



FEBRUARY 2017

SUSTAINABLE DEVELOPMENT MASTER PLAN FOR ANDROS ISLAND



in collaboration with





SUSTAINABLE DEVELOPMENT MASTER PLAN FOR ANDROS ISLAND

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List of abbreviations

| | |
|---|---|
| AMP: Andros Master Plan | GEF: Global Environment Facility |
| ANCAT: Andros Nature Conservancy and Trust | GOB: Government of The Bahamas |
| AOE: Airport Of Entry | IDB: Inter-American Development Bank |
| BAIC: Bahamas Agricultural and Industrial Corporation | IICA: Inter-American Institute for Corporation on Agriculture |
| BAMSI: Bahamas Agriculture and Marine Science Institute | MAMR: Ministry of Agriculture and Marine Resource |
| BEST: Bahamas Environment, Science and Technology Commission | MEH: Ministry of Environment and Housing |
| BNT: Bahamas National Trust | MEP: Mechanical, Electrical and Plumbing |
| BPL: Bahamas Power and Light Company | MH: Ministry of Health |
| BREEF: Bahamas Reef Environment Educational Foundation | MTA: Ministry of Transport and Aviation |
| CARICOM: Caribbean Community | MT: Ministry of Tourism |
| CRFEM: Caribbean Regional Fisheries Mechanism | MWUD: Ministry of Works and Urban Development |
| CSME: CARICOM Single Market and Economy | NatCap: Natural Capital Project |
| DMR: Department of Marine Resource | NGO: Non-Governmental Organization |
| DPH: Department of Public Health | NHSA: Nature's Hope for Southern Andros |
| EPA: Economic Partnership Agreement | OPM: Office of the Prime Minister |
| FAO: Food and Agriculture Organization for the United Nations | PPP: Public Private Partnership |
| FTAA: Free Trade Area of the Americas | SEV: SEV Consulting Group |
| GDP: Gross Domestic Product | SP: Sustainable Prosperity |
| | UB: University of The Bahamas |
| | WTO: World Trade Organization |



The Island of Andros lies 40 miles to the West of Nassau, the capital of The Bahamas, encompassing a land area of 2,300 square miles, an area greater than all the other 700 Bahamian islands. Vast mangrove and coppice forests, large coral reefs, seagrass beds, sand flats, and a concentrated system of blue holes support the country's commercial and sport fishing industries, nature-based tourism activities, agriculture and freshwater resources.

Yet the full potential of Andros remains untapped.

FOREWORD

BY THE PRIME MINISTER



Rt. Hon. Perry G. Christie

Prime Minister and Minister of Finance of the Commonwealth of the Bahamas

The completion of the Andros Sustainable Development Master Plan marks a milestone in not only the development of Andros but indeed the entire Bahamas. The sleeping giant to the west of New Providence, Andros is rich in natural resources and has long been discussed as a potential center for development to accommodate the future growth of the Bahamas. It is critical that we make the best and most informed decisions possible for the development of Andros and its people so that future generations can enjoy the same, if not greater, benefits from this island that past generations have been able to depend on. The Andros Master Plan will therefore be an important tool to help guide and influence government, private sector and citizen decision-making processes for the next 25 years. As evidenced by the concurrent production of Vision2040 The National Development Plan of the Bahamas, Bahamians have committed themselves to participating in long term planning processes to ensure a sustainable and prosperous future for our nation.

The ecosystems on Andros provide tremendous benefits and opportunities for Androsians and Bahamians. For decades, the island provided fresh water for residents of New Providence. Its surrounding fishing grounds are among the most bountiful in the Bahamas, supported by the creeks and mangroves that provide a critical nursery habitat for Bahamian fisheries. The mystique and serenity of Andros' blue holes and the West Side National Park have long attracted those seeking solitude and adventure. Andros has been branded the ecotourism capital of the Bahamas and supports a nature-based tourism economy that is largely owned by Androsians and has potential for significant growth, especially in Central and South Andros. Investments in Bahamian agriculture, particularly through the Bahamas Agriculture and Marine Science Institute (BAMSI) in North Andros, will enable us to reduce or reliance on foreign food imports and increase our food security. Nascent sponging and coconut industries in Mangrove Cay have the potential to support local entrepreneurs for generations to come.

Our archipelago is particularly vulnerable to the impacts of climate change. In recent years, we have suffered from more frequent and intense extreme weather events. Hurricanes Joaquin and Matthew have forced us to realize we must be more aggressive in pursuing and implementing strategies for climate change adaptation and disaster risk mitigation. We must do whatever we reasonably can to ensure that the decimation of communities such as what was experienced in Lowe Sound, North Andros, does not become a regular occurrence for our society.

Bearing in mind the delicate balance we must maintain between development and protection of the environment, The Andros Master Plan will be a great asset for the people of Andros to pursue the vision they have outlined for their future. The Master Plan, which will serve as a template for development planning on other islands in our archipelago, will help us better zone human activities, identify and prioritize investments in infrastructure and human development, and define best management practices to ensure a sustainable and vibrant future for Andros' residents. On behalf of the government and the people of the Commonwealth of the Bahamas, I thank the Inter-American Development Bank for providing the technical cooperation that made this project possible. I extend congratulations to the residents of Andros and other stakeholders who, through their commitment and participation in this process, have invested in the sustainable development of Andros and the Bahamas.

1. INTRODUCTION

*The central challenge confronting the Government of The Bahamas is to design a **Sustainable Development Master Plan** that will harness the island's wealth of natural assets without sacrificing the very ecosystems that underlie its economy and sustain the well-being of its citizens.*

A Master Plan provides a long-range vision for the built and natural environments of a community. It guides the appropriate use of lands and sea in order to protect public health and safety and to promote general welfare. Among other issues, the Master Plan can identify:

- Suitable locations for mixed-use development and different types of activities,
- Strategies for increasing economic development,
- Environmental, historical and cultural resources that need conservation, to preserve cultural heritage and ensure the sustainability of ecosystems and the benefits they provide to people now and in the future.

As a result, the Master Plan has a direct relationship to its citizens.

To address this challenge, the Office of the Prime Minister (OPM), with support from the Inter-American Development Bank (IDB), has engaged in an innovative process to design a sustainable Master Plan for Andros Island. **The main goal is to identify public and private investment opportunities, policy recommendations, land and sea zoning guidelines, and other management actions to guide sustainable development of the island for both its people and its environment.**

The Master Plan presents the strategy of sustainable development for Andros and associated recommendations/actions for:

- **The short term: up to 5 years (2020),**
- **The medium term: up to 15 years (2030),**
- **The long term: up to 25 years (2040).**

The Andros Sustainable Development Master Plan is also connected with several concurrent national efforts:

- ▶ In 2014, the country embarked upon a national development planning process. **The National Development Plan** will provide a roadmap for the future development of The Bahamas. The Plan will include a comprehensive policy framework that will guide Government decision making and investment over the next 25 years. Vision2040 is an initiative of the Government of The Bahamas, developed in partnership with the Inter-American Development Bank and in close cooperation with the University of The Bahamas and The Bahamas Chamber of Commerce and Employers Confederation. The Plan will be guided by extensive research, analysis and widespread public consultation aimed at addressing four main policy pillars: The Economy, Governance, Social Policy and Environment (Natural and Built).
- ▶ The national development approach supports the establishment of The Bahamas Agricultural and Marine Sciences Institute (BAMSI) in North Andros. The Institute offers teaching and training to provide the professional and technical qualifications necessary for various branches of agriculture and marine resources and to provide strong academic training and extensive hands-on orientation in crop and livestock production, farm management, environment conservation, agri-business and management of marine resources.

Figure 1: National Development Plan: Vision2040



Source: <http://www.vision2040bahamas.org/index.html>

- ▶ The Best Commission is collaborating with several agencies to develop a new national framework for **climate-resilient Integrated Coastal Zone Management**. The Andros Master Plan will be updated according to this framework to bring it in line with coastal management actions.
- ▶ The government passed a National Policy for Adaptation to Climate Change in 2005, a National Energy Policy in 2013 and a National Maritime Policy was recently passed.

These processes exemplify The Bahamian government's commitment to integrated, cross-sectoral planning and provide an important overarching context for the Andros Master Plan. At the same time, the Andros process can serve as a pilot project for translating these national policies into an actionable plan that puts **the needs of the people and the environment of the island at the core of sustainable development**.





2. THE ANDROSIANS' KEY ISSUES

The largest of the islands in the archipelago of The Bahamas, Andros stretches 104 miles in length and 45 miles in width. Politically considered a single entity, **Andros is in fact comprised of three major landmasses and four districts.** The districts of North and Central Andros make up the northern swath of land, followed by Mangrove Cay and then South Andros. To the east, the island is bordered by a 6000-foot deep-sea trench called the Tongue of the Ocean and by the third largest barrier reef in the world. The extensive flats of The Great Bahama Bank lie to the west, northwest and south of Andros and the island boasts the highest density of blue holes in the Western Hemisphere.

Andros has some of the **most intact coastal and marine ecosystems in The Bahamas**, including vast mangroves and wetlands, coppice and pine forests, seagrasses, coral reefs and hundreds of small inlets and cays, connected by estuaries and tidal marshes. These habitats support many rare and endangered species and provide **numerous benefits to the Bahamian people.** Commercial fishing, including crabbing and sponging, is the most substantial income-earning activity for local residents, generating \$70 million in revenues each year¹ and making up almost half of the island's total economy. Nature-based tourism also supports local livelihoods, resulting in \$44 million in direct revenues². Andros houses the largest source of freshwater in The Bahamas and its habitats provide many important regulating services such as protection from storm related flooding and erosion, maintenance of water quality and carbon storage and sequestration.

The natural resources of Andros are plentiful, but the full social and economic potential of the island remains untapped. Andros remains largely undeveloped and the Androsians lack essential infrastructure and educational opportunities to ensure the wellbeing of themselves and of generations to come. Public and social infrastructure is largely in disrepair, air travel is unreliable, and access to freshwater is limited for the southernmost communities. Ad hoc development involving dredging, habitat conversion, poor sewage treatment and other stressors is beginning to threaten Andros' ecosystems and the many services they provide to people. These problems are challenging in their current form, but likely to have even greater consequences for shoreline communities in the face of rising seas, more intense storms and the acidic waters that put fragile reefs at risk and pose major coastal hazards for the people and infrastructure on the low-lying island.

There is broad interest in balancing development and the conservation of natural habitats, but current legislation to address these issues is limited. Andros and The Bahamas lack a coordinated vision and the supporting legislation to meet the current and future societal, environmental and economic challenges on Andros.

The Sustainable Development Master Plan for Andros Island has the goal to provide a comprehensive framework and actionable plan to guide decision-making and investment over the next 25 years by addressing eight key pillars and eight human activity sectors that requires multi-sectoral management, both identified by the Androsians.

¹ Department of Marine Resources / NatCap, 2016

² Hargreaves-Allen, 2010

Geographic location

Andros general view



 Town
 District boundary

February 2017
 Sources : NatCap - BRLi - Blue, GoogleEarth

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community Source: BRLi 2016

2.1 KEY PillARS

Androsians and Bahamians identified eight desired outcomes that encompass the key management, conservation and development issues they are facing. These desired outcomes will serve as key pillars for the Master Plan.

The key pillars identified are as follows. They are further detailed below³:

- **Food and water security,**
- **Connectivity and accessibility,**
- **Education and capacity building,**
- **Livelihoods and income equality,**
- **Land tenure security, land use planning and enforcement,**
- **Health and wellbeing,**
- **Strengthening local government,**
- **Climate change and coastal resilience.**

2.1.1 Food and water security

The 2010 National Census indicates the population of The Bahamas as three hundred and fifty three thousand six hundred and fifty eight (353,658) people. Andros contains seven thousand four hundred and ninety (7,490) people or **two percent (2 %) of the country's population**⁴ yet it is two thousand three hundred square miles (2,300 square miles) and covers **forty three percent (43%) of The Bahamas total land mass.**

The Bahamas imports ninety percent (90%) of the food consumed within the country⁵. Due to its large size (2,300 square miles) and freshwater resources, Andros has the potential to **supply forty percent (40%)⁶ of agricultural products for the island's people** and other regions throughout The Bahamas. With this vision in mind, the Government has invested heavily in the **Bahamas Agriculture and Marine Sciences Institute (BAMSI)** in the North District of Andros. In addition, to the major agriculture investment in the north, Androsians throughout the island engage in

smaller scale agriculture to supplement their income and nutrition as they face a high cost of living. However, there are worries that both BAMSI and other agricultural production could have **negative impacts on the island's freshwater resources** and other environmental services, through for instance unsustainable farming practices. Freshwater for drinking is plentiful in the north, but Androsians elsewhere (and especially in the south) frequently lack basic infrastructure to access freshwater to meet their most basic human needs and to support small business ventures.

As a result of the liberalization of markets {the eventual membership of The Bahamas in the World Trade Organization (WTO), its participation in the Free Trade Area of the Americas (FTAA), the possibility of joining the Caribbean Single Market and Economy (CSME), and the EU/ACP Economic Partnership Agreement (EPA)} trade issues are a growing area of importance to The Bahamas.

³ Key pillars are presented in an arbitrary order

⁴ Cf. Table 1.

⁵ BAMSI / NatCap, 2016

⁶ <http://jonesbahamas.com/north-andros-institute-will-reduce-food-imports-by-40-per-cent/>

The top imported consumer-oriented products for The Bahamas include poultry meat and products, beef and beef products, dairy products, snack foods, fruit and vegetable juices, prepared food, pork and pork products, wine and beer, fresh vegetables, and non-alcoholic beverages. As development increases,

demand in these areas should be expected to increase. The Bahamas is **heavily dependent on imported food** to provide its dietary needs. This dependency leaves the country vulnerable and has negative effects on food security and economics. The imported food goods are often processed and unhealthy.

Table 1: Population of Andros by settlement with 50 inhabitants or more⁷

| Settlement | District | Population | Total by district | | |
|--|----------------|--------------|-------------------|----|------|
| Behring Point | Central Andros | 152 | 630 | | |
| Bowen Sound (incl. Man-O-War Sound) | | 196 | | | |
| Cargill Creek | | 282 | | | |
| Burnt Rock | Mangrove Cay | 89 | 802 | | |
| Grants and Orange Hill | | 67 | | | |
| Lisbon Creek | | 48 | | | |
| Moxey Town (/ Little Harbour) | | 420 | | | |
| Pinders | | 178 | | | |
| Andros Town | North Andros | 59 | 4437 | | |
| Barc Community | | 175 | | | |
| Blanket Sound | | 145 | | | |
| Calabash Bay | | 98 | | | |
| Conch Sound | | 117 | | | |
| Fresh Creek/Coakley | | 333 | | | |
| Love Hill | | 321 | | | |
| Lowe Sound | | 712 | | | |
| Mastic Point | | 694 | | | |
| Miller's Hill | | 53 | | | |
| Morgan's Bluff | | 64 | | | |
| Nicholls Town | | 825 | | | |
| Red Bay | | 284 | | | |
| San Andros | | 207 | | | |
| Small Hope Bay | | 64 | | | |
| Stafford Creek | | 98 | | | |
| Staniard Creek | | 188 | | | |
| Congo Town | | South Andros | | 90 | 1306 |
| Deep Creek (incl. Black Point & Pure Gold) | | | | 58 | |
| Driggs Hill | 127 | | | | |
| Duncombe Coppic | 88 | | | | |
| Ferguson | 59 | | | | |
| High Rock | 86 | | | | |
| Kemps Bay | 273 | | | | |
| Little Creek | 85 | | | | |
| Mars Bay | 88 | | | | |
| Smith's Hill/Ash Town | 67 | | | | |
| The Bluff | 285 | | | | |

⁷Based on the Bahamas Department of Statistics 2010 population census data.



The Bahamas imports eight hundred and seventy nine thousand dollars (\$879,000) in fish and seafood⁸ every year. This does not supply the majority of the seafood demand but options are often more affordable than local caught products. There are over nine thousand three hundred (9,300) people (7% of the workforce), as well as an estimated 3,800 part-time fishers, 23 vendors, 11 processors and 18 exporters employed in the commercial fishing industry. Of those, Andros alone employs three thousand three hundred and ninety two (3,392) full and part time persons⁹. The import of fish and seafood directly affects about forty-five (45%) percent of the Andros population.

The Bahamian diet comprises mainly of meats such as chicken or seafood such as snapper, grouper or conch and starchy side dishes such as peas and rice, macaroni, plantains, French fries or a simple salad. The diet represents a dietary shift from vegetables and protein to cereals, snacks and sugary products. The transition from traditional foods to more “western style diet” has also seen an increase in non-communicable diseases that are associated with being overweight¹⁰.

The agriculture sector in The Bahamas has deteriorated over the last three decades accounting for less than one per cent (1%) of GDP, some figures show. In 1978, there were 80,000 acres of land area in production. By 1984, that number had dwindled to 50,000 acres and has fallen currently to around 10,000 acres in cultivation¹¹.

The introduction of BAMSI and its programs seeks to address this problem by working on **sustainable, self-sufficient food systems** that provide access to local healthy food products. The programs are geared towards educating and supporting farming enterprises, science and technology workforce development, future food production and lowering the economic impact of imports in The Bahamas.

Rain is the only natural source of freshwater in The Bahamas as there are no rivers or large bodies of water. The rainwater seeps through soluble limestone and it rests on top of denser saltwater forming a freshwater lens. Throughout the islands, **the largest lens can be found on Andros**. North Andros has the largest groundwater lens on the island that is recharged by approximately 60 inches of rain per year. South Andros is much drier than north and only receives approximately 40 inches of rain per year¹²; therefore, its water lens is not as extensive.

Androsian households are provided water from the following sources:

- Private water wells which is fresh ground water that is at times blended with brackish groundwater,
- Desalination (Reverse Osmosis) provided in large by the Water and Sewerage Corporation,
- At times, water trucked from one part of the island to another, and
- Bottled water for drinking and cooking.

The major potable water supply issues for Andros include the **lack of freshwater access in parts of South Andros** and the **over exploitation of the water lens throughout the island**. The available freshwater resources are also threatened by climate change, sea level rise and natural disasters (saltwater intrusion risk¹³).

⁸ http://www.cbato.fas.usda.gov/cfm_bahamas.htm

⁹ Hargreaves-Allen 2010

¹⁰ Pratt, A, et al, 2015

¹¹ <http://jonesbahamas.com/north-andros-institute-will-reduce-food-imports-by-40-per-cent/>

¹² US Army, 2004 – Holding and Allen, 2015

¹³ When saltwater from the ocean penetrates freshwater lenses leading to a pollution risk

Figure 2: Water pumping system in South Andros



Source: BRLi / Blue – May 2016

Figure 3: Farming in South Andros



Source: BRLi / Blue – May 2016

| Food & Water security | |
|-----------------------|--|
| Strengths | Andros large size and large stock of available land |
| | Plentiful freshwater resources in the north |
| | Products for the island's people and other regions throughout The Bahamas |
| | BAMSI |
| Weaknesses | Limited access to diverse and fresh food products |
| | Low local production and heavy reliance on export |
| | Limited access to freshwater in South Andros |
| | Over exploitation of the water lens throughout the island |
| Opportunities | Reduce quantity of imported foods |
| | Increase available healthy food options |
| | Increase local and national production of food supply by training and capacity to enhance agricultural yields |
| | Increase access to freshwater supply throughout the island by implementing adequate infrastructures |
| | Improve management of water resources by promoting sustainable agricultural practices |
| Threats | Freshwater resources threatened by climate change and sea level rise (saltwater intrusion) |
| | Unsustainable farming practices that lead to pollution |

2.1.2 Connectivity and accessibility

The future economic growth of the island will depend heavily on its infrastructure (roads, bridges, airports, harbors). **The economic success of most facets of society and sectors relies on the island's connectivity including:**

- Any food or craft products need to be shipped by sea or air to reach markets on other islands,
- Tourists that land in Nassau (the major port of entry) must fly or take a boat to enjoy recreational opportunities on Andros,
- Services, infrastructures and benefits available in one district are not easily accessible to people in other districts who must travel by sea or air by means, which are not readily accessible.

Andros ground, sea and air transport connects its people and the local economies as well as supports over 20,000 estimated domestic and international visitors. Transportation is currently the responsibility of The Ministry of Transport and Aviation having formerly been that of the Ministry of Public Works and Transport.

GROUND TRANSPORTATION

Andros has **over one hundred miles (100 miles) of roads** running through its districts, connecting its people to the various settlements. The Government has recently invested seven million dollars (\$7 million) to reconstruct almost 10 miles of roads. This is the first phase of works identified for the 79.5 miles between North and Central Andros. The roads in Mangrove Cay and South Andros are also in need of reconstruction mainly due to their close proximity to the shore. Roads are adjacent to the shoreline and have suffered various degrees of “wash out” damage due to storm surge.

Figure 4: Staniard Creek bridge showing deterioration, Central Andros



Source: BRLi / Blue – May 2016

The degree of damage is, in part, dependent on the protection, or lack of protection, provided by coastal infrastructure and/or natural protection. If not addressed, this issue will only be exacerbated with sea level rise and climate change.

Bridges in Andros are a vital transportation link as they currently provide the only crossing of natural creeks such as Stafford Creek, Staniard Creek, Fresh Creek and Cargill Creek in North and Central Andros, and Deep Creek and Little Creek in South Andros. The bridges in South Andros were rehabilitated in 2011 at a cost of nearly two million dollars (\$2 million). Several components of the bridges in North and Central Andros are currently showing signs of significant deterioration. Some repair works are budgeted by the Ministry of Works to be undertaken between 2016 and 2018. Moreover, bridges and causeways are reported to contribute to the infilling of creeks' entrance, affecting the health of the creeks and associated natural habitats such as mangroves and wetlands that provide fisheries, tourism and coastal protection benefits.

Andros' districts are suffering from a **crucial lack of connectivity**: as North and Central Andros are not connected to Mangrove Cay and South Andros by roads or bridges, inhabitants must rely on air/sea connections.

TRANSPORTATION BY WATER

Connectivity by water within, to and from Andros is important to facilitate the transport of economically important goods and services.

At present, only Mangrove Cay and South Andros are connected by a daily ferry service. The government run service is provided at no cost. There is **no regular ferry service between North / Central Andros and Mangrove Cay or South Andros**. Persons wishing to travel between North / Central Andros and Mangrove Cay / South Andros must either fly into Nassau or charter a flight which can be difficult to locate and expensive. As a result, many North and Central Androsians have never travelled to Mangrove Cay or South Andros and vice versa. Some Androsians are more familiar with New Providence than their neighbouring. There is a need for an inter-island ferry service, as it is not considered feasible to link Central Andros with Mangrove Cay, and Mangrove Cay with South Andros, by bridges.

Between New Providence and Andros, ferries and mail boats transport people and goods to many of the major settlements along the eastern coast weekly. In addition, a number of fishing boats, sailboats and other private vessels visit the east coast of Andros including some shipping vessels. Many of these vessels from the United States clear customs and immigration at Chub Cay in the Berry Islands, and spend only a short period in Andros due to the **limited facilities at ports**, which are in need of improvements.

Figure 5: Mangrove Cay/South Andros Ferry at Lisbon Creek, Mangrove Cay



Source: BRLi / Blue – May 2016

TRANSPORTATION BY AIR

There are **four (4) airports in Andros**, connecting the island with Nassau and with the United States (Florida):

- San Andros Airport in North Andros, classified Airport of Entry¹⁴ (AOE),
- Andros Town International Airport in Central Andros, classified AOE,
- Clarence A. Bain Airport at Mangrove Cay, not AOE,
- Congo Town Airport in South Andros, classified AOE.

Three out of four airports are classified as an Airport of Entry (AOE) for international travel. A great concern raised by Androsians is the absence of a major port/airport of entry in Mangrove Cay, which hinders exportation of the local sponge and stone crab that are important economic industries of the district. Further studies will be needed into the feasibility of an airport upgrade, however, it is unlikely that the Bahamas can continue to maintain the current number of AOE through public expenditure. The airports are currently showing signs of deterioration to its buildings and facilities including the length of runway and security monitoring equipment.

Presently, there is not enough flight demand to validate the use of Bahamasair, the national flight carrier, to service Andros. This however allows for smaller commuter airlines such as Western Air, Flamingo Air and LeAir to provide daily service to and from New Providence. As South Andros and Mangrove Cay are not easily connected to the North part of Andros, the Andros Town International airport has little benefits for these districts.

The Government in long term will seek to operate fewer airports throughout The Bahamas. Although it was a common request, it is unlikely Andros will have several international airports in the future.

Figure 6: Road in poor state, Central Andros



Source: BRLi / Blue – May 2016

¹⁴An authorized airport of entry for clearance of all classes of scheduled and unscheduled aircraft (travelers and cargo).

| Connectivity & Accessibility | |
|---|--|
| Strengths | Existing transport infrastructure presenting potential |
| | Existing airports in each district and 3 airports with international linkages |
| | All districts serviced from Nassau by mail boats |
| | Free existing ferry service between Mangrove Cay and South Andros |
| Weaknesses | Roads in poor state suffering from surges in coastal areas |
| | Bridges showing significant deterioration and potential negative impacts on mangrove health |
| | Lack of connectivity between North/Central Andros and South Andros/Mangrove Cay (no bridge feasible / no regular ferry service) |
| | Limited and unsafe facilities at ports |
| | Airports showing signs of deterioration or lack of equipment |
| | No port or airport of entry in Mangrove Cay |
| Opportunities | Improvement of transportation infrastructure and facilities (roads, bridges, ports, airports, international cargo terminal) |
| | Implementation of a new ferry service between South Andros, Mangrove Cay and Central Andros |
| | Mangrove Cay airport or port upgraded to allow export |
| Threats | Transport infrastructure failures |
| | Damages to infrastructures resulting from coastal hazards due to climate change (extreme meteorological event, sea level rise, flooding, erosion) |
| | Accidents resulting from a lack of safe transport facilities and infrastructure |

2.1.3 Education and capacity building

Andros currently has **four (4) high schools** and **16 primary schools**, in addition to **The Bahamas Agriculture and Marine Science Institute (BAMSI)**, which opened in North Andros in September 2014. There is also **The Bahamas Technical and Vocational Institute (BTVI)** and **the University of The Bahamas (UOB)**, which offers continuing education and educational services in Andros. Together, they present an opportunity for the advancement of education and skills training on the island.

At the national level, a foundation is being laid by the Ministry of Education in the “*Vision 2030: A Shared Vision for Education in the Commonwealth of The Bahamas*”. The document is the result of efforts by the National Education Committee (NEC) to provide “*a realistic and workable plan for education in The Bahamas through to 2030*”.

It articulates the goals of education in The Bahamas and sites the 2012 IDB Labor Market Study, with findings that provide insight into the required strategic approach to tackle education in Andros. Employers identified the lack of specific skills (33.8%), followed by lack of experience (28.8%) and lack of soft skills (27.5%) as the main difficulties in recruiting staff. The skills deficit (particularly soft skills) is linked to productivity losses due to unsatisfactory performance, absenteeism, lack of responsibility and commitment to the job.

