“THE CRITICAL ANALYSIS OF THE POTENTIAL OF THE SOUTH OROPOUCHE WETLAND BASIN AS AN ECOLOGICALLY ECONOMIC HUB

1.0 Background

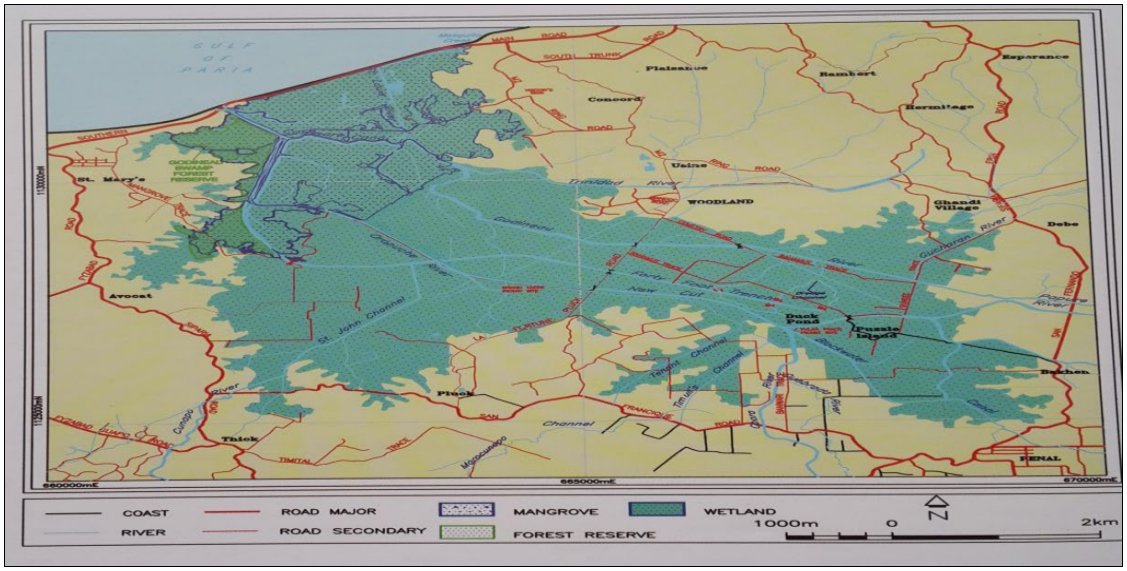
The uniquecombination of aquatic and terrestrial conditions results in these ecosystems being the most complex in the world. The Convention on Wetlands of International Importance, commonly called the Ramsar Convention (1971), to which Trinidad and Tobago became a signatory in 1993, defines wetlands as *“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 metres”*.

Godineau Swamp

The Godineau Swamp also known as the South Oropouche Wetland Basin or South Oropouche Swamp or the Oropouche Lagoon is located 5.5 kilometres Southwest of San Fernando between Freeman Bay and the Mosquito Creek.

The geographical boundaries of the Oropouche Lagoon are illustrated in Figure 1below:

Figure 1: Geographical boundaries of the South Oropouche Wetland Basin



1.1 Problem /Issue Definition

The severe degradation has led to dramatic losses of fertility of the South Oropouche Wetland Basin and a drastic reduction in the economic potential of this once thriving ecosystem.

1.2 Rationale

The research is premised on identification of the present risks facing the Oropouche Lagoon and what are the future rehabilitation measures required for it to become a successful ecologically Economic Hub. It is anticipated that the findings from the researcher's study will encourage key stakeholders to drive its rehabilitation. The research is intended to highlight how successful rehabilitation can facilitate its use as a future global Wetlands Sustainable Development Model.

1.3 Objectives

The following are the objectives of the researcher's study:

1. To critically explore global models of Wetlands which successfully function as economic hubs
2. To critically explore the South Oropouche Wetland Basin against a global model identifying present risks and rehabilitation measures.
3. To make recommendations relative to identified risks and rehabilitation measures to facilitate conversion of the South Oropouche Wetland Basin to a vibrant ecologically economic hub.

