MSW) department of koralaipattu DSD in Batticaloa manage the waste disposal properly. This activities not regular because some urban area only include in this waste management, rest of the parts wastage disposal not regular process. So in this cause some wetland area fill up by waste dump.

5. Conclusion

The case study in this paper highlight the many ways in which wetlands support and improve the lives of this area people of koralaipattu in DSD, Batticaloa. They are often the main source of food water and another economic resources for this regional people living nearby, or act as a safety net during hard times. In other places, wetland resources are providing a source of income to help people survival. But the many threats facing wetlands are not going away and in many places are intensifying. As populations increase and people need more food and water or aspire to having more money, the demands on wetlands escalate. Many have already been lost or irreparably damaged, and many more are under threat. To ensure the future of wetlands and to sustain the many benefits they provide – to local communities and the wider population – we need to put people at the center of thinking about wetlands. Improving the livelihoods of regional people. so that their opinions, needs and knowledge or researches help to form policies and management plans. The best management approaches are those that allow for competing uses of the wetland’s services to continue, but only to the extent that they do not degrade the wetland and lead to the services being lost.

Approaches will change as people’s needs change. The best conservation & development strategic approaches will therefore be inclusive, negotiated and flexible, empowering local people to conserve wetlands in their own landscapes, to the benefit of both current and future generations.

Conservation & development strategy for preventing and reducing degradation of wetland eco-system

- Coordinate divisional secretariat plans and projects with an impact on the wetland.
- Approve the delegation of responsibilities to other management organisms.
- Prepare the internal regulations of the other management organisms.
- Tracking and control of plans and projects carried out in the area.
- Provide economic incentives for the popularization of conservation farming; these could include fiscal measures, provision of services.
- Provide incentives and technical and other assistance for integrated farming in agriculture, and support research on such activities under conservation & development.
- Re-establishing wetland functions; and monitoring of enhancement, restoration, and creation activities to ensure success.
- Improvements in land and tree tenure, training and awareness creation, etc

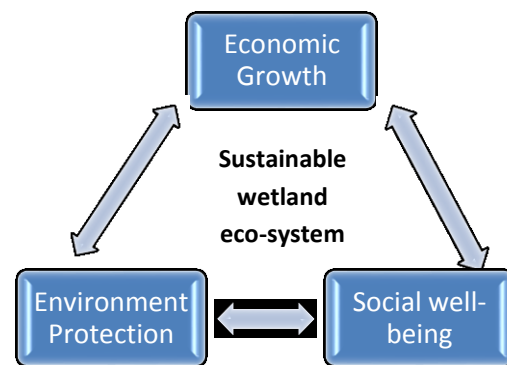


Fig 4. Diagram of sustainable wetland ecosvstem

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