Currently, **Andros is limited in infrastructure and resources to support learners** (public libraries, technological access for the public such as computers, specialized teachers, and sport centers). **Improved education and skills building** among Androsians is crucial for the island’s sustainable development, in addition to its natural resources. This education and skills building must respond to the labor market and plans for development over the next few decades.

The Bahamas’ State of the Nation Vision 2040 National Development Report¹⁵ notes: “*In a small country like The Bahamas, every person must pull his or her own weight*”. Goal 4 of the Sustainable Development Goals is to “*ensure inclusive and quality education for all and promote lifelong learning*”. Quality and inclusive learning as well as lifelong learning will be critical for Andros, as it seeks to reap the full benefits of its sustainable development master plan. Goal 4 reflects this well, noting, “*Obtaining quality education is the foundation to improving people’s lives and sustainable development*”¹⁶.

Going forward, education on Andros must align with the targets as set out in Goal 4, which reflect several key considerations: gender; literacy levels among youth and adults; vulnerable groups¹⁷; scholarships; and the need for qualified teachers/trainers, and improved access to them.

EDUCATION AND SKILLS BUILDING

The NEC has come up with a sample of applied sciences and fine arts course clusters that should help Androsians respond to the changing marketplace and the sectors earmarked for development, given its natural capital. They include agriculture, automotive, building trades, media specialist, and souvenir production — each with courses identified to enable students to meet graduation standards and be ready for post-secondary opportunities in technically oriented institutions. The aim is also to “*facilitate students acquiring BGCSE (Bahamas General Certificate of Secondary Education) and other internationally recognized certifications, such as City and Guilds, in specialized areas from as early as Grade 10 [while also supporting] youth development and the acquisition of life skills*”¹⁸. In this way, Vision 2030 answers for Andros the concerns raised in the IDB’s 2012 Labor Market Study.

¹⁵Government of The Bahamas, 2016

¹⁶UN, 2015

¹⁷Children, pregnant women, elderly people, malnourished people, and people who are ill or immunocompromised – World Health Organization, 2002

¹⁸NEC, 2015

CULTURAL LEARNING

Cultural learning remains an important form of knowledge transfer in Andros. For example, crabbing which is estimated to make Androsians an extra \$4,000 to \$5,000 a year¹⁹ is sustained by knowledge gained through cultural learning. The same is true for the transmission of cultural norms — including thatch palm weaving skills among the descendants of the Black Seminoles of Red Bays. It will be important to promote and support this form of knowledge transfer.

OPEN AND DISTANCE LEARNING (ODL)

Open schooling is *“the physical separation of the school-level learner from the teacher, and the use of unconventional teaching methodologies, and information and communications technologies (ICTs), to bridge the separation and provide the education and training”*²⁰. Given the separation, social and physical, of the districts of Andros, **open schooling** is a useful and necessary option for facilitated learning and skills building. It also responds to the need for inclusiveness and universal access to education.

SCHOLARSHIPS

Whilst some Androsians do receive scholarships, which support their education and skills building, more can be done. Scholarships should be provided in those labor market-aligned skill areas, which meet the needs of the sectors to be developed under the AMP, in line with the interests of Androsians.

INFRASTRUCTURE

The delivery of education in Andros can be enhanced through **key infrastructure improvements**. In Mangrove Cay and South Andros, there is the need for a library and/or resource center that is accessible to students outside of school hours. A similar need exists in North and Central Andros, where stakeholders have also identified the need for a sporting facility. These developments should be undertaken bearing in mind the accessibility needs of special needs students, such as those with physical or mental disabilities. There is, too, the requirement for publicly available technology infrastructure, notably computers, in order to aid teaching and enhance learning outcomes — whether learning takes place face to face or at a distance.

Androsians should look to reducing its dependency on central government to supply all of its infrastructure needs. Developing partnerships with corporate entities, international tertiary institutions and fundraising events are other means to assist. The Deep Creek Primary School partnered with Lesley University in Massachusetts and local high school teachers and students to revitalize the school library by building shelves, developing a library cataloging system, borrowing policy and training volunteers. The library had previously been closed for 10 years.

TEACHERS

There has been a **shortage of specialist teachers in Andros**, particularly for the delivery of mathematics education.

PUBLIC EDUCATION AND AWARENESS-RAISING

Efforts to improve education and skills building toward the implementation of the AMP require **ongoing public education and awareness raising**. It should be wide ranging, targeting not only the players from the sectors of primary focus under the master plan, but also children in school and the vulnerable.

Organizations such as The Bahamas National Trust (BNT), The Nature Conservancy (TNC), Andros Conservancy and Trust (ANCAT) and Natures Hope for South Andros should continue to develop programs to educate and make the public **more aware of the natural environment** while empowering them to see nature all about them and to interact with it. The aim of such programs are to reinforce the community's value as contributors to and beneficiaries of Andros' sustainable development.

¹⁹McCoy & McCoy et al, 2012

²⁰Commonwealth of Learning, 2013



| Education & Capacity building | |
|-------------------------------|--|
| Strengths | Education considered as a national issue to be addressed through the National Development Plan Vision2040 |
| | Existing education infrastructure that can be improved |
| | BAMSI, BTVI, UOB offering continuing education and educational services in Andros |
| Weaknesses | Limited or no public library and/or resource center to support learners |
| | Limited public access to technological infrastructure (i.e. computers) to support teaching and learning |
| | Lack of specialist teachers, notably in mathematics |
| | Limited or no physical infrastructure and specialist teachers to support needs of students, notably in Central Andros |
| Opportunities | A public library and/or resource center in each of the districts of Andros |
| | Technological infrastructure (computers) that supports teaching and learning |
| | Specialist teachers motivated to work in Andros |
| | Infrastructure that enables the participation and success of all students including those with special needs (physical or mental disabilities) |
| Threats | Lack of development in Mathematics and sports due to lack of qualified teachers/trainers in these subjects |
| | More children are educated elsewhere (i.e. travel further in Andros or outside of Andros) |
| | Development of Andros limited due to limited level and availability of education |
| | Increased number of days schools are closed due to climate change effects (extreme meteorological events, flooding) |

Figure 7: Nicholl's Town primary school in North Andros



Source: Ann-Sophie Gabellini BRLi – December 2016

2.1.4 Livelihoods and income equality

The population of Andros has been gradually decreasing since the 1970s. At the 2010 census, the total population of Andros was 7,490 (a mere 84% of the population in 1970)²¹. With a 17% unemployment rate, Androsians have been emigrating to Nassau or elsewhere in pursuit of economic opportunity. Young people in particular leave the island in search of jobs. The **negative population flux** coupled with the **spread out nature of the settlements** reduces the capacity of the island to provide education, local services, economic development and emergency response, among other things.

The importance of various activities varies by administrative district based on ecological, social and economic conditions. For example, agriculture is particularly prominent in the North, fishing is the focus on Mangrove Cay and South Andros, and people throughout the island are engaged in tourism, the majority of which is nature-based tourism.

The following is an excerpt from Hargreaves-Allen's "Economic Valuation of the Natural Resources of Andros Islands" (2010): "It is estimated that Andros' natural resources generate \$142 million in direct revenues each year and employ over 80% of the population either full or part-time. Overall, \$70 million stems from commercial fishing and \$44 million from nature-based tourism. If secondary impacts (related to spending not included here, such as fisheries equipment, construction and inter-island transport) are considered, we estimate that the total impact is \$177 million each year. It should nevertheless be noted that these are gross revenue estimates and that direct, indirect and opportunity costs can be significant."

There are marine vessels that pass Andros on a daily basis as well as nature-based tourism and research opportunities available to the island. Infrastructure development of marinas, a cargo port at Morgan's Bluff, improved airport terminals etc. is key as it has the potential to attract activities that may have previously avoided the island.

There are many development opportunities in areas of forestry, the creation of high end and boutique hotels, fisheries, agriculture and more but policies must be put into place that ensures the local communities are able to directly benefit from projects. There is the sentiment that **when development opportunities do come to the island, there is little opportunity for local community members to participate or contribute**. This has meant that wealth generated from development tends to leave the island or to be concentrated within a subset of people or industries on the island. Efforts to build capacity should be increased; these include training programs in marketing, business management, ecommerce and merchandizing. Quality goods and services that can be sourced on island will reduce the need to leave the island to procure. The creation and strengthening of local cooperatives provides opportunities that may not be available as individuals. Agriculture and craft manufacturing are the sectors currently represented and the theory of cooperatives and associations should be introduced to other qualified sectors as well .

There are thirty-four (34) hotels on the island and locals own a large percentage. Although opportunities are present, small-scale businesses face such that Bahamian-owned hotels lie in **access to Crown Land** as well as **funding for the businesses**. Accessing Crown land at present is a tedious and lengthy process and there are very few opportunities for Androsians to access funding for their businesses. There is the **Bahamas Entrepreneurial Venture Fund (BEVF)** that makes loan or equity funding available to start-up businesses. Since its inception in 2005, the government body has released around \$5.7 million with 80 per cent going to Nassau, 12 per cent to Grand Bahama and the rest dispersed among the Family Islands. Applicants must submit a business proposal, which is reviewed by the board. The fund can grant up to \$200,000 in equity and approval for a loan can be granted within a month. However, it currently has an 80% failure rate according to BEVF Chairman Michael Cunningham. This may be due to the lack of training in business management and marketing.

²¹City population website, 2016

Androsians have stated that the banks' lending policies make it difficult to obtain or payback small loans. One consideration would be for the Government to step in with financing, perhaps through microloans through the Bahamas Development Bank. The Micro-loan Program could provide loans up to \$50,000 to help small businesses and certain non-profit centers start up and expand. The maximum repayment term allowed for a microloan would be approximately six years. Otherwise, the best opportunity seems to be the creation of cooperatives where persons could pool their resources and access grants that are not available to individuals.

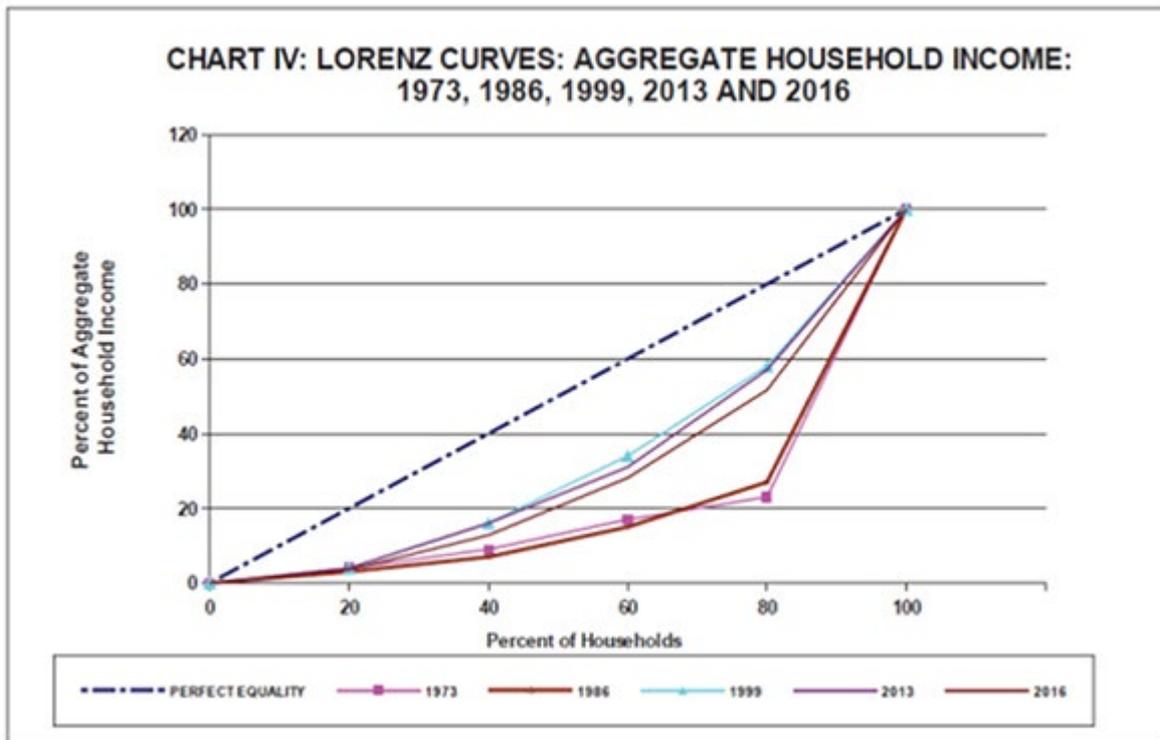
The Bahamas gross national income makes it the wealthiest member of the Caribbean Community (CARICOM), however, evidence points to a widening of income inequality and a fall in standards of living as poverty rates increased over the last decade in all age categories other than those over 65 years. For people 15 to 19 years old, the rates doubled, while the 20 to 24 years old accounted for 23.9% of the poor. More than 12.8% of the population, or 43,000 persons, live at or below the poverty line, which was defined at \$4,247 in 2013. The increase in the poverty gap was evident

in many of the Family Islands and New Providence. However, the minimum wage was increased by 40% in August 2015 to address this issue.

In The Bahamas' Department of Statistics' most recent Labor Force Survey, a graph illustrating trends in income distribution from 1973 to 2016 shows a laudable closing of the income inequality gap from one of quite severe income inequality in The Bahamas in 1973 and 1986 to a vastly improved position by 1999. However, from 1999 onwards, income inequality has increased in The Bahamas. This graph is shown below

Livelihoods and income equality should begin to improve as a result of the **introduction of Value Added Taxes (VAT)**. They can be sustained by improving education, providing libraries/resource centers, improving clinics and ensuring protection of natural resources to ensure sustainability of better infrastructure and the economic development of fishing, agricultural, forestry and other nature-based activities..

Figure 8: Trends in income distribution from 1973 to 2016



Source: Labour Force and Household Survey Report - Bahamas' Department of Statistics - 2016

| Livelihoods & Income equality | |
|---|---|
| Strengths | Andros' natural resources generate millions in direct revenues each year and employ the vast majority of the population either full or part-time |
| | Natural resources such as marine resources, forests and land appropriate for agriculture are relatively vast in comparison with other islands in The Bahamas |
| Weaknesses | Decreasing population in Andros |
| | Young people leaving the island in search of jobs |
| | Little opportunity for local community members to contribute to development projects |
| | Outdated infrastructures |
| | Ineffective interdepartmental communications |
| | Inadequate or lack of resources (budget allocation and human resources as well as access to land) |
| Opportunities | There are many development opportunities in areas of forestry, the creation of high end and boutique hotels, fisheries, agriculture and more but policies must be put into place that ensures the local communities are able to directly benefit from projects |
| | Efforts to build capacity should be increased, these include training programs in marketing, business management, ecommerce and merchandizing |
| | Access to microloans through the Bank of The Bahamas |
| | Improved social and health services |
| | Improved education and capacity building |
| | Repairs and improvements to existing infrastructure |
| | Economic development of fishing, agriculture, forestry and other nature-based activities |
| | Market access for products and services |
| Legislative environment promoting protection of ecological resources | |
| Threats | Andros' natural resources and thereby main source of income are threatened by climate change and mismanagement |
| | Andros' infrastructure may compromise livelihoods if not adequately maintained |
| | Some developments may hinder others (i.e. use of fertilisers in agriculture affecting marine resources) and must be managed in a sustainable way |
| | Development opportunities do not benefit local communities but others |

2.1.5 Land tenure security, land use planning and enforcement

LAND TENURE

The majority of land issues on Andros is related to access to Crown Land. As most of the land on Andros is Crown Land, its effective administration has to be addressed, not just in Andros but also nationally.

A good percent of all land is in dispute and the main reason is the **lack of clear and easily accessible documentation**. Slow response times and lack of access to information either stymies development or encourages ad-hoc building without permits. Squatting is also a major issue in some areas of North Andros in particular.

The administration of important records needed for clear and secure documentation of property ownership is separated among multiple agencies including the Ministry of Agriculture, the Ministry of Public Works, the Registrar General, the Department of Lands and Surveys, the Department of Physical Planning, the Real Property Tax Department, and the Treasury Department. Data is largely **paper based** and **records are incomplete and weakly managed** in most cases. Attempts have been made at each of the agencies to better organize existing records as well as improve day forward processes such as the issuance of new Crown Grants, but serious gaps exist complicating further transactions. The recording of all information related to land is not mandatory nor is it based on a common property identifier and as a result, it is very difficult to link the multiple record sets that describe the same real property unit. In all cases, each of the departments charged with land administration have the same and **numerous core functional problems**.

The Government of The Bahamas, realizing the increased threat and pressure from unguided development, growth, and the Government's inability to effectively steward land resources, embarked in 1998 on a **National GIS Project (BNGIS)**. The project brought together more than 13 government agencies to work together to try to illustrate through two pilot studies, one an urban information system and the other an

environmental study, how integrated land management using GIS and spatial data could benefit The Bahamas. BNGIS now continues to promote, educate, coordinate and advance the practical and efficient use of GIS Technology in The Bahamas. It is primarily responsible for the provision of GIS services, including training and technical support, to the Bahamian national community. One of its key functions and responsibilities is the development of Spatial Data Infrastructure system and program that guides cooperation and coordination among governmental agencies and other groups in the collection, production, maintenance, sharing and use of spatial information.

PLANNING

In The Bahamas today, there is a **lack of strategic land use planning for sustainable development of the land and marine resources**, which results in:

- Conflicts in the use of land,
- Conflict between the various land development agencies, and
- Poor service delivery of utilities and infrastructure.

The fact that there is no comprehensive and legally mandated environment plan or land use plan nor guidelines on how to develop land, particularly in environmentally sensitive areas, compound these problems.

In general, the agencies tasked with planning in The Bahamas all suffer from:

- Limited Resources (Staff and Budget),
- Lack of access to a complete and up-to-date information base,
- Lack of access to suitable monitoring tools, e.g. high resolution aerial photography on a regular basis,

- The absence of a comprehensive planning approach and a clear 'Integrated National Land Use Policy',
- Duplication in functions between sector agencies,
- Fragmented administrative responsibilities, and
- Lack of legal mechanisms and political commitment to enforce breaches of existing rules or policies.

In recent years, the Government has sought to address some of the environmental concerns by introducing various initiatives including:

- 1. The release of a draft Environmental Planning and Protection Bill 2015 to the public for commentary. The Bill is intended to consolidate and strengthen environmental protection and planning by establishing a new Department of Environmental Planning and Protection (DEPP) and an Environmental Advisory Council.
- 2. The Planning and Subdivision Act came into force in January 2011. Among others, the foremost object and purpose is to provide, for a land use planning based development control system led by policy, land use designations and zoning.
- 3. The enactment of the Forestry (Amendment) Act 2014, which amends Forestry Act 2010 to strengthen forest management and conservation.

Work is currently underway for a National Development Plan, which should seek to **lay the foundations for land administration** in that the relationship of land parcels, the use to which the land is put and the proprietary interests residing in that land would provide a means of achieving a sound fiscal base to meet social and community needs. Additionally, it should establish an **effective decision making framework** in relation to decisions that concern the natural environment and the impact of development on that environment.

ENFORCEMENT

Land use planning can be enforced by defining **development or no-development areas for each human activity sector**. It will be of prime importance to define these areas with regard to climate change. Enforcement can be better applied by :

- Creating a land cadastre to establish land ownership in Andros,
- Establishing development zones and a clear process to have areas rezoned,
- A land use planning process that is transparent, comprehensive and inclusive to include the views of local residents.

LAND USE PLANNING, PERMITTING AND APPROVAL ISSUES

The main coastal land use planning, permitting and approval issues identified during the field visit include the following:

- Land ownership is often in question. Clear definition of property lines and land ownership needs to be addressed including definition of crown land, common land, generation land, and private land.
- Androsians have expressed frustration over delays in the Crown Grants application process.
- No coordination between central government and local town councils regarding land planning and construction project approvals.
- No coastal plans – mostly ad hoc development.
- No "Best Practices" to minimize impacts resulting from construction are in place. In particular with regard to road construction and the excavation of construction materials.
- Criteria for Government approval of projects are somewhat ambiguous, e.g. different standards exist for international versus national investors and for the relative size of the development.
- Land use planning is reactive versus proactive, i.e. reacting to major development proposals without some overall guidance for developers and Government managers.
- No building codes for construction in sensitive areas, i.e. sand dunes or flood areas.



| Land tenure security, land use planning and enforcement | |
|--|---|
| Strengths | Most of the land in Andros is Crown Land (for which effective administration needs to be addressed) |
| | Most of the land in Andros has not been developed |
| Weaknesses | Delays in the Crown Land application process for Androsians |
| | Lack of and access to resources (staff, funding, expertise, knowledge, technology etc.) |
| | Administration of important record, needed for clear and secure documentation of property ownership, separated among multiple agencies with ineffective inter-departmental communications |
| | Lack of strategic land use planning for sustainable development of the land and marine resources |
| | Absence of a comprehensive planning approach and a clear 'Integrated National Land Use Policy' |
| | Lack of legal mechanisms and political commitment to enforce breaches of existing rules or policies |
| | Slow response times and lack of access to information either stymies development or encourages ad-hoc building without permits |
| Opportunities | Improve legal mechanisms and political commitment to enforce breaches of existing rules or policies |
| | Strengthen individual and institutional capacity for an integrated approach for improved land administration |
| | Increase transparency and efficiency of land administration institutions and challenge to move to more sustainable land management |
| | Strategic land use planning for sustainable development of the land and marine resources |
| | Define development or no-development areas with particular consideration to effects of climate change |
| | Improve access to Crown Land for Androsians for business opportunities |
| Threats | Continued reactive planning results in continued loss of infrastructure and natural resources from the effects of climate change |
| | Continued issues in the management of Crown Land limits development and/or results in illegal development |

2.1.6 Health and wellbeing

There are nine (9) healthcare facilities throughout Andros, for which the Ministry of Health has assessed main issues, repairs needed and budgets associated²² :

▶ **Three (3) clinics in North Andros**, for which no special issues were raised by Androsians, but for which the Ministry of Health has identified repair works to be undertaken and planned the associated budget:

- To improve the integrity of Nicholls Town Clinic and support the expansion of its services, redesign and structural repairs are needed,
- To remedy the unacceptable flows in terms of health care standards and the increased risk of confidentiality being breached at Mastic Point clinic, total reconfiguration of space and structural repairs are needed,
- A new clinic is required in Red Bays (private) to replace the poor, substandard rental facility.

▶ **Four (4) clinics in Central Andros**, for some of which special issues were raised by Androsians, and for which the Ministry of Health has identified repair works to be undertaken and planned the associated budget:

- Work flow redesign to create diagnostic services and health education, and deep structural repairs are needed for Fresh Creek clinic,
- To improve the delivery of services at Cargill Creek clinic, expansion and redesign of work space are needed,
- To improve access to services for residents at Staniard Creek clinic, minor repairs are needed,
- Redesign of space and clinic flows, and minor works are needed for Stafford Creek clinic.

▶ **The clinic of Mangrove Cay was raised as a crucial issue by the Androsians:** despite its renovation in 2009, the clinic was relocated in 2016 in a rental space that is not capable of meeting the needs, as space is lacking and as the building is flooded during heavy rains. The Ministry of Health has identified repair works to be undertaken and the associated budget: due to the initial poor design and shoddy work, the entire facility requires redesign to improve health services delivery, privacy and secure confidentiality for clients and staff. Moreover, the construction of a morgue cooler is urgently needed.

▶ The Androsians raised no special issues for Kemps Bay clinic in South Andros, but the Ministry of Health has identified repair works to be undertaken and planned the associated budget: repairs on the electricity and water systems are needed.

Androsians face a **lack of health care options**, both because of deteriorating infrastructure and the limited numbers of health care professionals. There is a **critical need for improved health services and infrastructure** throughout the island.

Overall, health and well-being for the Androsians can also be sustained through the maintenance of the natural features of Andros that bring benefits, the improvement of food and water security, and the reduction of risk from coastal hazards.

²²Health System Strengthening Charlene Bain, May 2016



| Health & Wellbeing | |
|----------------------|---|
| Strengths | Existing health infrastructure presenting potential that can be improved |
| Weaknesses | Deteriorated clinic infrastructures throughout Andros |
| | Weak integrity of facilities and delivery of health services |
| | Lack of trained health care professionals |
| Opportunities | Improvement of health infrastructure and facilities planned and budgeted by the Ministry of Health |
| | Increased numbers of health care professionals |
| Threats | Lack of public budget |
| | Health care professionals not interested in working in Andros due to the deteriorated infrastructure and the lack of connectivity with other islands |
| | Damage to health infrastructure resulting from coastal hazards due to climate change (extreme meteorological events, sea level rise, flooding, erosion) |

Figure 9: Mangrove Cay clinic



Source: BRLi / Blue – May 2016

2.1.7 Strengthening local government

Governance is one of the key pillars of the New National Development Plan encompassed in VISION2040. Effective Governance implementation is under the umbrella of the Joint Economic Council (JEC) that gathers, among others, the Government, the Private Sector and the Community.

Local government is often hamstrung by national policies that may or may not be relevant to Andros. **Coordination between local and national government is reported to be poor and burdensome**, limiting the ability of local government to support and promote the services and development desired by the Androsians. However, emphasis is put on efforts to make decentralization easier and invite Local Governments to take part in decisions. Indeed, they are tools for energizing local economies, their topics ranging from local procurement of goods and services, promoting inward investment, supporting training and skills development, directly attracting jobs and investment, working with central government, the private sector and other partners to implement joint investment and job-creating strategies.

Since 2008, The Bahamas Local Government Association (BALGA) is a member of bodies such as the Caribbean Forum of Local Government Ministers (CFLGM) and the Regional Caribbean Associations

of Local Government (CALGA), whose aim is “To promote good governance and local democracy through capacity-building, networking, advocacy, and effective representation of the interests and views of Local Government Authorities». The principal objective of BALGA is to **strengthen Local Government and Communities Associations** in the country. In 2014, the government enacted the 2014 Local Government Law (Amendment). This amendment empowers Local Government Practitioners and aims to ensure the modernization of the Local Government Structures in the Family Islands Districts. In addition, Youth is invited to take a greater participation in decisions through the Youth Program and Bodies implemented in the country.

Beyond the 2014 Local Government Act, **greater decentralization** is the claim clearly expressed by Androsian stakeholders, in other words, the transfer of state/national responsibilities or functions from central government to sub-national levels of government, or from central agencies/offices to regional bodies. It can be described as “*the redefinition of structures, procedures and practices of governance to be closer to the citizenry*”²³

| Strengthening local government | |
|--------------------------------|---|
| Strengths | Governance considered as a national issue to be addressed through the National Development Plan Vision2040 |
| Weaknesses | Poor coordination between local and national government |
| | Limited ability of local government to support Androsians issues |
| Opportunities | Strengthen local government and communities’ associations through greater decentralization and financial autonomy |
| Threats | No or limited transfer of state/national responsibilities or functions from central government to sub-national levels of government |

²³Miller, K.L., In Caribbean Conference on Local Government & Decentralization, 2008. P.3.