2.0 Literature review

Sustainable development has been the all-encompassing goal of the global community since the UN Conference on Environment and Development (UNCED) in 1992. This Conference called on governments to develop national strategies for sustainable development, incorporating policy measures outlined in the *Rio Declaration* and *Agenda 21*. Despite numerous international and governmental efforts to implement such strategies, there are continuing concerns over global economic and environmental developments in many countries.

The United Nations (UN) Millennium Development Goals (MDGs) commenced in the year 2000 and drove progress in several key areas.

Goal 5 above specifically addressed environmental sustainability. SDGs offer a universal agenda and recognise the need for restoration and management of water-related ecosystems, including wetlands, as a basis for addressing water scarcity and water risks (CBD, 2015). On the revised Agenda, Goals 12, 13, 14 and 15 (shown in figure 2 below) refer specifically to conservation of the earth's natural resources.

Figure2: United Nations' Sustainable Development Goals

2.1 Measuring Economic Value of Wetlands

Economic valuation of ecosystem services provides an opportunity to drive prioritisation and investment decisions by understanding the relative benefits that alternative investments produce.

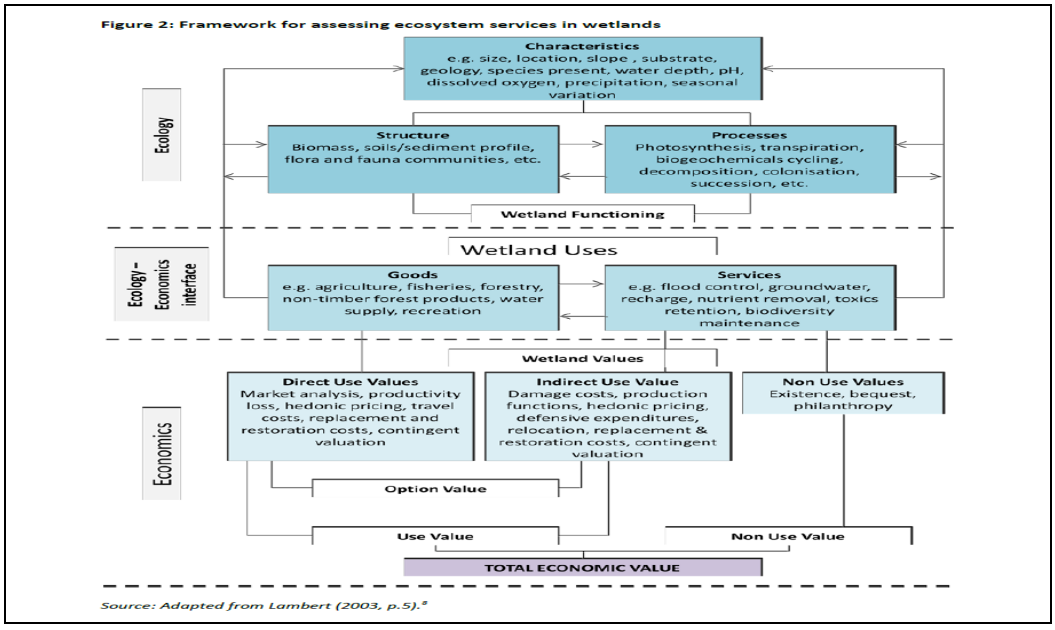
The most common framework for understanding the full economic value of environmental resources such as wetlands is the Total Economic Value (TEV) framework.

2.2 Conceptual Framework

The following framework given in Figure 3 was adopted for this research for the purpose of assessing the present status of the South Oropouche Wetland Basin.

Figure 3 below summarises an assessment framework adopted for the purpose of linking wetland ecology with economic principles by the Australian Government's Department of Sustainability, Environment, Water, Population and Communities (Marsden Jacob Associates, 2012). The model encapsulates the Total Economic Value Framework (Marsden Jacob Associates, 2012).