2.1.8 Climate change and coastal resilience

GLOBAL CLIMATE CHANGE

According to the Intergovernmental Panel for Climate Change (IPCC) “*Climate Change 2014: Synthesis Report*”, human influence on the climate system is clear.

Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen. Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans. Those impacts of climate change, irrespective of the cause, indicate the sensitivity of natural and human systems to changing climate.

Surface temperature is projected to rise over the 21st century. It is very likely that heat waves will occur more often and last longer, and that extreme precipitation events will become more intense and frequent in many regions. The ocean will continue to warm and acidify, and global mean sea level to rise.

The **projected change in global mean sea level rise** for the mid- and late 21st century compared to the 1986–2005 period is:

- ▶ **Between 0.24 and 0.30 m** for the mid-21st century (2046–2065),
- ▶ **Between 0.40 and 0.63 m** for the late-21st century (2081–2100).

Sea level rise will not be uniform across regions. By the end of the 21st century, it is very likely that the sea level will rise in more than 95% of the ocean area. About 70% of the coastlines worldwide are projected to experience a sea level change within $\pm 20\%$ of the global mean.

CLIMATE CHANGE IN THE BAHAMAS

In the Caribbean, more than 70% of the arable land would be affected by climate change due to reduced water availability and changes in precipitation in dry areas. Overall production of the main staple foods is estimated to decrease by 5 % in the region by 2020. Temperature increase, sea-level rise and higher hurricane intensity will threaten lives, property, public and economic infrastructure and livelihoods throughout the Caribbean. As ocean levels rise, some of the smallest low-lying islands may even disappear. With temperatures rising and storms becoming more severe, tourism, the most important sector of many Caribbean economies, will be very adversely affected, and with it, the income of a substantial portion of the 40 million people inhabiting these islands.

Although the contribution of The Bahamas to greenhouse gas emissions is globally insignificant and ranks amongst the lowest in the world, the Bahamian islands arguably face the heaviest, immediate burden of climate change affecting the low-lying islands, like Andros, that make up most of the country.

The following are the main future risks related to climate change in The Bahamas:

- ▶ **Changes in rainfall and drought patterns,**
- ▶ **Increases in the frequency and/or intensity of extreme meteorological events leading to more frequent flooding events,**
- ▶ **Sea level rise,**
- ▶ **Storm surge and wave action leading to coastal erosion,**
- ▶ **Temperature changes and variations.**

Many of the impacts of climate change have already begun to be realized in The Bahamas. Projections based on climate models indicate an increase in average atmospheric temperature; reduced annual rainfall; and increased Sea Surface Temperatures (SST) contributing to a potential increase in the intensity of

tropical storms. The Bahamas on average is brushed or hit by a hurricane once every three years, and is hit by a major hurricane once every 12 years.

The CARIBSAVE Climate Change Risk Atlas (CCCRA) Phase I, funded by the UK Department for International Development (DFID/UKaid) and the Australian Agency for International Development (AusAID), was conducted from 2009 – 2011. It successfully used evidence-based, inter-sectoral approaches to examine climate change risks, vulnerabilities and adaptive capacities; and develop pragmatic response strategies to reduce vulnerability and enhance resilience in The Bahamas.

Regional Climate Models, downscaled to national level in the Risk Atlas, have provided projections for Caribbean SIDS and coastal states with enough confidence to support decision-making for immediate adaptive action. A summary of model projections is reproduced in Box 1²⁴.

According to the Government of The Bahamas, the major issues of climate change are **sea level rise**, the likelihood of more intense weather systems and periods of drought. Sea level rise is seen as having the greatest potential impact, especially during intense storm swell conditions since human settlements and tourism developments are mainly located along the coast, and are at high risk in terms of coastal erosion and catastrophic events²⁵.

BOX 1: CLIMATE MODELLING PROJECTIONS FOR THE BAHAMAS

Temperature: Regional Climate Model (RCM) projections indicate an increase spanning 2.7 - 2.8 °C by the 2080s under the higher emissions scenario.

Precipitation: General Circulation Model (GCM) projections of rainfall span both overall increases and decreases, ranging from -1.2 inches (-30 mm) to + 0.8 inches (+21 mm) per month by 2080 under the high emissions scenario. Most projections tend toward decreases. The RCM projections, driven by HadCM3 boundary conditions, indicate larger decreases in annual rainfall (-7%) when compared to simulations based on ECHAM4 (-5%).

Sea Surface Temperatures (SST): GCM projections indicate increases in SST throughout the year. Projected increases range from +0.9 °C and +2.7 °C by the 2080s across all three emissions scenarios.

Tropical Storms and Hurricanes: North Atlantic hurricanes and tropical storms appear to have increased in intensity over the last 30 years. Observed and projected increases in SSTs indicate potential for continuing increases in hurricane activity and model projections indicate that this may occur through increases in intensity of events but not necessarily through increases in the frequency of storms.

²⁴CARIBSAVE, 2012

²⁵NCCC, BEST Commission, 2005

CLIMATE CHANGE ON ANDROS

Andros is particularly concerned about the effects of a changing climate over the next years and decades. Indeed, the entire island is extremely low-lying and the settlements are concentrated on the eastern coast close to the shore, placing people and coastal infrastructure at high risk in terms of sea-level rise, coastal erosion and flooding from storms, since there is limited safe, higher ground. Moreover, Andros lies in the hurricane belt.

During the latest series of high tides, the ocean encroached on coastal properties in Central Andros and Mangrove Cay, flooding the main roads that in some places were about a kilometer inland. Hurricane Matthew has also been disastrous in all districts in terms of flooding and erosion, causing major damage.

These characteristics make Andros highly vulnerable, with a strong vulnerability to natural disasters due to geographic remoteness and lack of emergency response services, especially as it lacks of full access to the resources and supplies required to respond to disasters (lack of infrastructure, lack of connectivity, weak food security).

The effects associated with climate change also put natural resources, such as freshwater and coastal habitats, at risk:

- ▶ Regional corals are very sensitive to seawater temperature changes. Elevated seawater temperatures (above seasonal maxima) can seriously damage coral ecosystems by bleaching. They can also impair reproductive functions and lead to increased mortality.
- ▶ It is expected that mangroves will be more adaptive to climate change; however, coastal land loss and the presence of infrastructure in coastal areas will reduce the natural capacity of mangroves to adapt and migrate landward.

- ▶ Changes in the patterns of rainfall or saltwater intrusion are also a threat to Andros' groundwater resources. Extreme weather events and sea level rise put groundwater resources at risk of being contaminated by salt water, as the water table in Andros is very high, located at only 30 cm (approximately 1 ft.) below the surface²⁶. One event of note is the 2004 storm surge during Hurricane Frances that led to the contamination of the groundwater supply²⁷.

Another important point is that **more than 55% of the populated east coast of Andros is currently buffered by coral reefs, seagrass, mangroves, wetlands and coppice forest**²⁸. These natural habitats play an important role in protecting Andros from the effects of climate change, affording protection for coastal communities and infrastructure while maintaining or restoring the multiple benefits of coastal habitats for people and ecosystems now and in the future:

- ▶ The barrier reef protects the eastern shoreline of Andros from the larger waves propagating from the deep open waters of the western Atlantic Ocean. The energy of the waves is partially dissipated as they break along the reef system prior to hitting the shoreline.
- ▶ Coastal settlements are protected from the destructive action of the ocean thanks to existing mangrove stands, that also act as natural coastal protection against erosion, dampening waves and currents in the nearshore and retaining sediments,
- ▶ Wetlands can absorb flooding from surges, acting as a natural buffer.

²⁶Martin and Bruce, 1999 - Cited in McCarthy J., et al (eds). 2001. *Climate Change 2001: Impacts, Adaptation, and Vulnerability Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press: Published for the Intergovernmental Panel on Climate Change (IPCC).

²⁷Bowleg, J., and D. M. Allan, 2012 - *Effects of Storm Surges on Groundwater Resources, North Andros Island, Bahamas in Tiedel, H. et al. 2012. Climate Change Effects on Groundwater Resources: A Global Synthesis of Findings and Recommendations*. London: Taylor and Francis Group.

²⁸NatCap, 2016

Tourism is recognized as one of the most economically important factors in Andros. **Climate change effects will affect tourism directly and indirectly** due to loss of beaches to erosion and inundation, increasing stress on coastal ecosystems and damage to coastal infrastructure from storm events. Such impacts will threaten the long-term sustainability of the tourism industry in Andros. It is estimated that the tourism sector in The Bahamas will lose between US \$ 869 million and US \$ 946 million annually, as a result of sea level rise alone²⁹.

Figure 10: Coral reefs, mangrove and coppice forests that buffer shorelines from erosion and flooding



Source: Katie Arkema - 2016

²⁹The CARIBSAVE Partnership, 2012 - *Climate Change Risk Profile for The Bahamas*. Bridgetown, Barbados: The CARIBSAVE Partnership

The table below summarizes how climate change effects may affect Andros' environment and human activities:

| Human activities and natural resources in Andros | Climate change effects | Potential impacts |
|--|---|---|
| Infrastructure | Extreme meteorological events, sea level rise, flooding, erosion | Damage to infrastructure, especially when close to the shoreline |
| | | Loss of connectivity and accessibility (on the ground, by air or by water) |
| | | Lack of emergency response services |
| Dredging & Mining | Extreme meteorological events, sea level rise, flooding, erosion | Increased exposure of the coast to climate related hazards |
| Transportation by water | Extreme meteorological events, sea level rise, flooding, erosion | Damage to port infrastructure |
| | | Loss of connectivity and accessibility by water |
| | | Lack of safety during extreme weather events due to the lack of connectivity within districts and with Nassau |
| Fisheries | Increased sea temperature | Migration of some fish species which could move in search of cooler water |
| | | Change in breeding habits for some fish species which could spend less time in the Caribbean sea |
| | | Degradation of habitats or fish stocks around Andros |
| | | Livelihoods affected if massive decrease in fish stocks |
| Agriculture | Increased temperature, changes in rainfall, extreme meteorological events | Less water available during certain times of the year |
| | | Change in the rain-fed growing season |
| | | Land quality degradation and soil erosion |
| | | Lower crop yields |
| Forestry | Increased temperature, changes in rainfall, extreme meteorological events | Food security affected if massive decrease in crop yields |
| | | Landslides |
| | | Land quality degradation and soil erosion |
| Nature-based tourism | Extreme meteorological events, sea level rise, flooding, erosion | Stunted pine growth, decreased timber yields |
| | | Loss of beaches |
| | | Changes to blue holes (chemistry, species) |
| | | Damage to coastal ecosystems sustaining the nature-based economy |
| Natural resources | Extreme meteorological events, sea level rise, flooding, erosion, increased sea temperature | Livelihoods affected if massive destruction of natural assets |
| | | Coral bleaching ³⁰ |
| | | Loss of mangroves / seagrasses / sand flats |
| | | Loss of breeding grounds and habitats for fish, turtles and other marine animals |
| | | Saltwater contamination of ground water |
| | | Water security affected if contamination of ground water |

³⁰Warmer waters cause corals to expel the small plant organisms (algae) that live in them. When this happens, the corals go white or 'bleach'. Bleached corals can eventually die. Strong hurricanes also put pressure on the reefs, most of which are already damaged by pollution from the land, overfishing and disease.

As Andros is **particularly vulnerable to the effects of climate change from an environmental, social and economic point of view**, it is crucial to ensure its sustainable development and coastal resilience through:

- Conservation and protection of key natural buffers such as coral reefs, seagrass, mangroves, wetlands and coppice forests,
- Preferably nature-based solutions to protect the shoreline against erosion and the action of the waves and winds,
- Limited coastal infrastructure development.

The CCCRA has developed pragmatic response strategies for The Bahamas to provide the necessary foundation, in terms of information and data, development policy, awareness raising and cross-sectoral linkages, from which wider actions to combat the threat of climate change on future development can be legitimized. These strategies can be adapted for Andros:

- **Implementing and Strengthening Data Collection, Monitoring and Evaluation Activities:**
 - ➔ Update the census data and broaden the data collected to ensure that all vulnerable groups are accounted for to assist with emergency response planning,
 - ➔ Develop an in-depth water quality-monitoring program, particularly for non-registered private wells,
 - ➔ Assessments focusing on the links between health, tourism and climate change,
 - ➔ Data collection, research, monitoring and evaluation in the Health Sector,
 - ➔ Develop computer models of groundwater flows to account for the impact of sea-level rise on groundwater levels,
 - ➔ Inventory existing coastal defenses, as well as their design range and maintenance status.

- **Mainstreaming Climate Change into Policy, Planning and Practice:**

- ➔ Develop and implement sustainable tourism plans with more attention to disaster risk reduction and climate change adaptation,
- ➔ Integrate SLR considerations in local land use and development planning, with special consideration for vulnerable coastal areas and tourism hot-spots to reduce or avoid impacts,
- ➔ Mainstream gender and poverty into climate change and related policies,

- **Building and Strengthening Information Sharing and Communication Systems and Networks:**

- ➔ Epidemiology data with climate signals,
- ➔ Biodiversity data.

- **Climate Change Education and Awareness.**

Figure 11: Damage in Lowe Sound – North Andros after Hurricane Matthew in October 2016



Source: SEV - 2016



| Climate change & Coastal resilience | |
|--|--|
| Strengths | More than 55% of the populated east coast of Andros coastline is currently buffered by coral reefs, seagrass, mangroves, wetlands and coppice forest |
| | Large awareness raising about climate change risks and impacts in Andros and in The Bahamas |
| Weaknesses | Low-lying island with settlements concentrated close to shoreline |
| | High vulnerability to climate change effects (sea level rise, flooding, erosion, extreme weather events, increased temperature), inducing direct damages on coastline, ecosystems, infrastructures, population security, and indirect damages on regional economy especially tourism and ecosystem services |
| | Strong vulnerability to natural disasters due to geographic remoteness and lack of infrastructure and emergency response services |
| | High reliance on natural habitats playing important roles in both buffering the populated coast, and providing multiple benefits for people and ecosystems |
| Opportunities | Improve coverage and availability on climate change data and vulnerability to inform future risk-resilient coastal planning and decision-making in Andros |
| | Define a local Integrated Coastal Zone Management plan for reducing coastal vulnerability (maintaining certain activities, protecting exposed low-lying places or more simply keeping an eye on natural evolution) |
| | Protect the most low-lying coastal areas from ocean attack and sea level rise through nature-based solutions |
| | Ensure conservation and protection of key natural buffers such as coral reefs, seagrass, mangroves, wetlands and coppice forests |
| | Develop policies and land use regulations to minimize the potential effects of climate change and sea level rise |
| Threats | Lack of climate change and vulnerability data |
| | Poor infrastructure development planning and lack of integration of coastal risks |
| | Limited land-use regulations |



Source: BRLi / Blue - May 2016

2.2 HUMAN ACTIVITY SECTORS

The Androsians identified eight human activity sectors present on and around Andros that require multi-sectoral management.

These are as follows and are further detailed below:

- **Infrastructure development,**
- **Dredging and mining,**
- **Transportation by water,**
- **Fishing activities,**
- **Agriculture,**
- **Forestry,**
- **Nature-based tourism,**
- **Protected areas.**

At present on Andros, strengths and weaknesses exist in each of these sectors. However, they also present opportunities for development that will enable responses to some of the problems facing the Androsians, summarized in the previously mentioned eight key pillars.

2.2.1 Infrastructure development

Andros remains **largely undeveloped** with a lot of potential. However, the island **lacks the essential infrastructure (transport and public infrastructure)** to support its people's livelihoods and those of generations to come.

Whilst a large roads project is currently underway to improve roads in North and Central Andros and the extension of the supply of water to South Andros imminent, **a lot of the infrastructure is in a state of disrepair**. At present, the rehabilitation of bridges in Central Andros is critical. There are also a number of docks and ramps needing repairs and development. Work is also necessary at some of the creeks where infrastructure is negatively affecting the health of the creeks, for instance London Creek causeway, to improve the water flow for the health of the mangroves. **Improvements to the main public and social infrastructure** such as clinics (e.g. Mangrove Cay clinic), schools (e.g. Fresh Creek School) and sport centers (e.g. Mangrove Cay sport center) are also needed. Dumps are under-developed and poorly managed in each district in terms of waste collection and storage, and no treatment / recycling processes are enforced.

A number of factors including the following has hindered the development of infrastructure:

- Decreasing population,
- Lack of available funding,
- Much of the island being a highly vulnerable environment,
- Complicated land tenure and registration processes,
- The scattered nature of development to date,
- Poor infrastructure (i.e. poor roads restrict the development of infrastructure in either North/Central Andros due to poor connectivity),
- Lack of value vested in the natural environment combined with poor waste management,

- Lack of long-term infrastructure planning,
- Lack of integration (due to accessibility and training and possibly desire) of modern technology, GIS, ecosystem valuation, hazard planning, adaptation and mitigation services, and
- Lack of preparedness for inevitable climate change.

Infrastructure is the key to creating a healthy, thriving economic climate and plays a critical role in enhancing sustainability. The **planning, design and construction of sustainable infrastructure** is of vital importance as it supports and connects communities. It is not simply the short-term provision of infrastructure that is of prime importance, but planning and designing infrastructure, which takes full account of its own impact and its operational needs and use. **Infrastructure must be sustainable** if it is to benefit coming generations and make a positive contribution to the future.

Figure 12: Morgan's Bluff harbor, North Andros



Source: BRLi / Blue - May 2016



Sustainable infrastructure design is not just about new infrastructure. It is about **rehabilitation, reuse or optimization of existing infrastructure**, which is consistent with the principles of urban sustainability. This encompasses:

- Infrastructure renewal,
- Long-term economic analysis of infrastructure,
- Energy use and reduced infrastructure costs,
- The protection of existing infrastructure from environmental degradation,
- Material selection for sustainability, quality, and durability,
- Energy conservation, minimizing waste and materials,
- The redesign of infrastructure in light of climate change effects (sea level rise, flooding, erosion, extreme meteorological events),
- The remediation of environmentally damaged soils and water.

Figure 13: Staniard Creek Bridge, Central Andros



Source: BRLi / Blue - May 2016

| Infrastructure development | |
|----------------------------|---|
| Strengths | Existing infrastructure presenting potential |
| | Ecosystems generally healthy and intact with limited impact resulting from human activity |
| Weaknesses | Lack of essential infrastructure (transport and public infrastructure) to support Androsians' livelihoods |
| | Existing infrastructure in a state of disrepair |
| | Lack of long-term infrastructure planning |
| | Lack of preparedness for inevitable climate change |
| | Complicated land tenure and registration processes |
| Opportunities | Design sustainable, green infrastructure |
| | Improve the main transport, public and social infrastructure such as roads, airports, harbors, clinics, schools and sport centers |
| | Improve the health of the mangroves where infrastructure is having a negative impact |
| | Develop and improve sustainable waste management |
| | Restore and integrate ecosystems in infrastructure development planning |
| Threats | Infrastructure failures |
| | Damage to infrastructure resulting from coastal hazards due to climate change (extreme meteorological events, sea level rise, flooding, erosion) |
| | Damage to ecosystems due to poor infrastructure planning and lack of integration of ecosystems |

2.2.2 Dredging & mining

Dredging and mining take place in the ocean and on land respectively for quarry, sand, aragonite and other minerals.

Whilst the majority of high quality mined materials is generally sourced from Grand Bahama, some is sourced locally from Andros. **Sand and aggregate are in high demand for development**, most construction being done with concrete. In addition, the roads are constructed using a limestone base and double sand seal requiring large quantities of locally sourced materials.

Dredging and mining can be harmful to natural habitats that are **critical to fisheries, nature-based tourism and to the resilience of the shoreline**, but these negative impacts can be partially mitigated through effective management.

Mining and/or dredging operations increase vulnerability to climate change effects, as they cause a loss of natural buffer protecting the coast from ocean hazards.

MINING OPERATIONS

Due to the demand for construction materials, some of Andros' beaches are being mined for sand. The practice is often very destructive and poorly managed (or unmanaged).

This theft of beach and dune sand is a **direct cause of erosion** along many shorelines. It is very damaging to the beach fauna and flora, ruinous to beach aesthetics, and frequently causes **environmental damage to other coastal ecosystems such as wetlands or mangroves**. Another major impact of beach sand mining is the loss of protection from storm surges associated with hurricanes.

Where mining takes place inland, scars and ponds are left beside roads, which lead to eyesores along the roadside, mosquito issues and indiscriminate dumping.

Although there is evidence of illegal sand mining operations taking place throughout Andros, these practices are **destructive and unsustainable** given the low-lying nature of the island and the presence of fresh water lenses.

DREDGING OPERATIONS

Dredging for harbors, marinas and canals is a significant problem compounded by the fact that construction work generally occurs on privately owned land. Presently, no adequate regulations for dredging exist. Dredging regulation is generally enforced through the Town Planning Act, 1961 since permission for the development of land is required. Dredging harbors and ports requires permits from the Ministry of Transport. Large dredging operations impact mangroves and affect fresh water habitats.

Nevertheless, dredging operations are needed to improve maritime access to several harbors in Andros, to support connectivity and accessibility by sea.

OVERALL

Mining and dredging activities need to be limited and carefully managed in Andros, through the implementation of **best management practices** regarding the equipment used (select appropriate dredge type and size), the process (rate of operation), and the control (mitigation measures to safeguard the environment).

Figure 14: Dredging operation in Mars Bay, South Andros



Source: BRLi / Blue - May 2016

| Dredging & Mining | |
|----------------------|--|
| Strengths | Plentiful supply of marine sand around Andros |
| Weaknesses | Dredging and mining operations have the greatest negative impact on natural resources and habitats (highly destructive) |
| | Dredging and mining operations are currently poorly managed |
| | Sand and aggregate are in high demand in large volumes for development |
| | Illegal mining taking place in Andros |
| | Best practices non-existent |
| Opportunities | Several harbors in need of dredging (entrance channel and basin) |
| | Implement best management practices and improve dredging and mining activities monitoring |
| | Improve maritime access to Andros harbors through dredging operations |
| | Launch study to determine the most sustainable locations for quarry and offshore mining in Andros |
| Threats | Implement policies to limit aggregate mining in The Bahamas |
| | Continued theft of beach and dune sand causing further erosion along shorelines and loss of natural buffer to protect the coast |
| | Increased exposure of the coast to climate related hazards |
| | Continued dredging causing loss of natural habitats |
| | Limited access to coastal infrastructure due to a lack of dredging activities |

2.2.3 Transportation by water

Many port facilities in Andros need repair, which is both a safety and an economic issue. **Modern, safe, green dock facilities** are needed to support connectivity by water between Andros and the rest of the nation and to spur overall economic development. Passenger safety is also a concern: safety at sea must be improved nationwide. To this end, the Government released a first draft of the Bahamas National Maritime Policy in 2015³¹.

BETWEEN ANDROS AND NASSAU

The mail boat system that serves Andros needs to be upgraded. Service is slow and out of sync with modern practices and citizens' needs. There are currently four mail boats in operation in Andros:

- ▶ The "Lady Rosalind" connects North Andros (Morgan's Bluff) from Nassau on Wednesdays, return on Tuesdays once a week,
- ▶ The "Lady D" connects Central Andros (Fresh Creek) from Nassau on Tuesdays, return on Sundays, once a week,
- ▶ The "Lady Katherina" connects Mangrove Cay (Lisbon Creek) from Nassau on Thursdays, return on Mondays, once a week,
- ▶ The "Captain Moxey" connects South Andros (Driggs Hill) from Nassau on Mondays, return on Wednesdays, once a week.

Figure 15: Mail boat « Captain Moxey » at Driggs Hill harbor, South Andros



Source: BR Li / Blue - May 2016

Bahamas Fast Ferries also services Fresh Creek from Nassau, once a week. In addition, a number of private vessels, mainly fishing boats and sailboats, sail in.

BETWEEN ANDROS' DISTRICTS

Andros is split up into its districts largely by creeks, so that it is not possible to travel between Central (and North) Andros and Mangrove Cay, and Mangrove Cay and South Andros by road. The waterways that would need to be bridged to allow access by road are as follows:

- ▶ Between Central (and North) Andros and Big Wood Cay (northern bight - 3.7 miles),
- ▶ Between Big Wood Cay and Mangrove Cay (middle bight - 2.6 miles),
- ▶ Between Mangrove Cay and South Andros (southern bight - 2.4 miles).

Providing the 8.8 miles of bridges across these creeks, and the road on Big Wood Cay that would be necessary to connect the districts, would require major financing for a project that would be exposed to hurricanes. The demand for such a project is not considered sufficient to warrant this expense and ferry services are deemed more cost effective.

As the Androsians are suffering from **a lack of connectivity between the northern and southern districts**, there is a need for an inter-island ferry service.

At present, a ferry service is provided only between Mangrove Cay and South Andros twice daily, allowing visitors and employees to travel between these two districts. Persons wishing to travel between North / Central Andros and Mangrove Cay / South Andros must either fly into Nassau or charter a flight which can be difficult to locate and expensive.

³¹State of the Nation Report – Vision2040, 2016

Some of the issues that currently restrict the development of water transportation are as follows:

- Its **viability** is economically questionable,
- **Facilities are limited** at the various ports/docks (i.e. fuel, electricity, water etc., is not available and dockage with nearby accommodation is limited),
- There is a **lack of safe harbor**: access is limited at the various ports/docks due to inadequate depth and entrance channels are not secured (marking is lacking),
- There are **difficulties with docking** due to currents, depths and proximity of dock to bridge at Fresh Creek, which has meant that one of the main shippers no longer serves Central Andros.

OVERALL

Transportation by water needs to be developed in a sustainable way, through **sustainable port infrastructure** and the **implementation of best management practices for harbors and boaters** regarding:

- Bilge water management and used oil disposal,
- Hazardous chemicals and wastes disposal,
- Solid waste disposal,
- Sewage and gray water management,
- Vessel repair and maintenance activity.

Figure 16: Existing ferry service between South Andros and Mangrove Cay



Source: BRLi / Blue - May 2016

| Transportation by water | |
|-------------------------|---|
| Strengths | A lot of existing port infrastructure that can be improved |
| | All districts are serviced from Nassau by mail boats |
| | Free existing ferry service between Mangrove Cay and South Andros |
| | Main harbors in each district (Morgan's Bluff, Fresh Creek, Lisbon Creek, Driggs Hill) that can be improved to attract more commercial and recreational vessels |
| Weaknesses | Limited facilities at the various ports/docks (i.e. fuel, electricity, freshwater etc.) |
| | Lack of safe harbor: access limited and entrance channel not secured |
| | No regular ferry service between North / Central Andros and Mangrove Cay / South Andros |
| | Difficulties with docking due to currents, depths and proximity of dock to bridge |
| Opportunities | Lack of reef location indicators |
| | Implement best management practices for harbors and boaters |
| | Improve connectivity within Andros and to Nassau |
| | Improve port infrastructure and facilities |
| Threats | Further investigate the future use of the seven military bases on Andros that are currently in the process of being decommissioned |
| | Accidents resulting from a lack of safe facilities and infrastructure at ports |
| | Damage to reef habitats resulting from unmonitored anchorage and navigation |
| | Damage to port infrastructure resulting from coastal hazards due to climate change effects (extreme meteorological events, sea level rise, flooding, erosion) |
| | Lack of safety during extreme events due to the lack of connectivity within district and with Nassau |

2.2.4 Fishing activities

HEALTHY MARINE ENVIRONMENT

The commingling of marine and freshwater environments throughout Andros has produced an **important patchwork of habitats** that vary in environmental conditions and ecological communities.

The estuaries are important nursery and foraging habitat for commercially valuable species such as snapper, spiny lobster, tarpon and bonefish. The nursery habitats are thought to significantly contribute to fish stocks throughout the Caribbean region, particularly for highly migratory species such as bull sharks, tarpon and several other species of interest, including endangered sawfish. Thirty-two (32) fish taxa have been observed (19 in mangrove, 13 in hard bottom). **Fish biomass is extremely high**, due to the mangrove creeks on western Andros. The creeks have naturally high rates of productivity coupled with limited human impacts, such as creek fragmentation, fishing and coastal development, which can reduce the amount of fish biomass in mangrove systems. One of the most important spiny lobster fishing grounds in The Bahamas is located in the extensive bank areas to the west and southwest of Andros Island. Andros is also known to be an important mating area for nurse sharks, an important nursery area for lemon sharks and an important area for maintaining populations of bull sharks³².

The commercial and recreational fishing industries are currently governed by the National Agriculture Fisheries Act (Jurisdiction and Conservation Act) 1977, the Fisheries Resources (Jurisdiction and Conservation Regulations) 1986, the Fly Fishing Regulations 2016, and regulated by the Department of Marine Resources.

The fisheries in Andros are important both socially and economically as they employ many locals.

COMMERCIAL FISHING

Andros supports a **large commercial fishery focused on lobster, conch, Nassau Grouper and scale fish** such as snapper.

Figure 17: Fishermen in Little Harbor (Mangrove Cay)



Source: BRLi / Blue - May 2016

Stone crab is not as abundant as lobster but it has a high market value. Due to the strong export market available, there is considerable possibility of continued growth as a commercial fishery. A stone crab processing plant opened in Mangrove Cay in October 2015, only shipping crab products to the United States at present.

Sponging was one of the most important fisheries in The Bahamas until a fungal disease killed off the sponges in the 1930's. Since then, the population has gradually returned and the usage of sponges has increased. Presently, sponge harvesting and processing are extremely labor intensive and lack sustain-

³²The Nature Conservancy, 2006

nable harvesting or technical processing practices. To help the economically reemerging import industry, IDB, working with BAIC and the Bahamas Commercial Spongers Association, has embarked on a project that aims at assisting the spongers to increase their global market share. A sponge processing plant is installed in Mangrove Cay.

Another activity is **crabbing for land crabs**. It is currently unregulated, but the majority of Androsian households are known to practice the activity for either commercial or sustenance purposes. Very little is known about land crab population size and habitat usage. Future scientific research on ecology and population assessments, as well as socioeconomic assessments, are needed.

The current number of commercial fishers in Andros is unknown. Commercial fisheries are estimated to generate over **\$70 million** in revenues per year³³.

RECREATIONAL FISHING

Fly-fishing and deep-sea fishing are classified as recreational fishing. Fly-fishing for bonefish and tarpon has developed significantly more than deep-sea fishing. Indeed, Andros is known as the “**bonefishing capital of the world**”, due to the large number of people (including foreigners) who come to Andros for recreational fly-fishing.

Fly-fishing is known to employ many Androsians both directly and indirectly. This activity is estimated to generate over **\$10 million** in revenues per year, and to represent 81.2% of the island’s tourism expenditure³⁴. There are eighty (80) estimated recreational fishermen in Andros³⁵.

Deep-sea fishing tournaments using sustainable practices may be an effective way to entice boaters to the island.

FISHERIES MANAGEMENT ISSUES

The major issues that threaten the Andros fisheries industry include:

- **Lack of education and awareness** – This includes the resource users that may not be knowledgeable of the species they are catching, their habitats,

Figure 18: Sponging in Mangrove Cay



Source: BRLi / Blue - May 2016

their importance to the marine ecology or even the effects of their actions. By organizing bespoke educational programs for fishermen, they will have a better understanding of the resources and habitats, and their importance, and may be more willing to implement sustainable harvesting practices as well as comply with fisheries laws and regulations.

- **Lack of enforcement of existing regulations** – There are presently three (3) Fisheries Officers with limited resources who are responsible for managing the marine resources on Andros. Enforcement at sea is facilitated through cooperation with the Royal Bahamas Police Force and the Royal Bahamas Defense Force, as the Officers do not have access to boats, severely limiting their ability to oversee the fishing sector as they should. The landings data for

³³Description of the fisheries survey in The Bahamas - Luis Villegas, 1992

³⁴Fedler, 2010

³⁵Gittens - Senior Fisheries Officer, Department of Marine Resources, Ministry of Agriculture and Marine Resources, The Bahamas - Personal communication with Janeen Bullard, by email, August 11, 2016

Andros may be grossly underestimated as it does not take into account pressure on its resources from persons throughout The Bahamas and from Florida that utilizes the environment.

- ▶ **Illegal Fishing** – Illegal Dominican fishing vessels are said to be the largest group of illegal fishers to threaten the fishing industry throughout The Bahamas. These vessels also have very easy access to the Andros area across the Great Bahama Bank³⁶. New technology will have to be introduced to help combat this issue, for example the use of drones to canvas the seas in the absence of enforcement patrols.
- ▶ **Lack of accurate stock status and assessments** – The status and assessments of commercially important fisheries for Andros and The Bahamas is unknown. Available data such as stock biomass and landings is limited. Fishing pressures increase due to legal and illegal fishing with no idea of threshold levels putting the stocks at risk of depletion. The Food and Agriculture Organization (FAO) supported by the European Union (EU) developed a national program in 2016, a Fisheries Management Information System (FisMIS) that is a fisheries statistical monitoring system³⁷. If it is determined to be feasible for the remainder of the islands, it should be implanted in Andros to improve data collection.
- ▶ **Invasive Alien Species (IAS)** – The Bahamas has twenty-six (26) recorded aquatic IAS, several of which are a major threat to the Andros marine ecosystem³⁸. The Pacific Lionfish, which is found throughout The Bahamas including Andros, constitutes one of the major threats as it consumes economically important species such as spiny lobster, groupers, and snappers. It also consumes ecologically important species such as parrotfishes and other herbivorous reef fishes, which are crucial for preventing coral overgrowth by seaweed. The mitigation and control of IAS throughout Andros should be a priority, through the continued development and implementation management plans such as the Regional Strategy for the Control of Invasive Lionfish in the Wider Caribbean (2013) at the local level. It seeks to build on the existing programs

and efforts aimed at minimizing the impacts of the lionfish in the region and to provide a framework for action to provide a regionally coordinated response to the lionfish threat.

In order to sustain a growing fisheries industry, emphasis needs to be placed on **education** of the resource users and consumers, enforcement of existing regulations and the **implementation of new regulations**, the mitigation and control of **invasive alien species (IAS) such as Lionfish**, and **population assessments** to determine thresholds for fishing pressure.

Overall, fishing activities need to be developed in a sustainable way, through the implementation of **best management practices** regarding operational objectives and guidelines (comprehensive framework to guide scientists, fishers, decision-makers), transparency in data provisioning and decision making, a regionalized approach and co-management. Some examples include using biodegradable material to build fishing condos, or the use of fishing applications such as SHOCK fishing to immediately measure and record fish landings and releasing fish within seconds of catch during fishing tournaments.

Figure 19: Fishermen in Red Bays, North Andros



Source: BRLi / Blue - May 2016

³⁶Sullivan-Sealey, 2011

³⁷Project TCP/BHA/3501 - WECAFC, 16th session, 24-25 June 2016

³⁸Critical situation analysis (CSA) of invasive alien species (IAS) status and management, The Bahamas, Department of Marine Resources, 2013

Figure 20: Fishermen in Darel Island, North Andros



Source: BRLi / Blue - May 2016

| Fishing Activities | |
|---------------------------|---|
| Strengths | Healthy environment with unique nursery habitats |
| | Established profitable industry |
| | Bonefishing capital of the world |
| Weaknesses | Limited information on fish stocks |
| | Lack of enforcement officers and equipment |
| | Information gaps on registered fishermen |
| | Fishermen's livelihoods depending on health of fish stocks |
| Opportunities | Implement best management practices in fisheries |
| | Monitor important commercial species stocks |
| | Implement partnerships between fishermen, scientists and enforcement agencies |
| | Possible growth in fishing industries |
| | Education of existing fishermen |
| | Recruit younger generation into industry |
| Threats | Lack of interest in fishing from younger generations |
| | Habitat destruction resulting from unsustainable fishing practices |
| | Livelihoods affected if massive decrease in fish stocks |
| | Degradation of habitats or fish stocks resulting from climate change effects (sea temperature increase, weather changes) |
| | Invasive Alien Species (IAS) such as Lionfish |

2.2.5 Agriculture

Andros offers approximately 100,000 acres of the estimated 197,000 acres of prime farmland in The Bahamas³⁹ that can be utilized to reduce the entire countries \$1 billion per year food bill.

The Bahamas is also signatory to international trade agreements that have opened the market to food security issues. To help reduce the high food bill and provide some food security, the government has redefined roles and introduced new programs. The Ministry of Agriculture is the regulatory body. The Bahamas Agricultural Industry Corporation (BAIC) assists farms with business plans, research, sourcing funding, business advice/counselling, implementation, follow-up, and works which facilitate land distribution.

The **Bahamas Agriculture and Marine Science Institute (BAMSI)** was created in North Andros in 2014 to:

- Help growth in the agriculture sector,
- Recruit and train a younger generation of farmers and agricultural officers,
- Upgrade the sector by introducing new technology and best management practices,
- Assist farmers in producing marketable products.

Programs and training including the Associated Farmers Program, refrigerated shipping containers etc., have been implemented by the agricultural sector and have begun to work effectively by **creating marketing access and local support to farmers**. They are mainly accessible by farmers in North and Central Andros but have yet to be implemented in South Andros and Mangrove Cay. These areas are focused on **small-scale agriculture**, which needs to be developed further with a **viable marketing system** that is not too dependent on government support.

Poor nutrition and lack of exercise that lead to chronic non-communicable diseases such as obesity, heart disease and diabetes are on the rise in The Bahamas and Andros are no exception. This may be a direct result of a lack of education about proper nutrition and exercise as well as the **limited availability and affordability of healthy foods**.

Agriculture on Andros has the potential to develop into a major industry that drives the country towards better food security, health and nutrition, an increase in food exports and a reduction in food imports. The introduction of BAMSI and its programs and assistance from local and international organizations can lead to positive industry growth. In order to facilitate this growth, the industry needs to address **recruitment**. The younger generation needs to be made aware of farming as a viable career choice as well as available programs and incentives in the field.

Figure 21: Young banana crops BAMSI, North Andros



Source: Website <http://www.bahamas.gov.bs/>

³⁹Eneas, G., 2013



Figure 22: Avocado crops BAMS, North Andros



Source: Website <http://www.bahamas.gov.bs/>

Overall, agriculture needs to be developed in a sustainable way, through the implementation of **practical, cost-effective actions (best management practices)** that agricultural producers can take to reduce the amount of pesticides, fertilizers, animal waste, and other pollutants entering Andros water resources, and to conserve water supply.

| Agriculture | |
|---------------|--|
| Strengths | Establishment of BAMS and programs |
| | Formally establish and increase membership in existing organizations for farmers, producers and cottage industry |
| | Access to funding and educational opportunities |
| | Developing industry with potential to grow |
| Weaknesses | Lack of marketing strategy |
| | Dependence on government programs |
| | Difficulties in accessing land |
| | Lack of knowledge about existing programs |
| | Lack of food safety regulations |
| | Lack of recruitment of younger generation |
| Opportunities | Implement best management practices in agriculture |
| | Potential for growth |
| | Proximity and access to BAMS |
| | Possible growth in fishing industries |
| | Implement local and international partnerships |
| | Improve public health |
| Threats | Crop failures due to poor planning and execution |
| | Damage, crop yields decrease, or soil quality degradation resulting from climate change effects (temperature increase, changes in rainfall, extreme meteorological events) |

2.2.6 Forestry

Much of Andros is wilderness, covered with **coppice and pine forest habitats**, with little access except by boat or via a few roads. Mangrove Cay and South Andros support the largest pines remaining in The Bahamas, since they were not subject to the same extensive logging as North and Central Andros during the 20th century.

Indeed, logging for pulpwood by Owens-Illinois occurred from 1905 to 1973, bringing major infrastructure and settlement development in North Andros. Unfortunately, most of the forest in North Andros has been felled.

Since that period, forestry management has evolved, The Bahamas government passing the **Forestry Act in 2010** and establishing the Department of Forestry (Forestry Unit) within the Ministry of Environment. The overall purpose is to provide a legal framework for the **long-term conservation and sustainable management of all forests**. The priority activities for the Forestry Unit include:

- Development of the **National Forest Management Plans** for the national forest estate and plans for each Protected Forest.
- Development of **small sized sustainable forest utilization industry** for The Bahamas.
- Amendment to the **Protected Trees Order** to add other rare indigenous trees to the listing based on their endemism and rarity, from scientific evidence.
- Implementation of **GEF NPFE – Land Degradation Project** titled “Pine Islands - Forest Innovation and Integration – Integration of forestry into land use planning”⁴⁰.

Over **one million acres of forest areas have been identified on Andros** by the Forestry Unit for some level of protection. The Bahamas National Trust (BNT) is already managing approximately 2,2 million acres under the national park system. The types of areas include:

- **Forest Reserve**, to be managed as a permanent forest estate for the sustainable utilization of timber and non-timber forest produce.
- **Protected Forest**, to be managed as a Forest Reserve until the land is required for other purposes.
- **Conservation Forest**, to be managed strictly for the preservation of its unique natural resources and biological diversity. Some of these areas include forest areas but are protected and managed separately under the BNT.

In an effort to establish and effectively manage those areas, there are ongoing efforts on Andros to educate the communities about the Forestry Act, the benefits of forests and the economic opportunities that can be derived from sustainable timber harvesting and production, the verification of boundaries and the development of National Forest Management Plans. The Forestry Unit is in the process of preparing a National Forest Management Plan that will be updated every five years, to detail the contribution of forests to the national economy, including timber and water production.

⁴⁰The Global Environment Facility (GEF) Full-Sized Project Related to the Land Degradation Focal Area Strategy Entitled: “Pine Islands –Forest/Mangrove Innovation and Integration (Grand Bahama, New Providence, Abaco and Andros)” which runs from 2013 to 2019 is consistent with the Global Environment Facility (GEF) V: Strategy for Sustainable Forest Management and Focal Area Strategies for Land Degradation and Biodiversity. It adopts a multi-disciplinary approach to the conservation of biodiversity and ecosystem services, and further contributes to the linkages between ecosystems and human wellbeing. The project goals seek to properly manage the forest reserves, increase public awareness and strengthen local economic opportunities.



Table 2: Identification, locations and sizes of the Andros Forestry Reserve

| National Forestry Reserve Type | Andros Location | Acres | Total Acres |
|--|---------------------------------|---------|------------------|
| Forest Reserve | Kemps Bay (South Andros) | 31,551 | 123,116 |
| | Mangrove Cay | 14,277 | |
| | Red Bays (North Andros) | 15,063 | |
| | San Andros (North Andros) | 57,555 | |
| | South Bight | 4,670 | |
| Protected Forest | Stafford Creek (Central Andros) | 57,909 | 57,909 |
| Conservation Forest | Central Andros | 235,823 | 240,900 |
| | Mars Bay (South Andros) | 5,077 | |
| Conservation Forest (National Park system under the management of the BNT) | Blue Holes National Park | 33,269 | 761,343 |
| | Crab Replenishment Reserve | 3,348 | |
| | West Side National Park | 724,726 | |
| Andros Forestry Reserve Total | | | 1,183,268 |

Source: Department of Forestry, 2016

The Bahamas boasts some of the fastest growing and hardiest pine in the world (*Pinus caribaea*), which is ideal to produce lumber products. For the first time since the 1970s, the government has approved a **timber project on Andros**. The 5-year project granted to Caribbean Global Timber (CGT) is slated to begin in 2016 under strict management regulations, and will only receive renewal if regulations are adhered to. Some regulations include strict size limits and minimum thinning limits. They will be allowed to tap for pine resin and thin 4,500 acres in North Andros and are required to leave 40 trees per acre standing.

Overall, forestry activities need to be developed in a sustainable way, through the implementation of practical methods during forest management (**best management practices**) to achieve goals related to water quality, silviculture, wildlife and biodiversity, soil quality, aesthetics, and/or recreation.

The forests of Andros face issues including **exploitation by clear cutting** for development and the **use of pine trees for coal and dumping**. There is a **lack of capacity** on the island and training programs will need to be developed to enforce management practices. There is also a **need for public education programs** to understand the importance of protecting the forest areas. **Moreover, a continuous sustainable revenue-generating forestry industry is lacking.**

| Forestry | |
|---------------|---|
| Strengths | Potential for growth of industry |
| | Development of a technical training program to build capacity |
| Weaknesses | Limited number of staff |
| | Lack of public awareness on forestry and its importance |
| | Limited financial resources |
| Opportunities | Implementation of sustainable financing mechanisms |
| | Implementation of sustainable forestry practices regarding timber harvest, encouraging regeneration and community management |
| | Increase local employment |
| | Production of value-added products |
| Threats | Unregulated land clearing |
| | Encroachment of development on protected areas |
| | Stunted pine growth, decrease in timber yields or soil quality degradation resulting from climate change effects (temperature increase, changes in rainfall, extreme meteorological events) |

2.2.7 Nature-based tourism

Nature-based tourism is environmentally responsible tourism that perpetuates the natural, historic and cultural heritage of The Bahamas, and promotes education, conservation and sustainable development, while involving and providing benefits to the local community⁴¹.

Andros is the **premiere nature-based tourism destination in The Bahamas**, due to its large pristine marine and terrestrial environments. It is estimated to generate \$142 million per year from its natural resources, with **nature-based tourism producing \$42 million per year⁴²**. Fly-fishing, including bonefishing, is the leading revenue generator for that sector.

Nature-based tourism on Andros employs over **80% of the population** with many of the residents also selling products made from natural resources such as straw work and woodcarving. There are a number of small Bahamian owned boutique hotels throughout the island that service approximately **10,000 visitors per year**.

Figure 23: Andros blue hole



Source: Website <http://www.myoutislands.com/>

Although Andros boasts being home to the third largest reef in the world, the highest concentration of blue holes in the Caribbean region, home to endemic birds and other animals, and the largest area of protected areas in The Bahamas, the island faces issues to develop a thriving nature-based tourism industry:

- **Rustic amenities:** in order to develop the island's full potential, its amenities and infrastructure will have to be developed for each touristic site to standards that attract and retain visitors.
- **Limited transportation** to the island and between districts,
- **Limited accommodation and food availability,**
- **Limited marketing strategies:** lack of training on marketing in The Bahamas; marketing has traditionally been geared towards mass tourism and does not highlight nature-based tourism features that can be found on Andros.

Andros has the potential to develop a world-class nature-based tourism industry but it must further refine its standards and products to compete on a regional and global level. Product diversification, branding and marketing are key to its success.

⁴¹<http://www.tourismtoday.com>

⁴²Hargreaves, 2010

Figure 24: Bonefishing in Andros



| Nature-based tourism | |
|-----------------------------|--|
| Strengths | Andros is a unique and relatively pristine destination |
| | Potential for industry growth |
| | Local festivals, natural and cultural attractions |
| | Unexplored blue holes |
| | Third largest reef system in the world |
| Weaknesses | Proximity to North American tourist market allows over-exploitation of resources (such as boaters exceeding catch limits) |
| | Lack of proper marketing strategies |
| | Lack of financing to develop the Andros brand |
| | Lack of trained guides |
| | Lack of access and infrastructure at potential sites |
| Opportunities | Increase of tourists seeking nature-based tourism destinations |
| | Opportunities for business ownership |
| | Proximity to US market |
| | Revitalize existing and introduce new local festivals, natural and cultural attractions |
| | Additional accommodations |
| Threats | Regional competition (such as Cuba, Turks & Caicos Islands etc.) |
| | Destruction of natural environments |
| | Natural assets degradation resulting from climate change effects (temperature increase, changes in rainfall, extreme meteorological events, sea level rise, flooding) |

2.2.8 Protected areas

The Andros National Parks and Protected Areas span approximately 1,547,500 acres of land and sea within the following four (4) areas.

➤ West Side National Park,

The Andros West Side National Park encompasses virtually the entire west side of Andros Island covering approximately 1.5 million acres. It is one of the largest protected areas in the Western Atlantic / Caribbean region. The eastern edge of the park begins in the pinelands, and the western boundary parallels the coast about 8 km offshore on the Great Bahama Bank. Within these boundaries lie Williams Island and Billy Island, Turner Sound, Pelican Creek, Wide Opening, Loggerhead Creek and Spanish Wells, and they run all the way south to include Water Cays and Curly Cut Cays. The West Side National Park offers an amazingly complex ecosystem and scenic wilderness that attract visitors from around the world. This area of pristine coastal wetlands protects The Bahamas' most productive nursery area for conch and fish stocks. It is also a prime habitat for bonefish and other important sport fishes. Sport fishing is an important multimillion-dollar industry, which benefits many Androsians. The West Side National Park is also an important feeding area for the West Indian Flamingo.

➤ North and South Marine Parks,

The North and South Marine Parks are found off the eastern coast, on the third longest continuous reef system in the world. The two declared marine parks cover 64,834 acres. They serve as habitat for a diverse set of plants and animals; they are home to a number of fish and invertebrate species of commercial importance (Spiny Lobster, Nassau Grouper, Queen conch and snappers) and home to rare coral species (Staghorn and Elkhorn corals). The South Marine Park extends from a section of the barrier reef offshore of Fresh Creek as far as Lightbourne Point. The marine parks serve as fisheries stock replenishment areas and support marine-based ecotourism. Further, there is a proposed Andros Barrier Reef National Park that would cover the entirety of the reef.

➤ Blue Hole National Park,

Andros has the highest concentration of blue holes in the hemisphere. The Blue Holes National Park is 33,235 acres and protects the blue holes as well as large areas of coppice and pinelands and a portion of the extensive Andros freshwater lens.

➤ Crab Replenishment Reserve,

The Crab Replenishment Reserve is the best land crab habitat in Central Andros. It covers 2,979 acres to ensure a sustainable land crab population. The Reserve protects a large area of pinelands and a portion of the extensive Andros freshwater lens.

Two other areas have recently been proposed to be under a National Park type protection:

➤ Andros Barrier Reef National Park,

Proposed in 2015, this area covers the entirety of the reef. It has not been yet designated. It will continue to support traditional activities and ecotourism activities (multi-usage of the park) under determined management strategies.

➤ Joulter's Cays National Park,

Designated in 2015, the Joulter's Cays protected area is 79,500 Acres located north of North Andros and is comprised of several islands. The area is an extensive mangrove flat system and is presently utilized for bonefishing. The threatened Piping Plovers reside on the island chain. It will continue to support traditional fishing activities and ecotourism activities (multi-usage of the park) under determined management strategies. It has not been yet approved.

Regarding forest areas, conservation forests are protected areas with significant natural resources to be preserved.

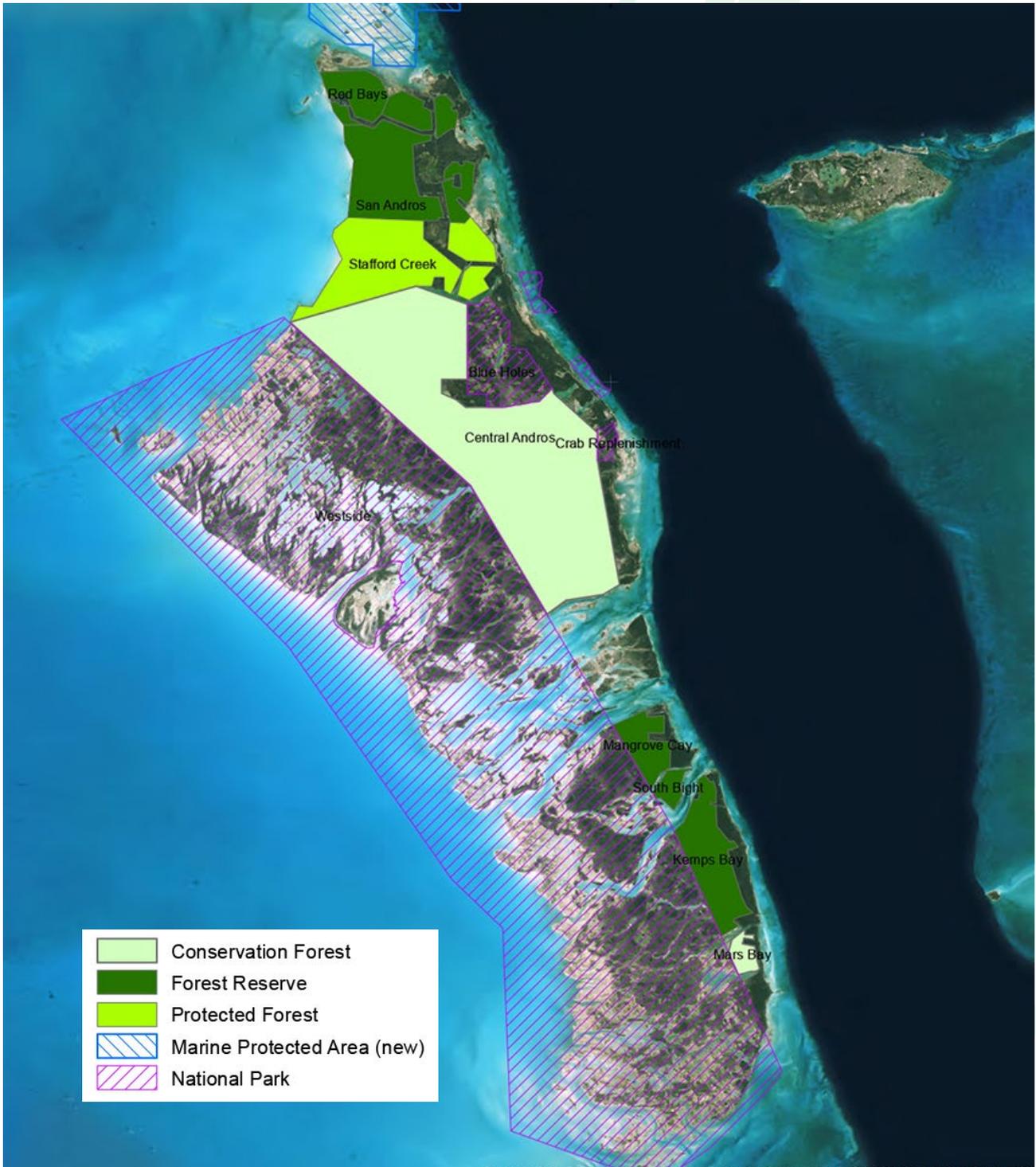
Protected areas are managed by The Bahamas National Trust (BNT), with assistance from several government agencies and Non-Government Organizations such as The Department of Agriculture for the Wild Bird Reserves, the Department of Marine Resources for the Marine Reserves, the Ministry of the Environment for Conservation of Forests the Nature Conservancy (TNC), The Andros Conservancy and Trust (ANCAT) and Natures Hope for South Andros.