Figure 3: The Framework used by the researcher for assessing the South Oropouche Wetland Basin



Source: Marsden Jacob Associates (2012)

2.3 Utilising the Green Economy to drive the South Oropouche Wetland Basin's productivity

With governments today seeking effective ways to lead their nations out of these related crises whilst keeping in mind its ecological limits, "*green economy*" has been proposed as a means for catalysing renewed national policy development and international cooperation and support for sustainable development.

Illegal squatting on the banks of the Godineau River

Fishing is a main source of livelihood

Area affected by Salt water intrusion

Old roofing galvanize, bottles etc. littering of the River's course

Massive clearance of valuable agricultural land for the construction of the Highway

Ineffective sluice gate system used to control tidal flow

3.0 Analysis of Findings

In order to critically analyse the findings obtained from the researcher's participant observation, a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis was prepared (indicated tables 1 to 4 below).

3.1 Methodological Triangulation

Methodological triangulation (indicated in tables 1 to 4 below) was utilised to determine the common emergent themes from the researcher's investigation.

Table 1: Methodological triangulation of the researcher's findings

METHODOLOGICAL TRIANGULATION			
QUESTIONNAIRE RESULTS	**INTERVIEW RESULTS**	**PARTICIPANT OBSERVATION**	**COMMON THEMES EMERGING FROM FINDINGS**
IMPORTANCE OF BENEFITS OF THE LAGOON Environmental benefits outweigh social and economic benefits	**LIVELIHOOD** Most farmers adopted sustainable agriculture as their livelihood with land passed down from their forefathers	**STRENGTHS** 1)Climate/location of T&T is ideal for agriculture 2)Third largest estaurine wetland after Nariva and Caroni Swamp 3)Location of the lagoon is close to regional agricultural markets and close to highway and to Gulf of Paria for ease of exportation of goods 4)Serves as nursery for a myriad of migratory birds and aquatic life. 5)Once issue of soil salinity is treated with ,the Lagoon can regain its fertility	1)Maintaining the biodiversity of the Oropouche Lagoon to mitigate climate change
HUMAN VALUES ASSOCIATED W/WETLANDS 1)Can be improved by wetland management 2)Should function naturally without human interference and gives a sense of well being 3)Should be utilised to improve the quality of life 4)Most disagree Lagoon's primary function is for products and services useful to humans	**PERIOD LAGOON WAS MOST FERTILE** Majority indicated between 1950 to 1970's the Lagoon was most fertile.IMA Researcher noted 1890 to 1960's over 1400 hectares of lagoon was under rice cultivation		

Table 2: Methodological triangulation of the researcher's findings (continued)

METHODOLOGICAL TRIANGULATION			
QUESTIONNAIRE RESULTS	**INTERVIEW RESULTS**	**PARTICIPANT OBSERVATION**	**COMMON THEMES EMERGING FROM FINDINGS**
KNOWLEDGE OF T&T'S WETLANDS 1) Majority know wetlands are fertile,complex,productive ecosystems 2)Most do not believe T&T wetland loss is critical 3)Majority aware of its role in biodiversity 4)Most unaware of wetlands' role in water regulation	**FOOD CROPS ONCE CULTIVATED** Short term crops such as bodi,melon,dasheen,bodi,sweet peppers,string beans,legumes such as black eyed peas.Seasonal crops such as rice and sugar cane **OTHER LIVELIHOOD ACTIVITIES** Fishing,catching of guabine,cascadura, Hunting and lumber production.Conducting of eco tours of the Lagoon	**WEAKNESSES** 1)Not a RAMSAR protected site as is Caroni and Nariva swamp 2)Poor emphasis is placed on Agriculture as a source of revenue in T&T presently,focus is on revenue earned from Oil and gas 3)Lack of strict enforcement of wetland managment policy and legislation nationally 4)Lack of public education and awarenesss on wetland importance/conservation 5) People generally do not participate in wetland conservation groups or voicing their opinions on wetland issues 6)Unplanned development on wetlands and lack of proper environmental impact assessment (EIA) prior to commencing Gov't mega projects	2)Effects of salt water intrusion on the Oropouche Lagoon Ecosystem