Although the Bahamas Protected Area Fund Act of 2014 offers a mechanism to ensure financial sustainability, this large system of protected areas exists with **relative little financing for effective management, minimal infrastructure or management plans**. Currently, only one completed management plan for the Westside National Park exists, and only two (2) BNT staff members assist in Andros National Park management.

Overall, the protected areas in Andros need to be developed and managed in a sustainable way, through the implementation of best management practices including **collaborative management plans**.

| Protected areas | |
|-----------------|---|
| Strengths | Many protected acres of land and sea |
| | Complex ecosystems and scenic wilderness areas |
| | Productive nursery and prime habitat areas for a diverse set of plants, animals, and a number of fish and invertebrate species of commercial importance |
| | West Side National Park is one of the largest protected areas in the Western Atlantic / Caribbean region |
| Weaknesses | Lack of financing for proper management |
| | Lack of management plans |
| | Lack of trained staff |
| | Lack of access and infrastructure at protected sites |
| Opportunities | Implement best management practices in protected areas |
| | Develop effective outreach programs and park management plans, including enforcement of regulations |
| | Increase staff capacity and establish a Headquarters (HQ) in Andros |
| | Improve infrastructure and tourist information to access protected areas |
| Threats | Destruction of natural environments without proper management |
| | Natural habitat degradation or loss resulting from climate change effects (temperature increase, changes in rainfall, extreme meteorological events, sea level rise, flooding, erosion) |
| | Lack of Land use planning and buffers around protected areas to ensure minimal impacts to ecologically sensitive areas |

Figure 25: National Forest estate and protected areas in Andros



Source: Ministry of the Environment and Housing, Forestry Unit. Nassau, Bahamas – March 2016



Figure 26: Captain Bill 's Blue Hole – Central Andros



Source: BRLi - December 2016

Figure 27: Blue Hole National Park



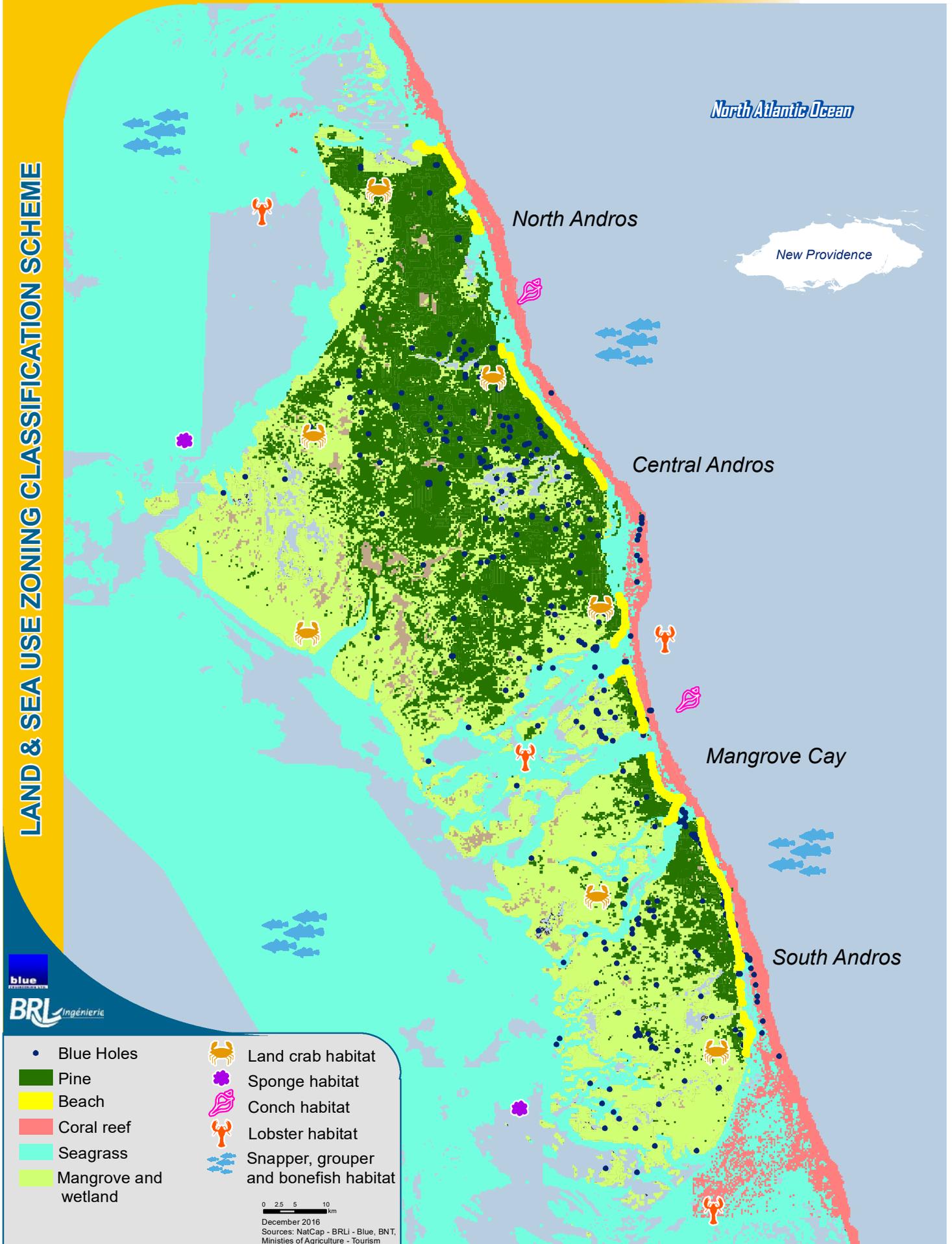
Source: BRLi - December 2016

The maps presented here after illustrate:

- The current terrestrial, coastal and marine habitats on Andros,
- The current land and sea use on Andros.

Ecosystems: current terrestrial, coastal, and marine habitats

LAND & SEA USE ZONING CLASSIFICATION SCHEME



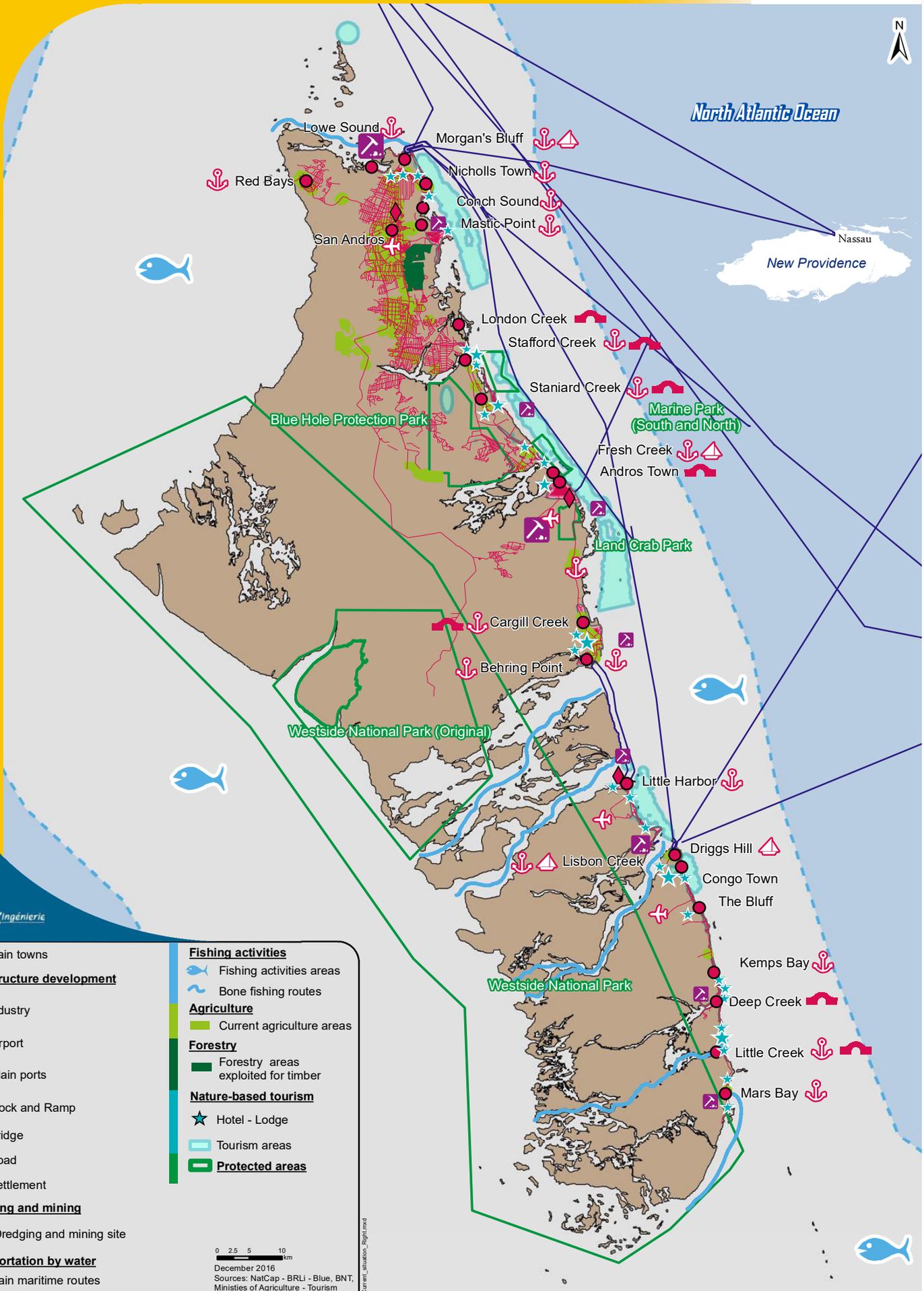
blue
BRL Ingénierie

| | |
|---|---|
| • Blue Holes |  Land crab habitat |
|  Pine |  Sponge habitat |
|  Beach |  Conch habitat |
|  Coral reef |  Lobster habitat |
|  Seagrass |  Snapper, grouper and bonefish habitat |
|  Mangrove and wetland | |

0 2.5 5 10 km
December 2016
Sources: NatCap - BRLI - Blue, BNT, Ministries of Agriculture - Tourism

Human activity sectors: current land and sea use

LAND & SEA USE ZONING CLASSIFICATION SCHEME



| | |
|-----------------------------------|---------------------------------------|
| ● Main towns | Fishing activities |
| Infrastructure development | 🐟 Fishing activities areas |
| ◆ Industry | 🌊 Bone fishing routes |
| ✈️ Airport | Agriculture |
| ⚓ Main ports | 🌱 Current agriculture areas |
| ⚓ Dock and Ramp | Forestry |
| 🌉 Bridge | 🌲 Forestry areas exploited for timber |
| 🛣️ Road | Nature-based tourism |
| 🏠 Settlement | ★ Hotel - Lodge |
| Dredging and mining | 🌊 Tourism areas |
| 🏗️ Dredging and mining site | 🟩 Protected areas |
| Transportation by water | |
| 🚢 Main maritime routes | |

0 2.5 5 10 km
December 2016
Sources: NatCap - BRLI - Blue, BNT, Ministries of Agriculture - Tourism





3. MASTER PLANNING PARTICIPATORY DESIGN

This chapter presents the process leading up to the final Master Plan for Andros, detailing:

- The comprehensive participatory approach used to identify the issues facing the Androsians and their vision for the future of Andros,
- The ecosystem services approach used to design different scenarios of development and to choose the best sustainable one,
- The design of the Master Plan derived from the Sustainable Prosperity scenario.

3.1 PROJECT IMPLEMENTATION

The Andros Master Plan formed a part of the “BH-T1040: Ecosystem-based Development for Andros Island” project, funded by the Inter-American Development Bank (IDB), which is divided into three components:

- **I. Ecosystem service valuation to assess scenarios of development for the island,**
- **II. Capacity building for ecosystem-based development for Andros,**
- **III. Design of the sustainable Master Plan.**

The Natural Capital Project (NatCap) in partnership with The Nature Conservancy (TNC) and the University of The Bahamas (UB) implemented component I. The SEV Consulting Group (SEV) implemented component II. BRL Ingénierie (BRLi), as lead consultant, and Blue Engineering (Blue) worked on the third component.

3.2 COMPREHENSIVE PARTICIPATORY APPROACH

The Andros Master Plan was informed by extensive public consultations, designed to ensure a stakeholder-led master planning process.

The project team held different rounds of public consultation in each district of Andros in July and October 2015, January, May and October 2016. In addition, key stakeholder meetings and one-to-one interviews were led in Andros, in parallel with technical field visits. The goal was to ensure that the Androsians' concerns and vision are reflected in the Master Plan. As a result of this process, the Androsians identified:

- ▶ **The above-mentioned key pillars on which the master plan is founded,**
- ▶ **The human activity sectors existing on and around Andros that require multi-sectoral management,**
- ▶ **The most appropriate human activities on which to base Andros' sustainable development up to 2040.**

The efforts of NatCap, TNC, UB, SEV, BRLi and Blue Engineering were guided by a number of key stakeholders, notably the Technical Advisory Committee (TAC)—comprised of community groups and policymakers—and the Office of the Prime Minister (OPM).

Figure 28: Administrator for Central Andros Cleola Pinder speaks with local community actors and members of the Andros Master Plan team during the public consultation process in May 2016



Source: Blue Engineering – Michelle Lakin Hope – 2016

Figure 29: Brett Lashley of the Office of the Prime Minister addresses community members during public consultations process in North Andros involving the Andros Master Plan development team in May 2016



Source: Blue Engineering – Michelle Lakin Hope – 2016

3.3 ECOSYSTEM SERVICES APPROACH TO DEVELOPMENT PLANNING: THE CHOICE OF THE SUSTAINABLE PROSPERITY SCENARIO

SUSTAINABLE DEVELOPMENT: THE 21ST CENTURY CHALLENGE

The central challenge of the 21st century is to develop economic, social and governance systems capable of ending poverty and achieving sustainable levels of population and consumption while securing the life-support systems that underpin current and future human well-being. Essential to meeting this challenge is the **incorporation of natural capital and the ecosystem services it provides into decision-making.**

Our current global economic, political and social systems are not well suited to meeting this challenge. There is a fundamental asymmetry at the heart of economic systems that rewards short-term production and consumption of marketed commodities at the expense of stewardship of natural capital necessary for human well-being in the long term. Correcting this asymmetry will require transforming the use of natural capital through better understanding of the role that natural capital plays in sustaining human well-being, integrating this information into decision and policy contexts, and changing institutions, policies and incentives to reward long-term stewardship. Sustainable development in the 21st century requires explicit recognition that **social and economic development are part of—and dependent upon— a stable and resilient biosphere.**

The Caribbean region pays sometimes insufficient attention to land use planning and other measures to protect its natural assets. As a result, in many Caribbean islands including Andros, environmental quality is deteriorating and natural disasters continue to set back development efforts, as demonstrated by Hurricane Matthew in October 2016. It is imperative that Andros, like all Small Island Developing States (SIDS), operates a transition towards **sustainable and inclusive growth and development**, which not only improves economic performance, but also conserves the environment, reduces inequality, strengthens resilience and promotes social inclusion.

DEFINING NATURAL CAPITAL & ECOSYSTEM SERVICES APPROACH

According to the Convention on Biological Diversity (CBD), «ecosystem» means a dynamic complex of plant, animal and microorganism communities and their non-living environment interacting as a functional unit.

“Natural capital” refers to the living and nonliving components of ecosystems—other than people and what they manufacture— that contribute to the generation of goods and services of value for people. Capital assets take many forms, including manufactured capital (buildings and machines), human capital (knowledge, skills, experience and health), social capital (relationships and institutions) and financial capital (monetary wealth), as well as natural capital. Multiple forms of capital interact to generate goods and services. For example, fish harvesting in Andros depends on the availability of grouper, lobster, conch stocks (natural capital), which depend on high-quality habitat like seagrass and mangrove (natural capital), but harvesting also depends on fishing vessels (manufactured capital, backed by financial capital), the skills and experience of Androsian fishermen (human capital) and fisheries governance (social capital).

Ecosystems sustain and fulfill human life through “ecosystem services”: the conditions and processes of ecosystems that generate—or help generate— benefits for people. These benefits result from the interactions among plants, animals and microbes in the ecosystem, as well as biotic, abiotic and human-engineered components of social-ecological systems. Placing natural capital and ecosystem services into a broader decision-making context is necessary to implement large-scale transformations in policies, practices and investments.

The “*ecosystem-services approach*” is thus defined as a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. It is based on the application of appropriate scientific methodologies which encompass the essential processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diver-

sity, are an integral component of ecosystems.

The concept of an “*ecosystem-services approach*” addresses the crucial links between climate change, biodiversity and sustainable resource management providing multiple benefits. It can illustrate the importance of considering where to invest in both infrastructure and conservation in order to achieve sustainability goals.

THE DESIGN OF ALTERNATIVE DEVELOPMENT SCENARIOS

A scenario describes how Andros might look given a particular sequence of development and investment decisions.

To create alternative scenarios for Andros, OPM and its partners gathered technical information from Androsians, policy documents and scientific literature and grouped the range of desired outcomes and recommendations into four future storylines, all of which include projections of sea-level rise and are represented by detailed spatial data that translate each storyline to different maps of a future Andros.

The four alternative future scenarios foreseen for Andros were the following:

- ▶ **Business as Usual:** represents a future similar to the current situation with little investment in new infrastructure, educational opportunities, or development.
- ▶ **Conservation:** gives priority to ecosystem health and protection of habitats and species rather than economic development.

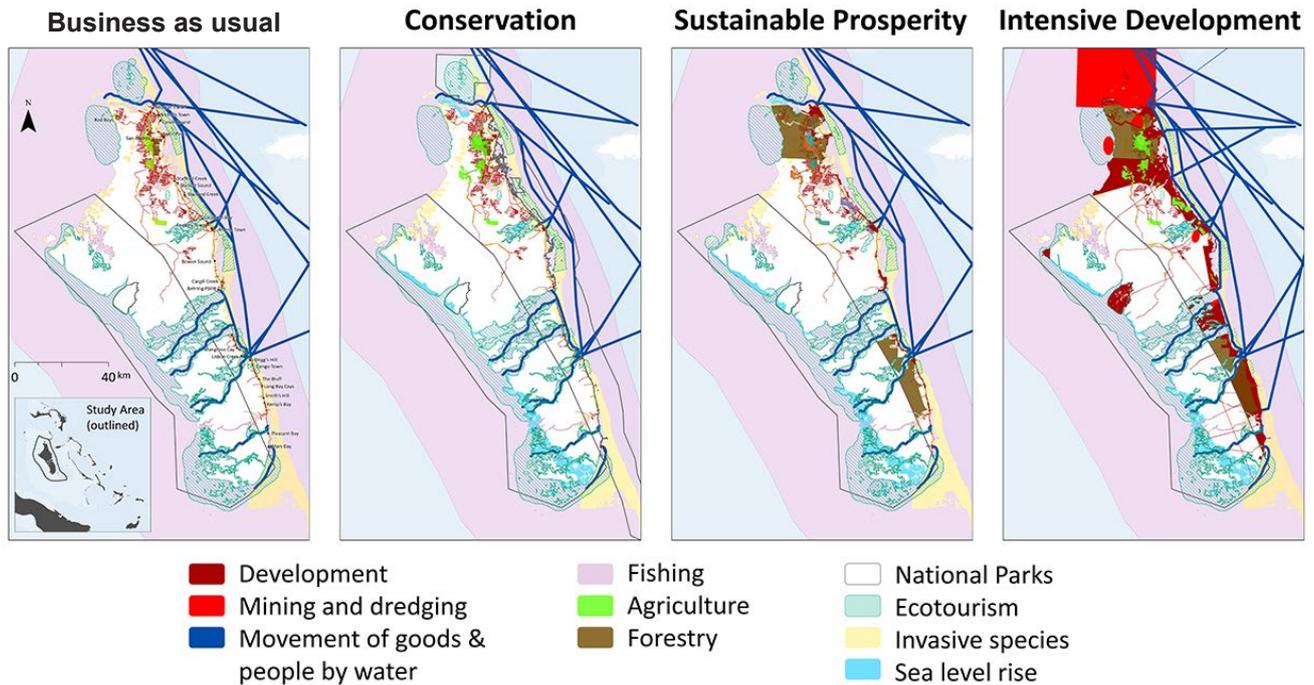
- ▶ **Sustainable Prosperity:** blends human development and conservation goals by investing in critical infrastructure and education to achieve a nature-based economy that can be sustained over time.
- ▶ **Intensive Development:** gives priority to major economic development rather than ecosystem health and protection of habitats and species.

⁴³Kates et al. 2001, Dailey et al. 2009



Figure 30: Alternative development scenarios for Andros Island Master Plan

Development Scenarios for Andros Island Master Plan



Source: NatCap-2016

THE ECOSYSTEM SERVICE AND SCENARIO ANALYSIS

Several studies by The Bahamas National Trust, The Nature Conservancy and others have assembled considerable information about the ecosystems and species on Andros and their current economic value. OPM and NatCap built on this knowledge about Andros using InVEST (open source software) to estimate the economic and social value of ecosystems and to help inform which scenarios, zoning guidelines and investment priorities will enhance livelihoods, food and water security, coastal resilience, and access to education for Androsians and all Bahamians.

Using 2015 as a baseline and projecting 25 years in the future to 2040—the timeframe for the National Development Plan and Andros Master Plan—the ecosystem service analysis estimates:

- ▶ The Sustainable Prosperity scenario would reduce the terrestrial and marine habitat at high risk of degradation from human activities by more than 30% relative to the Business as Usual scenario and to a 10th of the area at high risk under Intensive Development.
- ▶ Safeguarding ecosystems under the Sustainable Prosperity and Conservation scenarios would increase the export value of lobster catch provided Andros nursery habitat by almost 50% from US\$14 million (in Business as Usual) to US\$20 million. Intensive Development would decrease the countrywide catch by 13%, resulting in a loss of US\$10 million annually in the total value of lobster exported by The Bahamas due to degradation of nursery habitats in and around Andros.

- ▶ Coral reefs, seagrass, mangroves, wetlands, and coppice currently buffer more than 55% of the populated east coast of Andros coast. Under the Sustainable Prosperity scenario, 80 km of coastline would be buffered by coastal habitats, thus shielding nearly 400 people and US\$3 million in income that would otherwise be highly vulnerable to flooding and erosion without the protective capabilities of the ecosystems. These numbers are comparable to the coastal resilience provided by natural habitats under a Business as Usual scenario. The Intensive Development scenario would more than triple the number of people at risk from flooding and erosion, due to degradation of natural habitats and a dramatic increase in coastal populations and infrastructure.
- ▶ The Sustainable Prosperity scenario would increase tourism expenditures in all four districts. Total expenditures from tourism would increase by more than 35% in Mangrove Cay and North Andros and by about 10% and 20% in South and Central Andros, respectively. In contrast, the Intensive Development scenario would concentrate tou-

risms in the North and South districts (expenditures are predicted to be 30% and 25% more than the Business as Usual scenario) but it would cost Central Andros and Mangrove Cay US\$15 million and US\$3.5 million, respectively. Thus, the Sustainable Prosperity scenario offers an opportunity to enhance livelihoods throughout the island while the Intensive Development scenario further exacerbates the unequal distribution of wealth.

- ▶ The Sustainable Prosperity scenario would increase the area of freshwater resources at risk, but only by a 10th of the increase induced by the Intensive Development scenario.

Results indicate that the Sustainable Prosperity scenario will produce a higher delivery of tourism and services than the Business as Usual scenario, a similar delivery of fishery related services compared to the Conservation scenario, and lower the area of coastal, marine, and freshwater habitat at high risk of degradation and the numbers of people and total income at risk from flooding and erosion compared to the Intensive Development scenario.

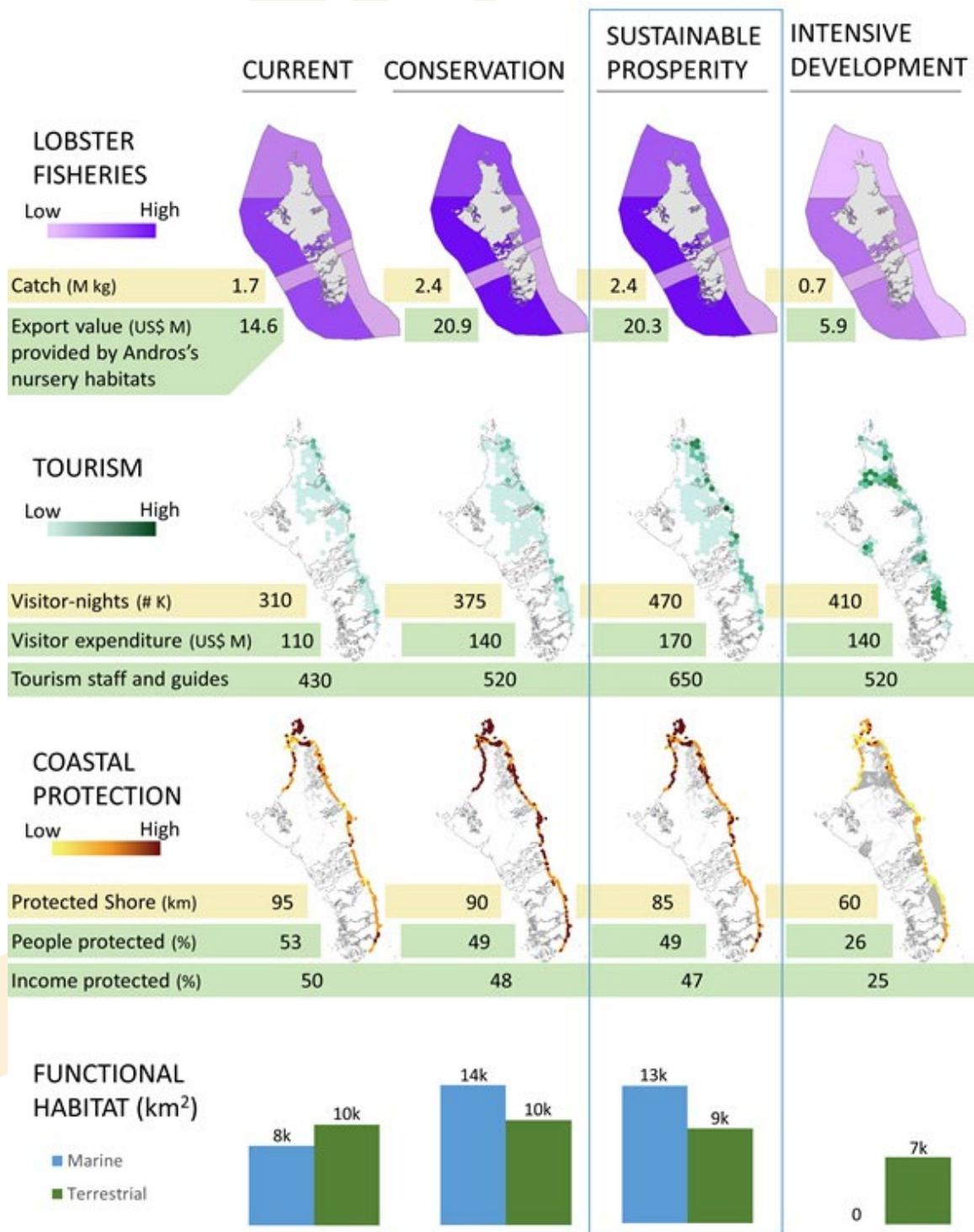
THE CHOICE OF THE SUSTAINABLE PROSPERITY SCENARIO

The ecosystem-services approach thus revealed the Sustainable Prosperity scenario as a relevant option of development for Andros, in terms of balance between economic development, improvement of social services and conservation of natural capital.

Importantly, the Sustainable Prosperity scenario goes beyond simply reducing trade-offs between infrastructure development and conservation. Overall, the Sustainable Prosperity scenario emphasizes investments in projects that align with the eight key pillars of the Andros Sustainable Development Master Plan.

Based on these results and their own experiences, the Androsians engaged generally favored the Sustainable Prosperity scenario.

Figure 31: Overview of ecosystem service results and selection of the preferred scenario



Source: NatCap - 2016

3.4 DESIGN OF THE ECOSYSTEM-BASED MASTER PLAN

The Andros Master Plan (AMP) reflects the translation of the Sustainable Prosperity scenario of development into an actionable plan based on the ecosystem services approach. The AMP analyzes the current situation, issues and development needs according to what Androsians want for their future.

For each human activity sector, it defines recommendations and actions, the implementation of which will address the different key pillars raised by the Androsians, **balancing the development of social and economic capital, and the conservation of natural capital:**

- ▶ **Food and water security are important regarding food and freshwater supply throughout the island.** They can be sustained by better infrastructure to transport goods (roads, water mains, harbors), sustainable fishing practices and stock monitoring, development and best management practices in agriculture and forestry reducing risk to land crab habitat and freshwater,
- ▶ **Connectivity and accessibility are important regarding the possibility for Androsians to access opportunities and services.** They can be sustained by better transport infrastructure (roads, bridges, airports), secured nautical access to main harbors and new ferry services linking each district and Nassau, improving access to the island for tourists as well as facilitating movement for locals,
- ▶ **Education and capacity building are important regarding the Androsian people's knowledge and possibility to access job opportunities.** They can be sustained by the improvement of school infrastructure and the implementation of different types of training regarding fishing, agriculture, forestry and nature-based tourism activities, fostering the ability of the Androsians to make the best of their wealth of natural resources,
- ▶ **Livelihoods and income equality are important regarding the development of social and economic capital.** They can be sustained by better infrastructure and the economic development of fishing, agricultural, forestry and nature-based activities, increasing visitation and total expenditure,
- ▶ **Land use planning is important for sustainable development and the exploitation of land and marine natural resources.** It can be enforced by defining development and no-development areas,
- ▶ **Health and wellbeing are vital,** they can be sustained by better social infrastructure (clinics, schools, sport centers), better connectivity with Nassau (airports, harbors), development and best management practices in agriculture and fishing,
- ▶ The development of activities in Andros, governed by enforced or new policies can **strengthen local government,** through more responsibilities,
- ▶ **Coastal resilience is crucial considering the high vulnerability of Andros to climate change effects (sea level rise, flooding, erosion).** It can be sustained by the conservation of key natural habitats (mangroves, coral reefs and seagrass), enhanced by sustainable fishing, agricultural and forestry practices, the enforcement of policies and protected areas. On the other hand, infrastructure development near the shoreline can amplify coastal risks linked with climate change and sea level rise.

Figure 32: How the AMP addresses the key pillars raised by the Androsians



Source: BRLi - 2016

3.5 COMMUNICATION STRATEGY

A communication strategy and action plan accompanied the development of the Andros Master Plan, with its guiding principles: continuity, accountability, transparency, and inclusiveness.

COMMUNICATION ACTIONS

The communication actions are the following:

- Design, printing and dissemination of flyers,
- Preparation and organization of public consultations and stakeholder meetings,
- Press releases,
- Public service announcements, and
- Facebook and email updates.

KEY MESSAGES

Key messages were directed at stakeholders from each human activity sector. The messages were shared primarily through the Facebook page developed under the project⁴⁴ (cf. illustration here after), as well as via email to district administrators in Andros:

- Infrastructure development informed by natural capital and climate change considerations will provide the greatest benefit now and into the future.
- Dredging and mining can be harmful to fish habitats and sites, which are invaluable for nature-based tourism on Andros. Dredging and mining should, therefore, be carefully located and monitored.
- A reliable land and sea-based transportation system is important for the economic growth of Andros.
- Climate change presents threats, but also opportunities for agriculture. The opportunities include building the resilience of the sector while helping to reduce the greenhouse gas emissions from Andros and, more generally, the Caribbean.
- The potential of agriculture can be enhanced through proper management, marketing and technology distribution.
- With the correct infrastructure, amenities and training programs to support it, nature-based tourism can bring economic growth.
- The long-term sustainability of the tourism sector depends on the preservation of habitats that safeguard coastlines and support fisheries.
- Conservation of forest cover is key to climate change mitigation as forests store carbon dioxide which otherwise helps to fuel global warming.
- Forests are also a potential industry to be utilized
- Responsible fishing practices now will help to ensure the long-term viability of the industry.
- Marine and terrestrial protected areas can be a source of significant income and are essential for the sustainable management of natural resources.

⁴⁴<https://www.facebook.com/Andros-Sustainable-Development-Master-Plan-Project-1550939868566737/>



Andros Sustainable Development Master Plan Project

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Andros Sustainable Development Master Plan Project

30 novembre 2016 ·

Please follow the new link below to download the Andros Master Plan, the Executive Summary and the final visual template. The previous link has expired.

<http://dl.brl.fr/c91sdu>



dl.brl.fr

AMP_11182016.zip (69.73 Mo) Disponible du 25 novembre 2016 au 5 décembre 2016 Uploaded by: Ann-Sophie Gabellini Votre téléchargement devrait démarrer automatiquement... Si ce n'est pas le cas, cliquez ici .

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3

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Communauté

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The Andros Sustainable Development Master Plan Project is spearheaded by the Office of The Prime Minister with support from the Inter-American Development.

560 personnes aiment ça et 559 personnes sont abonnées

À propos

Voir tout

Réponse moyenne : quelques heures Envoyer un message maintenant

PHOTOS







4. GENERAL VISION AND ACTIONS FOR ANDROS

This chapter presents the sustainable vision that is foreseen for the future of Andros, for the future of its people and its environment, based on the ecosystem-services approach.

4.1 THE VISION FOR ANDROS

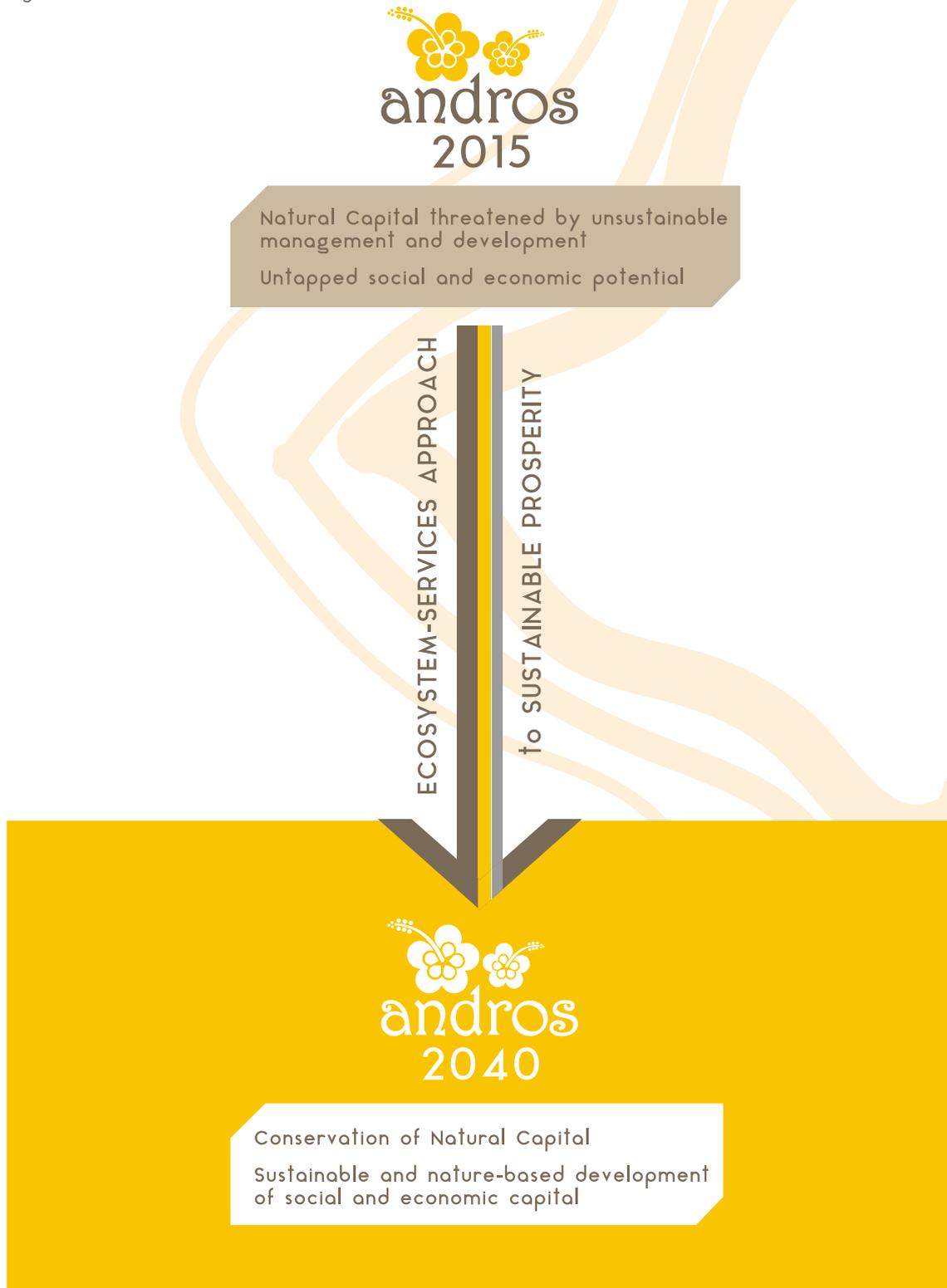
In the future, Andros will be a nature-based economy, providing balance between conservation of natural capital and sustainable development of social and economic capital.

The key elements for the future of Andros are the following:

- ▶ Targeted development around existing settlements with increased economic opportunities, improved transport infrastructure to accommodate a growth in population and visitors, and investments in social infrastructure,

- ▶ New nature-based tourism opportunities such as kayaking, bird watching tours, camping excursions to the west side, Culture Heritage Village in the north,
- ▶ Expanded ferry traffic to facilitate intra-island connectivity and to transport people and goods to and from New Providence,
- ▶ Low-intensity forestry activities e.g. resin tapping and selective thinning utilizing best management practices,
- ▶ Expansion of large and small-scale agriculture utilizing best management practices,
- ▶ Expansion of fishing activities in a sustainable way, utilizing best management practices, protecting habitats and monitoring fish stocks,
- ▶ Designation of the Joulter Cays and Great Barrier Reef National Parks, along with increased management and enforcement for all terrestrial and marine protected areas,
- ▶ New development done within the context of climate change threats and sea level rise.

Figure 33: The vision for Andros



Source: BRLi - 2016

4.2 THE STRATEGIC STEPS

4.2.1 Short term strategy (up to 5 years – 2020)

Paving the way to Sustainable Prosperity development: improvement of the main existing facilities and implementation of the processes necessary to make the next steps a success.

INFRASTRUCTURE DEVELOPMENT **TRANSPORTATION BY WATER** **DREDGING & MINING ACTIVITIES**

- ▶ Several measurements and studies are carried out to prepare the implementation of medium and long term strategies:
 - Topo-bathymetric surveys in the main harbors,
 - Andros Climate Change vulnerability, impacts and resilience study,
 - Marketing strategy for goods, services and tourism,
 - Study analyzing the impacts of currents and flows on mangrove areas, taking into account all bridges and causeways, to design mitigation solutions.
 - Study to enhance Driggs Hill harbor protection during Northeast surges (wave propagation modeling, proposal of several coastal systems such as breakwater walls...),
 - Study to determine the most sustainable locations for quarrying and offshore mining in Andros.
- ▶ Outreach strategy is implemented in Andros concerning:
 - Disaster and coastal risks and management,
 - Sea level rise and Climate Change adaptation,
 - Green and grey infrastructure for coastal protection.
- ▶ The main transport infrastructure is repaired, improved or replaced:
 - Roads (e.g. from North to Central Andros, access to Red Bays) are repaired, provision/zoning for future development off the main highway is defined, road signs (indicating main settlements and main natural sites to visit) and tourist maps are improved throughout Andros.
 - Bridges (e.g. Staniard Creek / Stafford Creek bridges) are fixed,
 - The medium/long term strategy for improvement and maintenance of Andros airports is defined according to the national one (ongoing project),
 - The Ministry of Works has planned several of these works.



Source: BRLI - 2016

- The main public and social infrastructure such as clinics (e.g. Mangrove Cay clinic), schools (e.g. Fresh Creek School) and sport centers (e.g. Mangrove Cay new sport center) is repaired or maintained. The corresponding ministries (Ministry of Works, Ministry of Health, and Ministry of Sports) have already planned several of these works.
- Existing port facilities (ramps and docks) are repaired, basic public services are added (freshwater, power, fuel and radio systems) and nautical access is improved (lights and buoys to mark channels) in the main ports. These works will attract more commercial and recreational boats and could be a source of income. Regarding coastal risks on these locations due to sea level rise, the climate change resilience study planned will assess risks and protection solutions to be proposed.
- Studies on London and Staniard creeks causeway are undertaken to improve the water flow for the health of the mangroves.
- Waste management is developed in a sustainable

way in each district in terms of waste collection and storage, and treatment / recycling processes are enforced. Research is launched on what has worked and failed at similar facilities. Co-ordinate, reduce, reuse and recycle programs are implemented with those of Nassau and/or the United States (with AUTEK). Improvement of reduce, reuse, recycle education should be assessed and implemented. Ways to make recycling and re-use of materials easier, more affordable and accessible to businesses as well as residents should be found.

- Freshwater access is secured in South Andros through the implementation of infrastructure for running water.

FISHING ACTIVITIES

Sustainable fishing practices and protection for habitat at risk are initiated with the enforcement of existing regulations, the implementation of new policies (catch and size limits, periods of closure) and community education.

Stock assessments and monitoring are also started for commercially important fish species (spiny lobster, conch, grouper, and snapper) and land crab, for which communities are largely involved.

AGRICULTURE

The development of sustainable commercial agriculture is encouraged in North and Central Andros with the support of BAMSI, and the development of small-scale farming is initiated in Mangrove Cay and South Andros:

- Agriculture Officers are appointed for South Andros and Mangrove Cay,
- Cooperatives are created,
- Processing and packaging unit for BAMSI is developed in North Andros,
- Agricultural educational programs are started, involving the following agencies: Bahamas Agriculture & Marine Science Institute (BAMSI), Bahamas Agricultural and Industrial Corporation (BAIC), and Inter-American Institute for Cooperation on Agriculture (IICA),

- Fund-raising applications (commercial banks, development banks or grants) are made,
- Healthy eating awareness is raised –training is provided as part of BAMSI initiative and restaurant owners are taught to use fresh produce in daily meals with less reliance on fried food. In addition, the incorporation of crab in tourist lodge restaurant menus is encouraged.

FORESTRY

Sap and lumber sustainable production is initiated: employments, trainings and development of management plans for future exploited forestry areas. Clauses in these plans are in place so that areas can become Bahamian owned and run.

NATURE-BASED ACTIVITIES

Nature-based tourism activities are initiated through guides training and the implementation of a marketing strategy promoting bird watching tours, bonefishing and fly-fishing, snorkeling and scuba diving on the coral reef, kayaking in the mangroves, camping in the West Side National Park.

PROTECTED AREAS

Terrestrial, marine and forest protected areas management plans are completed, regulations are better enforced.

Joulter Cay National Park is approved (multi-usage of the park under determined management strategies) and Conservation Forests are acknowledged.

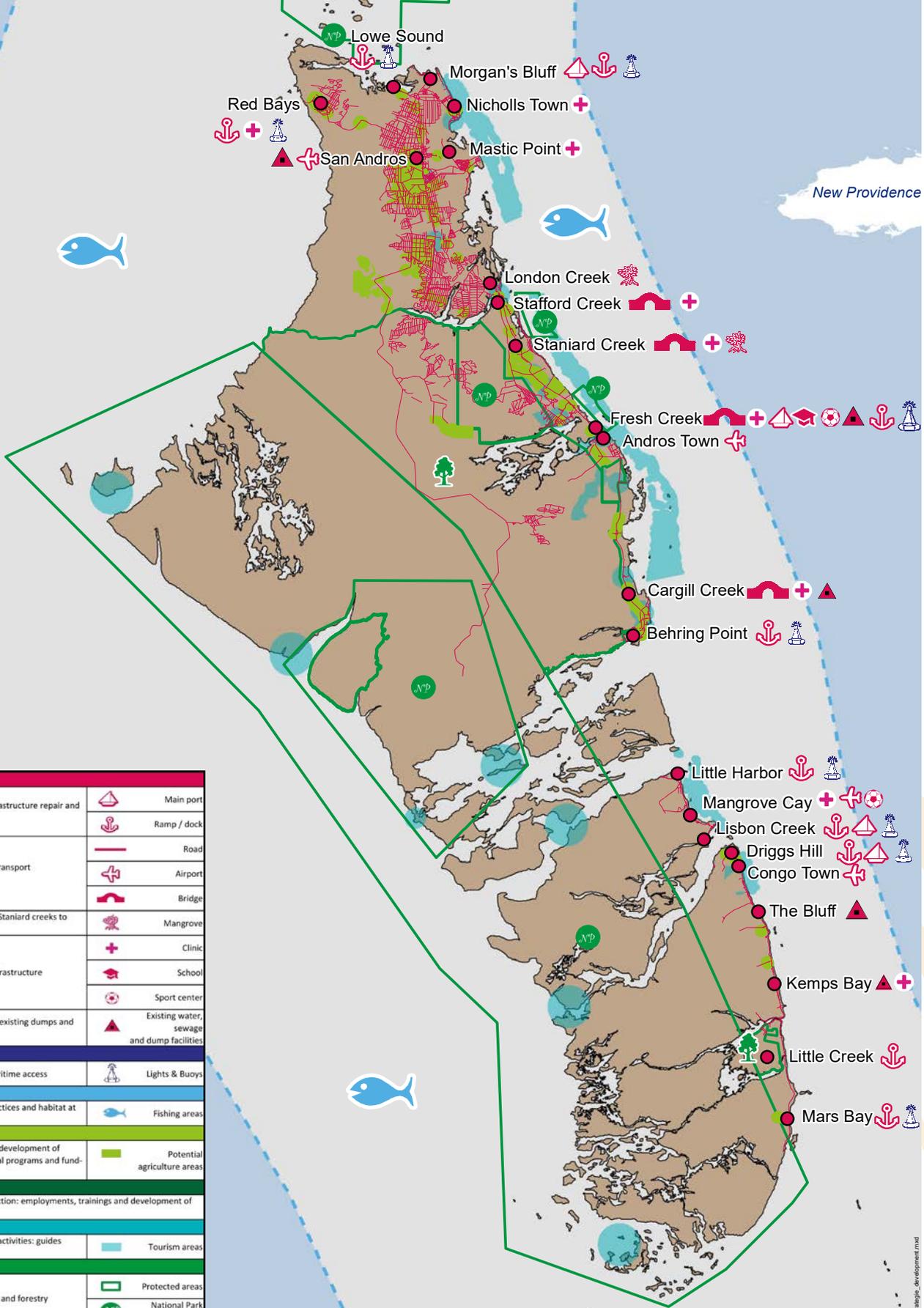


The map presented hereafter illustrates strategic development guidelines foreseen for the entire island for the short term.

Andros Master Plan: Short term strategy (5 years - 2020)

Paving the way to Sustainable Prosperity Development:
 Improvement of the main existing facilities and implementation of the processes necessary to make the next steps a success

LAND & SEA USE ZONING CLASSIFICATION SCHEME



| Infrastructure development | |
|---|---|
| Improvement of port facilities: infrastructure repair and implementation of basic services | Main port Ramp / dock |
| Repair and improvement of main transport infrastructure | Road Airport Bridge |
| Studies conducted on London and Staniard creeks to improve mangrove health | Mangrove |
| Repair of main public and social infrastructure | Clinic School Sport center |
| Development and management of existing dumps and sewage systems | Existing water, sewage and dump facilities |
| Transportation by water | |
| Improvement of conditions for maritime access | Lights & Buoys |
| Fishing activities | |
| Initiation of sustainable fishing practices and habitat at risk protection | Fishing areas |
| Agriculture | |
| Initiation of small-scale farming or development of commercial agriculture: educational programs and fund-raising application | Potential agriculture areas |
| Forestry | |
| Initiation of sap and lumber production: employments, trainings and development of forestry management plans | Conservation forest |
| Nature-based tourism | |
| Initiation of nature-based tourism activities: guides training and marketing process | Tourism areas |
| Protected areas | |
| Management of terrestrial, marine and forestry protected areas | Protected areas National Park or reserve |
| Finalization of Joulter Cays National Park | Conservation forest |

0 2.5 5 10 km
 December 2016
 Source : NatCap - BRLi - Blue, BNT, Ministries of Agriculture - Tourism

Short-term_strategy_development.mxd

4.2.2 Medium term strategy (up to 15 years – 2030)

On the road to Sustainable Prosperity Development: implementation of cultural, fishing, agricultural and nature-based tourism hubs.

INFRASTRUCTURE DEVELOPMENT TRANSPORTATION BY WATER

- An artisanal fishing center is developed in Darrel Island (Lowe Sound) which becomes the main artisanal fishing ground for North Andros:
 - ➔ The dock destroyed by a hurricane and its access are rebuilt, the ramp is repaired (completed at short term),
 - ➔ A small fish processing house is built for crawfish cleaning, packaging and fast freezing,
 - ➔ The area is cleaned and landscape is enhanced, a parking for trailers (15 to 20 boats / day), and a public parking are created, dock master building, conch shell waste management,
 - ➔ Minor dredging at the bottom of the ramp (approximately 30 cubic yards).
- Studies on Sandy, Stafford, Fresh and Cargill creeks are undertaken to improve the water flow for the health of the creek and mangroves.
- Water mains are replaced in Mangrove Cay,
- The Master Plan is updated, integrating Climate Change adaptation and Disaster Risk management according to the results of the Andros Climate Change impacts and resilience study. Consideration will be given to relocation and to green and grey infrastructure for coastal protection,
- Greater autonomy is developed for Local Government; Renewable energies are developed in particular for large energy consumption projects.

- Long term development for North and Central Andros (university – marina – housing expansion) is prepared:
 - ➔ Investors are sought for the development of a marina at small Morgan’s Bluff and Fresh Creek,
 - ➔ A concrete plant is implemented in North Andros,
 - ➔ Andros is developed as an ecological research center with elements to capture research information.
- Connectivity between districts and with Nassau, transport on land and sea, are improved:
 - ➔ New ferry service (from Central to Mangrove Cay and to South Andros) are set up to improve connectivity between districts of Andros,
 - ➔ Traffic flows and accidents on bridges are monitored,
 - ➔ Nautical accesses are improved in the four main ports: Morgan’s Bluff in North Andros, Fresh Creek in Central Andros, Lisbon Creek in Mangrove Cay and Driggs Hill in South Andros, including dredging operations and wreck removal. This will allow ferries / private taxis from Nassau to easily come to Andros.

FISHING ACTIVITIES

Sustainable fishing practices and protection of habitat at risk are progressing with the implementation of education, regulations, policies and stock assessments and monitoring, started in the short term phase, involving BAMSI, the Department of Fisheries and local fishermen’s communities.

AGRICULTURE

- Sustainable commercial agriculture is developed in North and Central Andros (with BAMSI).
- Small-scale farming is developed in Mangrove Cay and South Andros and small canning/bottling processing plants (coconut, crab, tomatoes, jams, pepper sauce etc.) are implemented.
- Research capability at BAMSI is developed as well as MOUs with other Universities.

FORESTRY

Sap and lumber sustainable production are further developed to produce value-added goods.

NATURE-BASED ACTIVITIES

- A Cultural Heritage Village is created in Red Bays including an Ecomuseum (little museum about history and the traditional activities of the Seminoles Indians - sponge, straw hand crafts, old traditional houses, general history) and an Ecolodge promoting nature-based tourism activities (bird watching, nature trails, tours in mangroves, horse riding into forests, cultural shows/dancing, bone-fishing, hunting ...) are established. Market day trips are organized for international (cruises) and domestic tourists. Funding could be through a partnership between Ministry of Tourism, Bahamas National Trust (BNT), The Antiquities, Monuments and Museums Corporation (AMMC) and the Florida Seminoles Indians.
- New nature-based tourism activities are started: bird watching tours, bonefishing and fly-fishing, snorkeling and scuba diving on the coral reef, kayaking in the mangroves, camping in the West Side National Park.
- Infrastructure to allow access to Blue Holes is developed in Central, South Andros and Mangrove Cay.
- New crafts and farmers' markets are implemented in Central and South Andros promoting and revitalizing cultural heritage and traditions.

PROTECTED AREAS

Terrestrial, marine and forest protected area management plans are completed, regulations are better enforced.