Table 3: Methodological triangulation of the researcher's findings (continued)

QUESTIONNAIRE RESULTS	**INTERVIEW RESULTS**	**PARTICIPANT OBSERVATION**	**COMMON THEMES EMERGING FROM FINDINGS**
EXPRESSIONS OF WETLAND MGMT ISSUES IN T&T 1) Majority used TV or books,magazines related to wetland issues. 2) Majority never attended lectures,or wrote to relevant authorities to express their views 3) Most are not part of any conservation organisation wrt wetlands	**CURRENT LIVELIHOOD PRACTICES** 1)Fishing and shellfish catching 2)Subsistence farming 3)Hunting 4)Teaching in pre and primary schools 5) Auto mehcanics ,carpentry/masonry	**OPPORTUNITIES** 1)Lagoon can create jobs,and revitalisation of the Agricultural sector,hence reducing National Food Import Bill 2)Restoration of wetland can cause it to regain its biodiversity and encourage ecotourism and fishing 3) Young people are interested in agriculture but do not have the initial capital investment for it 4) New technological advancements in aquaculture and hydroponics can encourage sustainable development 5)If declared a RAMSAR protected site ,it can be protected to ensure its conservation and wise use 6) Proper communication,education and awarness can motivate people to appreciate the value of wetlands so they become advocates for its wise use	3)Maintaining sustainable livelihoods through conservation

Table 4: Methodological triangulation of the researcher's findings (continued)

METHODOLOGICAL TRIANGULATION			
QUESTIONNAIRE RESULTS	**INTERVIEW RESULTS**	**PARTICIPANT OBSERVATION**	**COMMON THEMES EMERGING FROM FINDINGS**
PARTICIPANT INTERACTION W/ LAGOON 1)Majority knew of its aesthetic value and it being a wildlife habitat. 2)Majority agree that it provides natural and recreational opportunities 3) Majority disagree that the Oropouche Lagoon prevents opportunities for agricultural and infrastructural development	**THREATS FACING OROPOUCHE LAGOON** Salt water intrusion,Climate change,illegal squattting,heavy pollution,governmental mega-projects **REHABILTATION MEASURES** Government intervention and assistance.Implementation of soil labs and national education drive.Proper enforcement of "quit cultivation notice" by Ministry of Agriculture. **SUSTAINABLE LIVELIHOOD PRACTICES** 1)Crop rotation and adaptation of more controlled farming techniques 2)Controlled fishing/hunting in area 3)Ecotourism	**THREATS** 1)Salt water intrusion affecting fertility of the soil 2)Overfishing /overhunting in the Oropouche Lagoon 3)Climate change impacts 4)Pollution in the catchment area/watercourses 5)Illegal squatting on river banks 6)Lack of proper research monitoring facilities specifically for wetlands/Oropouche Lagoon 7)Intrinsic ,ecological and resource values for the Oropouche Lagoon are difficult to quantify or put an economic value on	4)Importance of food security and wetland sustainability

4.0 Conclusions & Recommendations

4.1 Conclusion for objective 1

To critically explore global models of Wetlands which successfully function as ecologically economic hubs

Suitable global models were utilised whose wetland issues were closely linked to the themes arising from the researcher's findings. These global models involved core sustainable development practices and knowledge to effectively address the issues associated with the South Oropouche Wetland Basin on order for it to become a vibrant ecologically economic hub. Two models where successful of wetland restoration namely; the Major Four Rivers Project in Korea and the Napa Valley River Restoration

were very costly due to the magnitude of their social and environmental implications. These case studies however can still be adapted to successfully drive rehabilitation of the South Oropouche Wetland Basin, albeit on a smaller scale. From these global models, it was observed that the level of success in restoration of the Oropouche Lagoon is heavily dependent upon on the effectiveness of collaboration amongst all legitimate stakeholders (such as local communities ,governments and the private sector).Synergy efforts are required in involvement, awareness and knowledge of the importance of Wetlands .