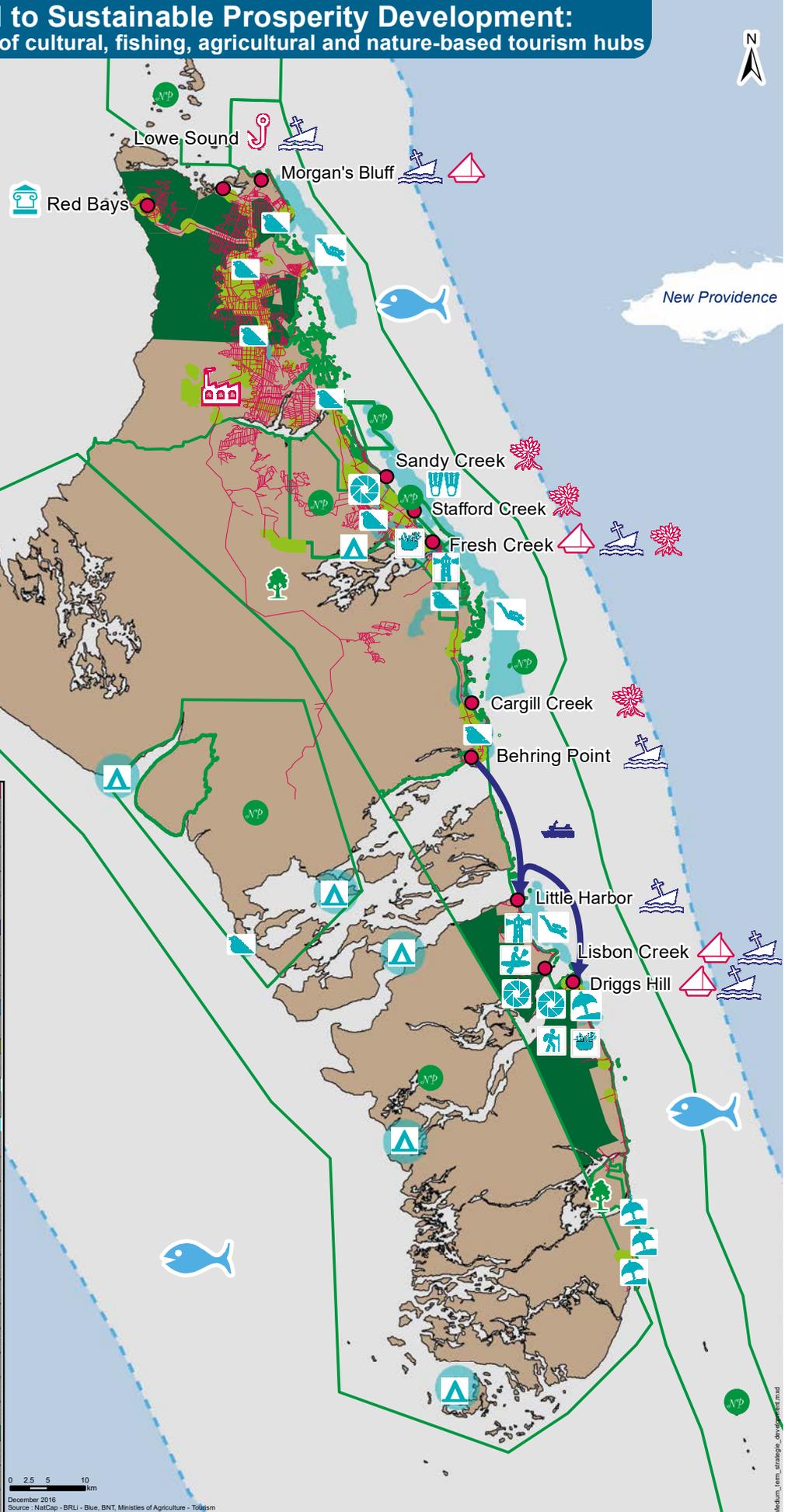
The map presented hereafter illustrates strategic development guidelines foreseen for the entire island for the medium term.

Andros Master Plan: Medium term strategy (15 years - 2030)

On the road to Sustainable Prosperity Development: Implementation of cultural, fishing, agricultural and nature-based tourism hubs

LAND & SEA USE ZONING CLASSIFICATION SCHEME

| Infrastructure development | |
|---|-------------------------------------|
| Development of an artisanal fishing center in Darel Island - Lowe Sound | Main ports |
| Studies conducted on Sandy, Stafford, Fresh and Cargill creeks to improve mangrove health | Fishing center |
| Implementation of a concrete plant | Mangrove |
| Implementation / improvement of water running systems | Concrete plant |
| Transportation by water | |
| Improvement of conditions for maritime access: dredging operations and wreck removal | Dredging operations & wreck removal |
| Implementation of new ferry service between Central Andros / Mangrove Cay / South Andros | New ferry service |
| Fishing activities | |
| Progress of sustainable fishing practices and habitat at risk protection | Fishing areas |
| Agriculture | |
| Development of small-scale farming, commercial agriculture and processing plants | Potential agriculture areas |
| Forestry | |
| Development of sap and lumber production | Forest areas exploited |
| Nature-based tourism | |
| Implementation of new nature-based activities | Tourism areas |
| | Bird watching |
| | Beach |
| | Kayaking |
| | Snorkeling |
| | Scuba diving |
| | Nature tour |
| | Historic site |
| | Backcountry camping site |
| | Blue Holes trail |
| Development of infrastructures to allow access to Blue Holes | Market |
| Implementation of new crafts and farmers markets | Culture Heritage Village |
| Creation of a Culture Heritage Village in Red Bays | Protected areas |
| Protected areas | |
| Management of terrestrial, marine and forestry protected areas | National Park or reserve |
| Designation of the Andros Barrier Reef National Park | Conservation forest |



4.2.3 Long term strategy (up to 25 years – 2040)

Up to the Sustainable Prosperity: development of a University as a driver in North, and nature-based tourism in Central and South Andros, and Mangrove Cay.

INFRASTRUCTURE DEVELOPMENT

- ▶ Assuming that research capability at BAMSI and partnerships with Universities have been a success at medium term, a new satellite campus of the University of Bahamas is implemented in North Andros in connection with research institutes. It could host up to 2,000 students and provide employment to Androsians. It would also help to develop services and improve connectivity with Nassau and other districts.
- ▶ A recreational marina (with resorts, shops, restaurants...) is developed in the “small Morgan’s Bluff” while the large dock is developed for commercial and large yachting use.
- ▶ A recreational marina is developed in Fresh Creek including the landscaping of the lighthouse site and the Lighthouse Club, while BEC is relocated.

FISHING – AGRICULTURE – FORESTRY

Fishing practices are sustainable, habitat at risk is protected and main species stocks are monitored (spiny lobster, conch, snapper, grouper, land crab).

Several agriculture, forestry, fisheries and marine research programs are ongoing in collaboration with foreign centers of excellence for the monitoring and management of natural resources.

NATURE-BASED ACTIVITIES

New nature-based tourism activities are fully developed in all districts: bird watching tours, bonefishing and fly-fishing, snorkeling and scuba diving on the coral reef, kayaking in the mangroves, camping in the West Side National Park.

PROTECTED AREAS

All protected areas (marine and terrestrial) are effectively managed according to an ecosystem-based approach, allowing both the protection of habitat at risk and nature-based tourism activities.

The map presented hereafter illustrates strategic development guidelines foreseen for the entire island for the long term.

Andros Master Plan: Long term strategy (25 years - 2040)

Up to the Sustainable Prosperity:
 Development of a University as the driver in North, and nature-based tourism in Central and South Andros, and Mangrove Cay

LAND & SEA USE ZONING CLASSIFICATION SCHEME



| Infrastructure development | |
|--|-------------------------------|
| Development of Morgan's Bluff and Fresh Creek as recreational marinas | Main ports Marina |
| Implementation of a new satellite campus of the University of The Bahamas | University |
| Expansion of towns centers and roads | Development areas |
| Transportation by water | |
| Improvement of ferry service between each district and between Andros and Nassau | Ferry service |
| Fishing activities | |
| Fishing practices are sustainable, habitat at risk are protected and main species stocks are monitored | Snapper, grouper and bonefish |
| | Conch |
| | Sponge |
| | Lobster |
| | Land crab |
| Nature-based tourism | |
| Increase of nature-based activities | Tourism areas |
| | Bird watching |
| | Beach |
| | Kayaking |
| | Snorkeling |
| | Scuba diving |
| | Nature tour |
| | Historic site |
| | Blue Holes trail |
| | Market |
| Backcountry camping site | |
| Protected areas | |
| Efficient management of terrestrial, marine and forestry protected areas | Protected areas |
| | National Park or reserve |
| | Conservation forest |

0 2.5 5 10
 December 2016
 Sources : NatCap - BRLI - Blue, BNT, Ministes of Agriculture - Tourism

4.3 RECOMMENDATIONS AND ACTIONS BY HUMAN ACTIVITY SECTORS

According to the vision and the strategy, the Andros Master Plan provides specific recommendations for each human activity sector, some of which are developed in action sheets which detail the objectives, the program and the road map for implementation. All these action sheets are presented in the appendices.

4.3.1 Infrastructure development

The table presented below summarizes all recommendations and actions planned regarding infrastructure development. **Refer to Appendix A for details and associated action sheets.**

Table 3: Recommendations/actions for infrastructure development

| Human activity sector | District | Recommendations / Actions | Timeliness | | | N° Action Sheet |
|-----------------------|----------------|--|------------|----|----|-----------------|
| | | | ST | MT | LT | |
| Infrastructure | All districts | Prioritize nature-based solutions to reduce coastal risks and maintain existing seawalls | | | | |
| | | Develop sustainable management of dump/landfill/sewage (collection/storage) and enforce treatment/recycling processes | | | | |
| | | Launch physical studies: - Topo-bathymetric surveys, - Andros Climate Change vulnerability, impacts and resilience study, - Study analyzing currents and flows impacts on mangroves areas, - Study for enhancing Driggs Hill harbor protection during Northeast surges, - Study to determine the most sustainable locations for quarry and offshore mining in Andros. | | | | 0 |
| | | Improve main public and social infrastructures: roads, bridges, clinics, schools, and sport centers | | | | 1 |
| | | Improve and manage Andros airports | | | | 2 |
| | | Improve facilities in the main ports of Andros : docks/ramps repaired and basic services implemented (potable water, electric power, fuel and communication systems) | | | | 3 |
| | | Sustainable urban development considering coastal vulnerability | | | | |
| | North Andros | Study on London Creek to improve the water flow for the health of the creek and mangroves | | | | 0 |
| | | Develop Morgan's Bluff harbor | | | | 4 |
| | | Develop an artisanal fishing center in Darel Island - Lowe Sound | | | | 5 |
| | | Develop a new satellite campus of the University of Bahamas in connection with research institutes | | | | |
| | | Construct a concrete plant to support the construction of needed public infrastructure | | | | |
| | Central Andros | Develop Fresh Creek marina and lighthouse site | | | | |
| | | Improve air quality and reduce noise levels at the BEC station at Fresh Creek and conduct a study on the feasibility of relocation | | | | |
| | | Studies on Sandy, Staniard, Stafford, Fresh and Cargill creeks to improve the water flow for the health of the creek and mangroves | | | | 0 |
| | Mangrove Cay | Re-vamp Lisbon Creek Regatta Site | | | | |
| | | Replace water mains | | | | |
| | | Create new road out of the seashore connecting hurricane shelters | | | | |
| | South Andros | Add infrastructure for running water from the Bluff to Mars Bay (adjacent to road) | | | | |

Source: BRLi / Blue - 2016

4.3.2 Dredging & mining

The table presented below summarizes all recommendations and actions planned regarding dredging and mining activities.

Refer to Appendix B for details and associated action sheets.

Table 4: Recommendations/actions for dredging and mining activities

| Human activity sector | District | Recommendations / Actions | Timeliness | | | N° Action Sheet |
|-----------------------|---------------|--|------------|----|----|-----------------|
| | | | ST | MT | LT | |
| Dredging & Mining | All districts | Implement policies to limit ad-hoc dredging and mining - Better regulate locations and depth of mining | | | | |
| | | Launch topo-bathymetric surveys in the main ports | | | | 0 |
| | | Launch study to determine the most sustainable locations for quarry and offshore mining in Andros | | | | 0 |

Source: BRLi / Blue - 2016

4.3.3 Transportation by water

The table presented below summarizes all recommendations and actions planned regarding transportation by water.

Refer to Appendix C for details and associated action sheets.

Table 5: Recommendations/actions for transportation by water development

| Human activity sector | District | Recommendations / Actions | Timeliness | | | N° Action Sheet |
|-------------------------|---------------|---|------------|----|----|-----------------|
| | | | ST | MT | LT | |
| Transportation by water | All districts | Move boat traffic to avoid travel on coral reef | | | | |
| | | Improve conditions for maritime access: implementation of lights and buoys, dredging operations and wreck removal | | | | 6 |
| | | Develop new ferry service connecting Central Andros - Mangrove Cay - South Andros | | | | 7 |

Source: BRLi / Blue - 2016

4.3.4 Fishing activities

The table presented below summarizes all recommendations and actions planned regarding fishing activities.

Refer to Appendix D for details and associated action sheets.

Table 6: Recommendations/actions for fishing activities

| Human activity sector | District | Recommendations / Actions | Timeliness | | | N° Action Sheet |
|-----------------------|---------------|--|------------|----|----|-----------------|
| | | | ST | MT | LT | |
| Fishing | All districts | Renew enforcement of existing regulations | | | | |
| | | Implement fisheries policy: catch and size limits, temporal closures, technique-based restrictions | | | | |
| | | Implement community education about sustainable fishing practices | | | | |
| | | Launch data collection, monitoring and marine research programs in collaboration with foreign centers of excellence for the monitoring/management of natural resources | | | | |
| | | Monitor and manage important commercial fish species stocks | | | | 8 |

Source: BRLi / Blue - 2016

4.3.5 Agriculture

The table presented below summarizes all recommendations and actions planned regarding agriculture activities.

Refer to Appendix E for details and associated action sheets.

Table 7: Recommendations/actions for agriculture activities

| Human activity sector | District | Recommendations / Actions | Timeliness | | | N° Action Sheet |
|-----------------------|---------------|---|------------|----|----|-----------------|
| | | | ST | MT | LT | |
| Agriculture | All districts | Establish relationship between local farmers and lodges | | | | |
| | | Launch feasibility study for the development of the cottage industry such as canning/bottling of coconut, crab, tomatoes etc. | | | | |
| | | Raise healthy eating awareness | | | | |
| | | Implement best management practices in commercial agriculture including restricting distance of farming to fresh water lenses and shorelines | | | | |
| | | Launch several agriculture research programs in collaboration with foreign centers of excellence for the monitoring and management of natural resources | | | | |
| | | Implement future commercial agriculture in all zoned areas | | | | |
| | North Andros | Implement processing and packaging unit for BAMSI | | | | |
| | | Develop research capability at BAMSI and MOUs with other Universities | | | | |
| | MC / SA | Designate Agriculture Officer | | | | |
| | | Create agricultural cooperative | | | | |
| | | Implement community education about sustainable agricultural practices | | | | |
| | | Develop small-scale farming | | | | 9 |

Source: BRLi / Blue - 2016

4.3.6 Forestry

The table presented below summarizes all recommendations and actions planned regarding forestry activities.

Refer to Appendix F for details.

Table 8: Recommendations/actions for forestry activities

| Human activity sector | District | Recommendations / Actions | Timeliness | | | N° Action Sheet |
|-----------------------|---|--|------------|----|----|---|
| | | | ST | MT | LT | |
| Forestry | North Andros, Mangrove Cay and South Andros | Develop and implement Forestry areas management plans | | | | No action sheet developed for this sector |
| | | Train Bahamians in sap and lumber production | | | | |
| | | Employ 15 staff in the Forestry Department | | | | |
| | | Launch forestry research programs in collaboration with foreign centers of excellence for the monitoring/management of natural resources | | | | |
| | | Implement best management practices to avoid erosion and contamination of the freshwater lens | | | | |
| | | Develop small sized sustainable forest utilization industry including sap and lumber production | | | | |

Source: BRLi / Blue - 2016

4.3.7 Nature-based tourism

The table presented below summarizes all recommendations and actions planned regarding nature-based tourism activities.

Refer to Appendix G for details and associated action sheets.

Table 9: Recommendations/actions for nature-based activities

| Human activity sector | District | Recommendations / Actions | Timeliness | | | N° Action Sheet |
|-----------------------|---------------|---|------------|----|----|-----------------|
| | | | ST | MT | LT | |
| Nature-based tourism | All districts | Develop training programs for guides for nature-based activities, small business management and marketing | | | | |
| | | Develop activities that attract tourists outside of bonefishing season | | | | |
| | | Improve road signs, tourist maps and websites for tourist information | | | | |
| | | Re-vitalize festivals | | | | |
| | | Define marketing strategy for goods, services and tourism | | | | 10 |
| | | Develop birding areas and bird watching tours | | | | 11 |
| | | Develop infrastructure to allow access to Blue Holes and other areas | | | | |
| | North Andros | Plan bonefishing in Joulter Cays to avoid key bird areas and habitat | | | | |
| | | Develop a Culture Heritage Village in Red Bays | | | | 12 |
| | South Andros | Create a new craft and farmer market at Long Bays Park | | | | |

Source: BRLi / Blue - 2016

4.3.8 Protected areas

The table presented below summarizes all recommendations and actions planned regarding protected areas.

Refer to Appendix H for details.

Table 10: Recommendations/ actions for protected areas

| Human activity sector | District | Recommendations / Actions | Timeliness | | | N° Action Sheet |
|-----------------------|----------------|--|------------|----|----|---|
| | | | ST | MT | LT | |
| Protected areas | All districts | Designate Andros Barrier Reef National Park (multi-usage of the park under determined management strategies) | | | | No action sheet developed for this sector |
| | | Develop and implement marine, terrestrial and forestry protected areas management plans | | | | |
| | | Formally acknowledge Conservation Forests (Department of Forestry) | | | | |
| | | Enforce National Park policies | | | | |
| | North Andros | Finalize Joulter Cays National Park (multi-usage of the park under determined management strategies) | | | | |
| | Central Andros | Manage the Crab Replenishment Reserve effectively | | | | |

Source: BRLi / Blue - 2016



Source: BRLi - December 2016





5. VISION AND ACTIONS PER DISTRICT

This chapter presents the sustainable vision that is foreseen for the future of each district of Andros.

5.1 NORTH ANDROS

5.1.1 The vision for the future of North Andros

In the future, North Andros will be the economic driver of the island, with the implementation of a new satellite campus of the University of The Bahamas, and expanded activities in agriculture, forestry and fisheries.

The future of North Andros will be reflected through economic activities focused on education, agriculture, forestry and fisheries.

Commercial agriculture will be expanded through the further development of BAMSI and its processing and packaging unit. The implementation of a satellite campus of the University of The Bahamas will attract Bahamian and foreigner students or experts, with the establishment of research programs and Memoranda of Understanding (MoU) with foreign Universities regarding the sustainable management of the island's natural resources. Sustainable and small-sized forest utilization industry will also be developed on the west side, including sap and lumber production. These activities will constitute an **agronomy and research center** around San Andros.

Fishing activities will be encouraged by the improvement of harbor facilities and infrastructure in Morgan's Bluff, Red Bays and Lowe Sound, and commercial fisheries will be expanded through the implementation of an **artisanal fishing center** located on Darel Island, including a fish-packaging house. New policies will govern the monitoring and sustainable management of important fish species stocks such as conch, lobster, sponge, snapper, in which local communities will be largely involved.

These expanded activities will lead to increased exports from Morgan's Bluff to markets in New Providence and the United States.

The local economy will also be sustained by the expansion of tourism. A **Culture Heritage Village** will be created in Red Bays, including an Ecomuseum and Ecolodge, to promote the Black Seminole Indians culture, traditions and handicraft. New nature-based activities will be developed such as day-trips to the Joulter Cay National Park, or bird-watching tours. Morgan's Bluff will be developed into a **recreational marina and commercial hub**, attracting more vessels and accommodating significant increase in agro-fishery and forestry exports.

The development of these activities will lead to increases in visitation and population that will be supported by improved transport and social infrastructure (such as roads, port, clinics) facilitating accessibility, connectivity and services. Red Bays, Nicholls Town and Mastic Point settlements will be expanded to accommodate the increased population.

Through these strategic investments, the AMP reflects a future for North Andros where policy enforcement, best management actions and sustainable practices blend socio-economic development and nature conservation goals to achieve a **nature-based economy** that can be sustained over time. Through the structural and physical changes brought to North Andros, this Master Plan will reshape the district creating **socio-economic benefits**.

From an economic point of view, the improvements in transportation infrastructure and connectivity, which will improve access to markets, as well as the maintenance of key ecosystem services for tourism and fisheries, will expand **economic development and growth**. The increasing demand for tourist services (transportation, accommodation, yachting, recreational fishing, access to protected areas and natural parks) will contribute to heightening the district's reputation and boosting the local economy, through increased incomes, employment rate and GDP. Unemployment is expected to decrease with the creation of many job opportunities related to the **agriculture, forestry, fisheries and tourism sectors**.

From a social point of view, the improvements in public infrastructure such as schools and clinics will develop social capital through **better education and health services**. The investments in educational programs related to agriculture, forestry, fisheries and nature-based tourism sectors will enhance North Androsian people's knowledge and skills, which will improve their access to job opportunities.

The drawing presented hereafter illustrates how North Andros will look like in 2040.

5.1.2 Recommendations and actions for North Andros

The tables and maps presented hereafter summarize all recommendations and actions foreseen for the future of North Andros for the short, medium and long term.

North Andros in 2040



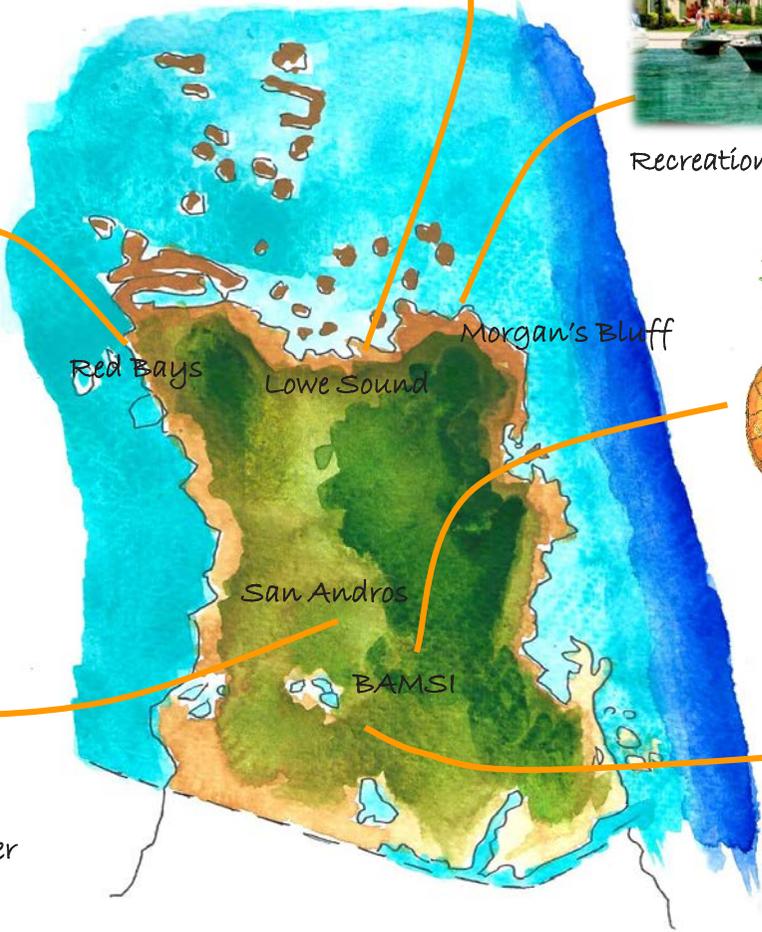
Artisanal Fishing Center



Recreational marina & commercial harbour



Culture Heritage Village
Ecomuseum & Ecolodge



Sustainable development
of commercial
agriculture



University of The Bahamas
Agronomy and research center



Development of small-
sized sustainable forest
utilization



original watercolors © Beynet, 2016 www.beynet-art.com

Table 11: Recommendations and actions for North Andros for the short term

| Human activity sectors | Appendix | Action sheet | Recommendations / Actions | Timeliness | | |
|-------------------------|----------|--------------|--|------------|---------|---------|
| | | | | ST 2020 | MT 2030 | LT 2040 |
| Infrastructure | A | | Prioritize nature-based solutions to reduce coastal risks | | | |
| | | | Develop sustainable management of existing dump/landfill/sewage | | | |
| | | 0 | Study conducted on London Creek to improve mangrove health | | | |
| | | 1 | Improve and maintain roads and clinics | | | |
| | | 2 | Improve and manage San Andros airport | | | |
| | | 3 | Improve facilities in Red Bays, Lowe Sound and Morgan's Bluff harbors: docks/ramps repaired and basic services implemented (potable water, electric power, fuel and communication systems) | | | |
| | | 4 | Develop Morgan's Bluff harbor into a recreational marina and commercial harbor | | | |
| Dredging & Mining | B | | Implement policies to limit ad-hoc dredging and mining | | | |
| | | 0 | Launch topo-bathymetric survey in Morgan's Bluff harbor | | | |
| | | 0 | Determine sustainable locations for quarry and offshore mining | | | |
| Transportation by water | C | | Move boat traffic to avoid travel on coral reef | | | |
| | | 6 | Improve conditions for maritime access: implementation of lights and buoys in Red Bays, Lowe Sound and Morgan's Bluff | | | |
| Fishing | D | | Renew enforcement of existing regulations | | | |
| | | | Implement new policy: catch and size limits, temporal closures, technique-based restrictions | | | |
| | | | Implement community education about sustainable fishing practices | | | |
| | | 8 | Monitor and manage important commercial fish species stocks | | | |
| Agriculture | E | | Establish relationship between local farmers and lodges | | | |
| | | | Launch feasibility study of canning/bottling | | | |
| | | | Raise healthy eating awareness | | | |
| | | | Restrict distance of farming to fresh water lenses and shorelines | | | |
| | | | Implement best management practices in commercial agriculture | | | |
| | | | Implement processing and packaging unit for BAMSI | | | |
| Forestry | F | | Develop and implement Forestry areas management plans | | | |
| | | | Train Bahamians in sap and lumber production | | | |
| | | | Employ staff in the Forestry Department | | | |
| Nature-based tourism | G | | Develop training programs for guides for nature-based activities | | | |
| | | | Develop activities that attract tourists outside of bonefishing season | | | |
| | | | Improve road signs, tourist maps and websites for tourist information | | | |
| | | | Re-vitalize festivals | | | |
| | | 10 | Define marketing strategy for goods, services and tourism | | | |
| | | | Plan bonefishing in Joulter Cays to avoid key bird areas and habitat | | | |
| | | 11 | Develop birding areas and bird-watching tours | | | |
| Protected areas | H | | Finalize Joulter Cays National Park (multi-usage of the park under determined management strategies) | | | |
| | | | Develop and implement marine, terrestrial and forestry protected areas management plans | | | |
| | | | Formally acknowledge Conservation Forests (Department of Forestry) | | | |
| | | | Enforce National Park policies | | | |