4.2 Conclusion for objective 2

To critically explore the South Oropouche Wetland Basin against a global model identifying present risks and rehabilitation measures

The West Lake Park in Broward County, Florida was chosen to critically explore this ecosystem's risks and the rehabilitation measures undertaken. The reasons for the researcher's choice were that it comprises an ecosystem and climatic conditions similar to the Oropouche Lagoon. The main reason for success of their Ecological Mangrove Restoration Method (EMR) in West Lake Park's Restoration were primarily due to the undertaking of comprehensive research and monitoring studies performed on a test plot on site. This was done prior to execution of this Ecological Mangrove Restoration project .This method involved synergistic stakeholder collaboration between the local government and the wetland design consultant in the planning ,design and implementation and oversight stages of the project. West Lake Park is used for mainly for public education and recreational amenities and has one of the largest ports in the United States compared to the South Oropouche Wetland Basin which possesses

differing uses such as human settlement and agriculture. The Ecological Mangrove Restoration Method (EMR) can be adopted for the successful restoration of the Oropouche Lagoon's ecosystem utilised since this method is very cost effective and involves hydrologic restoration which is a holistic approach to dealing with the issues affecting wetlands .This method is known to be highly effective once the problems causing the mangrove losses in a wetland have been successfully identified.

4.3 Conclusion for objective 3

To make recommendations relative to identified risks and rehabilitation measures to facilitate conversion of the South Oropouche Wetland Basin to a vibrant ecologically economic hub

The primary risks associated with the South Oropouche Wetland Basin are salt water intrusion, heavy pollution from unsustainable agricultural practices and illegal human settlement (on or near its water courses), climate change and the degradative impact on the Lagoon's ecosystem from developmental mega-projects.

It was observed that although most of the persons surveyed were fully aware of the present risks to the South Oropouche Wetland Basin, many were not aware of the integral roles wetlands play in climate and water regulation etc. Government intervention is urgently required to arrest the problem of further degradation of the Oropouche Lagoon and encourage and its citizens on utilising the "wise use" approach when accessing the wetlands many services. Stricter implementation and enforcement of wetland policies and laws by government are required for the protection of this invaluable ecosystem. Government has the ultimate responsibility of communication,

education, and public awareness of the importance of wetlands. Communication, education and public awareness are the primary tools for placing people's social, political, economic and cultural realisms within the context of good and services provided by the Oropouche Lagoon. The national community needs to be aware of the profound fact that ecological assets such wetlands are valuable economic assets. Hence, in order for the Oropouche Wetland to become a vibrant economic hub, sustainable practices in wetland management are essential.

4.4 Limitations

Longitudinal studies need to be carried out in order to determine comprehensive economic valuations of the assets of the Oropouche Lagoon. From such studies, economic justification will be established hence driving more effective and efficient rehabilitation of this wetland. Wetland goods and services must be given a quantitative value to ensure their conservation is chosen over alternative uses of the land or the water which feeds the wetlands. The value of wetland functions, for instance water quality improvement, may be determined from the cost of building a water treatment facility to perform the same processes. It is difficult, however, to quantify the economic value of biodiversity or the aesthetic beauty the Oropouche Lagoon, since the market for such "products" is more elusive and their economic valuation much more difficult to determine utilising traditional methods.

4.5 Future Research

The TEV model (Total Economic Value of Wetlands) can be effectively used to guide future policy making and planning with regard to making the South Oropouche Wetland Basin a vibrant ecologically economic hub. This Lagoon is a very valuable economic

asset to both the residents and the national community. Its restoration and improvement can be a cost-effective way of meeting a variety of policy, business and private objectives. Such objectives include water, food and energy security, since water plays a key role in both the agricultural and energy sectors.

Government and other legitimate stakeholders should perform further research into the viability of making the Oropouche Lagoon a “Wetland of International Importance” under the Ramsar Convention (1971).

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