Andros Master Plan: Recommendations / actions for the short term (5 years - 2020)

LAND & SEA USE ZONING CLASSIFICATION SCHEME

North Andros



| | |
|-------------------------------------|-------------------------------|
| ● Main towns | Fishing activities |
| Infrastructure development | 🐟 Fishing activities areas |
| ✚ Clinic | Agriculture |
| ⚓ Main ports | 🌱 Potential agriculture areas |
| ⚓ Dock and Ramp | 🏠 BAMS |
| — Road | Nature-based tourism |
| ⚠ Existing water, Sewerage and Dump | 🏞 Tourism areas |
| ✈ Airport | Protected areas |
| 🌿 Mangrove | 🌳 National Park or reserve |
| Transportation by water | 🌳 Conservation forests |
| ⚓ Lights & Buoys | |

0 2.5 5 10 km

December 2016
Sources: NatCap - BRLi - Blue, BNT, Ministries of Agriculture - Tourism

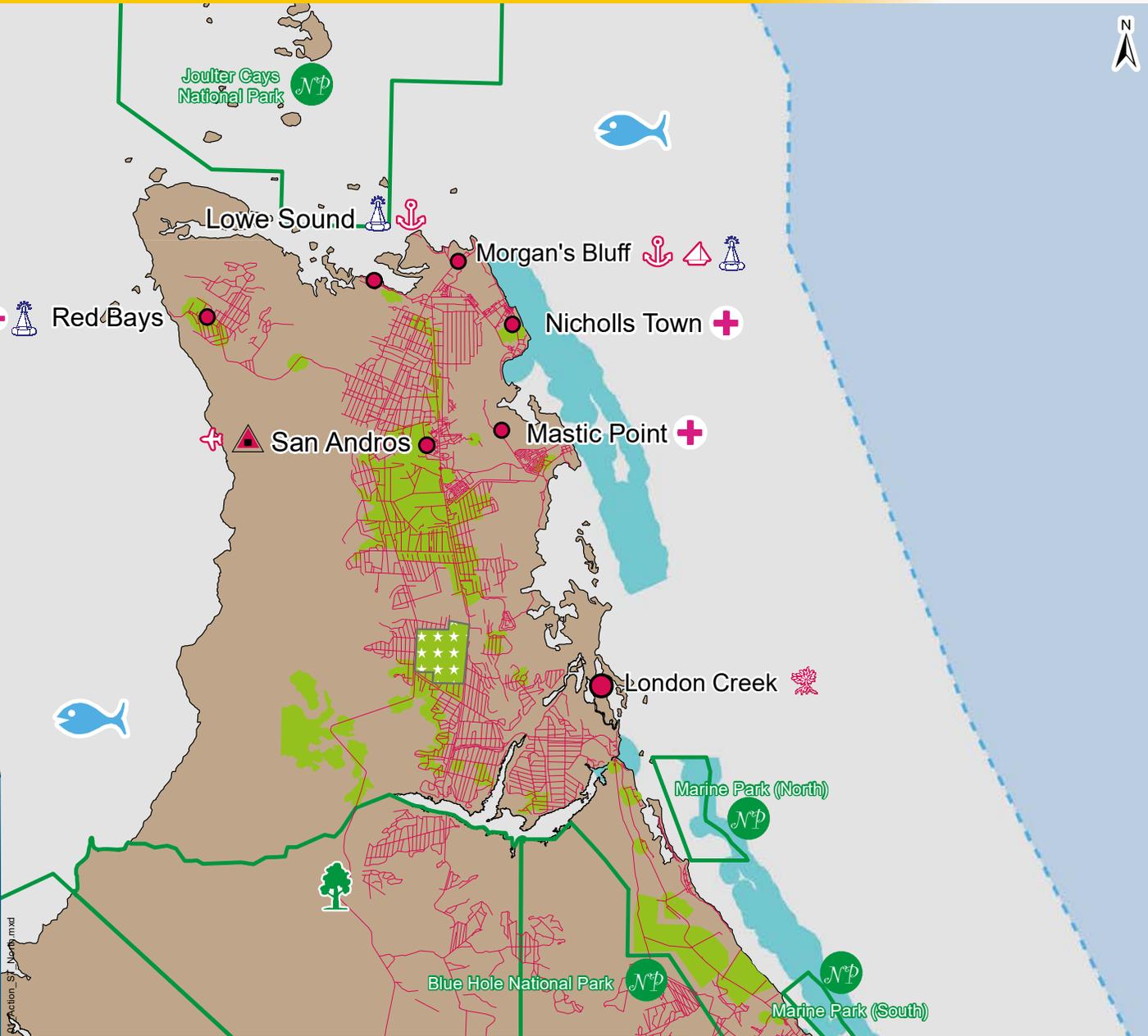


Table 12: Recommendations and actions for North Andros for the medium and long term

| Human activity sectors | Appendix | Action sheet | Recommendations / Actions | Timeliness | |
|-------------------------|----------|--------------|---|------------|---------|
| | | | | MT 2030 | LT 2040 |
| Infrastructure | A | | Prioritize nature-based solutions to reduce coastal risks | | |
| | | | Develop sustainable management of existing dump/landfill/sewage | | |
| | | 2 | Improve and manage San Andros airport | | |
| | | 4 | Develop Morgan's Bluff harbor into a recreational marina and commercial harbor | | |
| | | | Sustainable urban development considering coastal vulnerability | | |
| | | 5 | Develop an artisanal fishing center on Darel Island - Lowe Sound | | |
| | | | Construct a concrete plant to support the construction of needed public infrastructure | | |
| | | | Develop a new satellite campus of the University of The Bahamas | | |
| Dredging & Mining | B | | Implement policies to limit ad-hoc dredging and mining | | |
| Transportation by water | C | | Move boat traffic to avoid travel on coral reef | | |
| | | | Improve ferry service between Nassau and North Andros | | |
| | | 6 | Improve channel access at Morgan's Bluff harbor (dredging operations + wreck removal) | | |
| Fishing | D | | Renew enforcement of existing regulations | | |
| | | | Implement new policy: catch and size limits, temporal closures, technique-based restrictions | | |
| | | | Implement community education about sustainable fishing practices | | |
| | | | Launch fisheries research programs in collaboration with foreign centers of excellence for the monitoring/management of natural resources | | |
| | | 8 | Monitor and manage important commercial fish species stocks | | |
| Agriculture | E | | Establish relationship between local farmers and lodges | | |
| | | | Launch agriculture research programs in collaboration with foreign centers of excellence for the monitoring/management of natural resources | | |
| | | | Raise healthy eating awareness | | |
| | | | Restrict distance of farming to fresh water lenses and shorelines | | |
| | | | Implement best management practices in agriculture | | |
| | | | Implement future commercial agriculture in all zoned areas | | |
| | | | Develop research capability at BAMS I & MOUs with Universities | | |
| Forestry | F | | Launch forestry research programs in collaboration with foreign centers of excellence for the monitoring/management of natural resources | | |
| | | | Implement best management practices to avoid erosion and contamination of the freshwater lens | | |
| | | | Develop small sized sustainable forest utilization industry including sap and lumber production | | |
| Nature-based tourism | G | 11 | Develop birding areas and bird watching tours | | |
| | | | Develop activities that attract tourists outside of bonefishing season | | |
| | | | Develop infrastructure to allow access to Blue Holes and other areas | | |
| | | | Improve road signs, tourist maps and websites for tourist information | | |
| | | | Re-vitalize festivals | | |
| | | | Plan bonefishing in Joulter Cays to avoid key bird areas and habitat | | |
| | | 12 | Develop a Culture Heritage Village in Red Bays | | |
| Protected areas | H | | Develop and implement marine, terrestrial and forestry protected areas management plans | | |
| | | | Designate Andros Barrier Reef National Park (multi-usage of the park under determined management strategies) | | |
| | | | Enforce National Park policies | | |

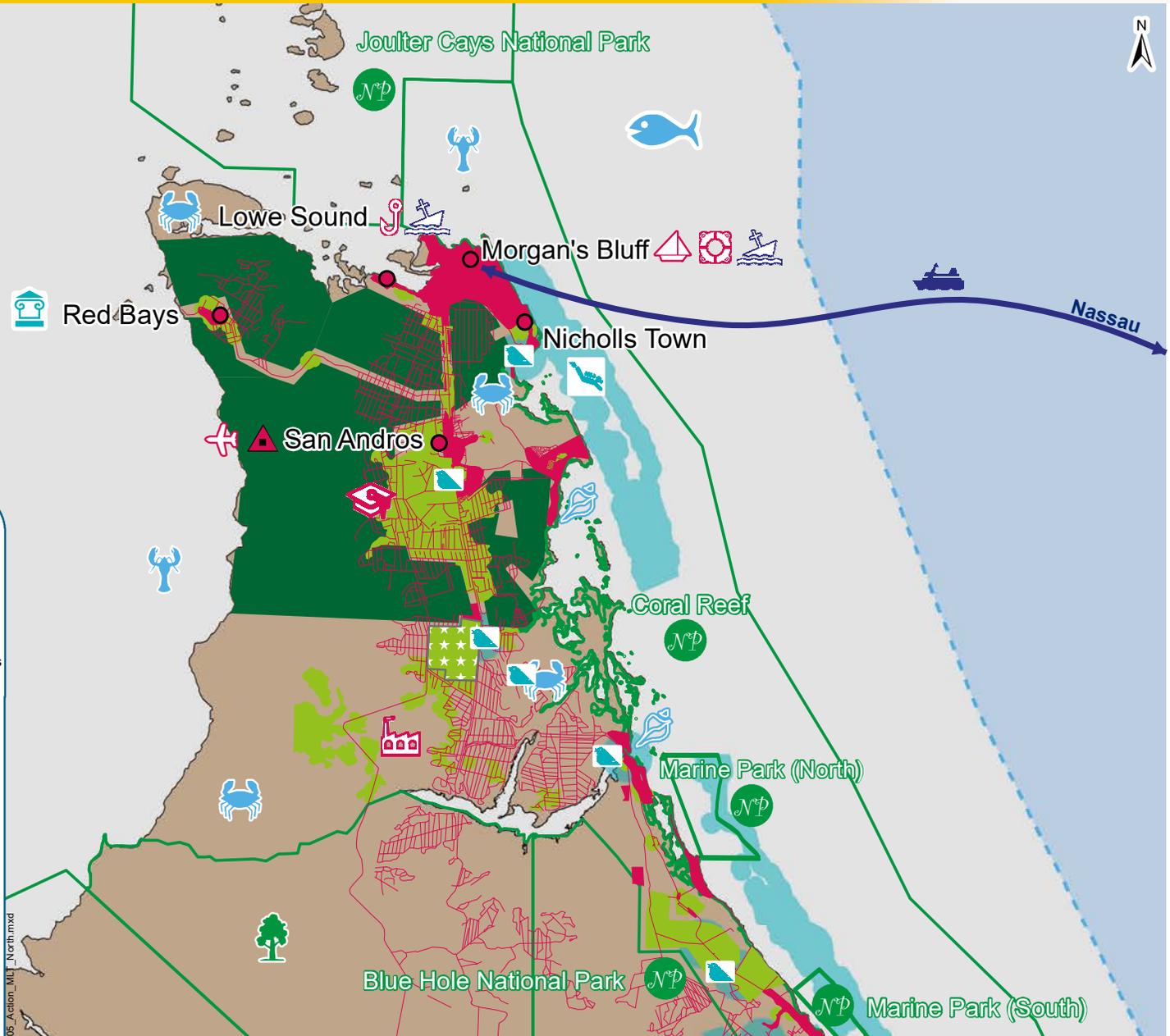
(15 years - 2030)
(25 years - 2040)



LAND & SEA USE ZONING CLASSIFICATION SCHEME

Andros Master Plan: Recommendations / actions for medium and long terms

North Andros



| | | | |
|--|--|--|-----------------------------|
| | Main towns | | Fishing activities |
| | Infrastructure development | | Fishing activities areas |
| | Fishing centre | | Lobster |
| | Main ports | | Conch |
| | Road | | Land crab |
| | Concrete plant | | Agriculture |
| | Marina | | Potential agriculture areas |
| | University | | BAMS |
| | Existing Water, sewage and dump facilities | | Forestry |
| | Airport | | Forestry areas exploited |
| | Development areas | | Nature-based tourism |
| | Transportation by water | | Scuba diving |
| | Dredging operation & wreck removal | | Culture |
| | New ferry service | | Heritage Village |
| | | | Bird watching |
| | | | Tourism areas |
| | | | Protected areas |
| | | | National Park or reserve |
| | | | Conservation forests |

0 2.5 5 10 km

December 2016
Sources: NatCap - BRLI - Blue, BNT, Ministries of Agriculture - Tourism

5.2 CENTRAL ANDROS

5.2.1 The vision for the future of Central Andros

Eco-tourism will be expanded through the further development of **nature-based activities** such as snorkeling and diving on the coral reef, bird watching in the forest, discovering blue holes, kayaking in mangroves and exploring West Side National Park. These activities will be sustained by the implementation of the necessary infrastructure to access all the natural assets of the parks and reserves (composting toilets, solar lighting, boardwalks, pavilions and interpretive signage, etc.).

Central Andros will become the **island's nature-based activities hub**, gathering the major protected areas: West Side National Park, Blue Hole National Park, Andros Barrier Reef National Park, the Crab Replenishment Reserve and the largest conservation forest. The growth of the nature-based tourism industry will lead to a boom in entrepreneurial and employment opportunities.

Central Andros will be the site of an **ecotourism training center**. The internationally accredited program will host local and international students. The state of art facility will be modeled after work begun by the Bahamas National Trust and Local NGO's. It will be a model of sustainability using green technology in construction and alternative energy sources.

New festivals and crafts markets, promoting Androsian batik or Seminole baskets, will attract domestic and foreign tourists, leading to increased visitation and population. This demographic growth will be supported by improved transport and social infrastructure (such as roads, bridges, ports, clinics) facilitating accessibility, connectivity and services. Fresh Creek, Andros Town, Cargill Creek and Behring Point settlements will be expanded to accommodate the increased population. Fresh Creek will be developed into a **commercial port and recreational marina**, and the lighthouse site will be upgraded for an improved experience for tourists and boaters.

In the future, Central Andros will be dedicated to nature-based tourism through its natural parks, reserves and festivals.

A **new ferry service** from Behring Point will connect North/Central Andros with Mangrove Cay and South Andros, facilitating the transport of economically important goods and services.

Fishing activities will be encouraged by the improvement of harbor facilities and infrastructure in Fresh Creek and Behring Point. New policies will govern the monitoring and sustainable management of important fish species stocks such as conch, lobster, sponge, snapper, in which the local communities will be largely involved. The local economy will also be sustained by the development of commercial agriculture, in line with the expansion of BAMS in North Andros.

Through these strategic investments, the AMP reflects a future for Central Andros where policy enforcement for protected areas, best management actions and sustainable practices in agriculture and fisheries blend socio-economic development and nature conservation goals to achieve a **nature-based economy** that can be sustained over time. Through the structural and physical changes brought to Central Andros, this Master Plan will reshape the district creating **socio-economic benefits**.



From an economic point of view, the improvements in transportation infrastructure (roads, bridges) and connectivity (ferry service), as well as the maintenance of key ecosystem services for tourism and fisheries, will expand **economic development and growth**. The increasing demand for tourism-related services (transportation, accommodation, yachting, recreational fishing, access to protected areas and natural parks) will contribute to heightening the district's reputation and boosting the local economy, through increased incomes, employment rate and GDP. Unemployment is expected to decrease with the creation of many job opportunities related mainly to the **tourism sector**.

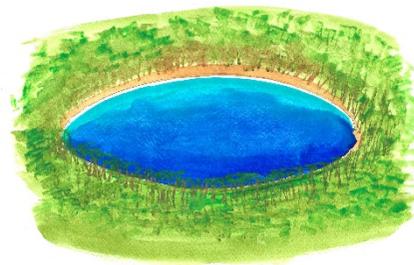
From a social point of view, the improvements in public infrastructure such as schools and clinics will develop social capital through **better education and health services**. The investments in educational programs related to the agriculture, fisheries and nature-based tourism sectors will enhance Central Androsian people's knowledge and skills, which will improve their access to job opportunities.

The drawing presented hereafter illustrates how Central Andros will look like in 2040.

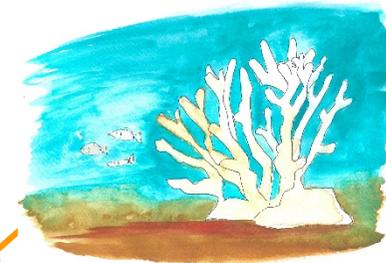
5.2.2 Recommendations and actions for Central Andros

The tables and maps presented hereafter summarize all recommendations and actions foreseen for the future of Central Andros for the short, medium and long term.

Central Andros in 2040



Development of new nature-based activities



Andros Reef National Park

Blue Hole National Park

Fresh Creek

Crab Replenishment Reserve

West Side National Park

Behring Point

Recreational marina & commercial harbour



New ferry service between Central Andros / Mangrove Cay / South Andros



Bird watching tours



Exploring & camping



Sustainable management and monitoring of natural resources





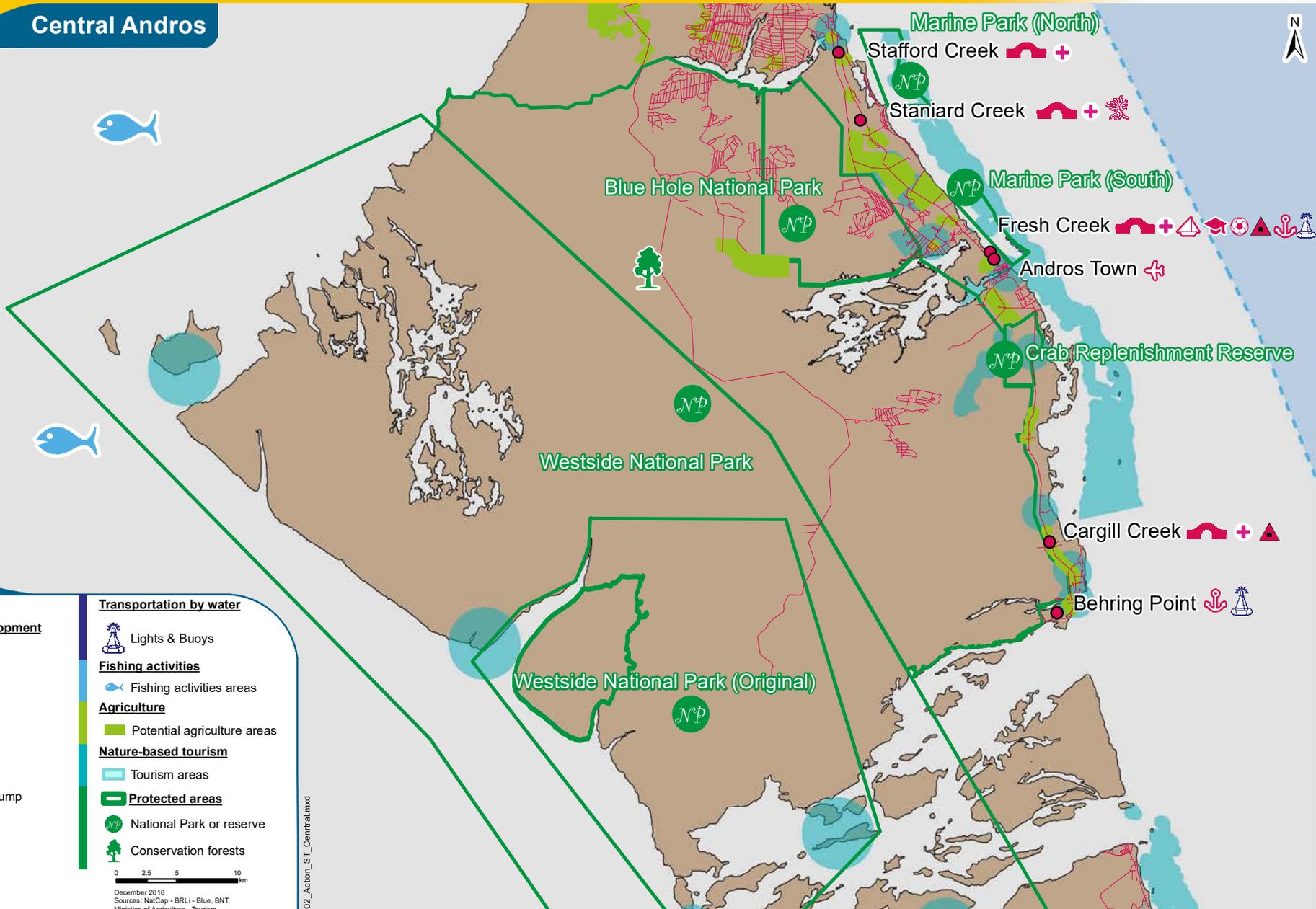
Table 13: Recommendations and actions for Central Andros for the short term

| Human activity sectors | Appendix | Action Sheet | Recommendations / Actions | Timeliness | | |
|-------------------------|----------|--------------|---|------------|---------|---------|
| | | | | ST 2020 | MT 2030 | LT 2040 |
| Infrastructure | A | | Prioritize nature-based solutions to reduce coastal risks | | | |
| | | | Develop sustainable management of existing dump/landfill/sewage | | | |
| | | 0 | Study conducted on Staniard Creek to improve mangrove health | | | |
| | | 1 | Improve and maintain roads, clinics, schools, sport centers, bridges | | | |
| | | 2 | Improve and manage Andros Town airport | | | |
| Dredging & Mining | B | | Implement policies to limit ad-hoc dredging and mining | | | |
| | | 0 | Launch topo-bathymetric surveys in Fresh Creek/Behring Point harbors | | | |
| | | 0 | Determine sustainable locations for quarry and offshore mining | | | |
| Transportation by water | C | | Move boat traffic to avoid travel on coral reef | | | |
| | | 6 | Improve conditions for maritime access: implementation of lights and buoys in Fresh Creek and Behring Point | | | |
| Fishing | D | | Renew enforcement of existing regulations | | | |
| | | | Implement new policy: catch and size limits, temporal closures, technique-based restrictions | | | |
| | | | Implement community education about sustainable fishing practices | | | |
| | | 8 | Monitor and manage important commercial fish species stocks | | | |
| Agriculture | E | | Establish relationship between local farmers and lodges | | | |
| | | | Launch feasibility study of canning/bottling | | | |
| | | | Raise healthy eating awareness | | | |
| | | | Restrict distance of farming to fresh water lenses and shorelines | | | |
| | | | Implement best management practices in agriculture | | | |
| Nature-based tourism | G | | Develop training programs for guides for nature-based activities | | | |
| | | | Develop activities that attract tourists outside of bonefishing season | | | |
| | | | Improve road signs, tourist maps and websites for tourist information | | | |
| | | | Re-vitalize festivals (Crab festival) | | | |
| | | 10 | Define marketing strategy for goods, services and tourism | | | |
| | | | Create a new craft and farmer market in Fresh Creek | | | |
| | | 11 | Develop birding areas and bird watching tours | | | |
| Protected areas | H | | Develop and implement marine, terrestrial and forestry protected areas management plans | | | |
| | | | Manage the Crab Replenishment Reserve effectively | | | |
| | | | Enforce National Park policies | | | |

Andros Master Plan: Recommendations / actions for the short term (5 years - 2020)

LAND & SEA USE ZONING CLASSIFICATION SCHEME

Central Andros



- Main towns
- Infrastructure development**
- ⚓ Main ports
- ⊕ Clinic
- ⚓ Dock and Ramp
- ⚽ Sport center
- Road
- ⚠ Existing Water, Sewerage and Dump
- ✈ Airport
- 🏫 School
- 🌉 Bridge
- 🌿 Mangrove

- Transportation by water**
- ⚓ Lights & Buoys
- Fishing activities**
- 🐟 Fishing activities areas
- Agriculture**
- 🌱 Potential agriculture areas
- Nature-based tourism**
- 🏖 Tourism areas
- Protected areas**
- 🌳 National Park or reserve
- 🌳 Conservation forests

0 2.5 5 10 km
December 2016
Sources: NatCap - BRLI - Blue, BNT, Ministries of Agriculture - Tourism

02_Action_ST_Central.mxd



Table 14: Recommendations and actions for Central Andros for the medium and long term

| Human activity sectors | Appendix | Action Sheet | Recommendations / Actions | Timeliness | |
|-------------------------|----------|--------------|---|------------|---------|
| | | | | MT 2030 | LT 2040 |
| Infrastructure | A | | Prioritize nature-based solutions to reduce coastal risks | | |
| | | | Develop sustainable management of existing dump/landfill/sewage | | |
| | | 0 | Study conducted on Sandy, Stafford, Fresh and Cargill creeks to improve mangrove health | | |
| | | 2 | Improve and manage Andros Town Airport | | |
| | | | Sustainable urban development considering coastal vulnerability | | |
| | | | Develop Fresh Creek marina and lighthouse site | | |
| Dredging & Mining | B | | Implement policies to limit ad-hoc dredging and mining | | |
| Transportation by water | C | 6 | Improve channel access at Fresh Creek/Behring Point harbors (dredging operations + wreck removal) | | |
| | | 7 | Implement new ferry service between Central Andros - Mangrove Cay - South Andros | | |
| | | | Move boat traffic to avoid travel on coral reef | | |
| Fishing | D | | Renew enforcement of existing regulations | | |
| | | | Implement new policy: catch and size limits, temporal closures, technique-based restrictions | | |
| | | | Implement community education about sustainable fishing practices | | |
| | | | Launch fisheries research programs in collaboration with foreign centers of excellence for the monitoring/management of natural resources | | |
| | | 8 | Monitor and manage important commercial fish species stocks | | |
| Agriculture | E | | Establish relationship between local farmers and lodges | | |
| | | | Launch agriculture research programs in collaboration with foreign centers of excellence for the monitoring/management of resources | | |
| | | | Raise healthy eating awareness | | |
| | | | Restrict distance of farming to fresh water lenses and shorelines | | |
| | | | Implement best management practices in agriculture | | |
| | | | Implement future commercial agriculture in all zoned areas | | |
| Nature-based tourism | G | | Develop activities that attract tourists outside of bonefishing season | | |
| | | | Develop infrastructure to allow access to Blue Holes and other areas | | |
| | | | Improve road signs, tourist maps and websites for tourist information | | |
| | | | Re-vitalize festivals (Crab festival) | | |
| | | 11 | Develop birding areas and bird watching tours | | |
| Protected areas | H | | Develop and implement marine, terrestrial and forestry protected areas management plans | | |
| | | | Designate Andros Barrier Reef National Park (multi-usage of the park under determined management strategies) | | |
| | | | Manage the Crab Replenishment Reserve effectively | | |
| | | | Enforce National Park policies | | |

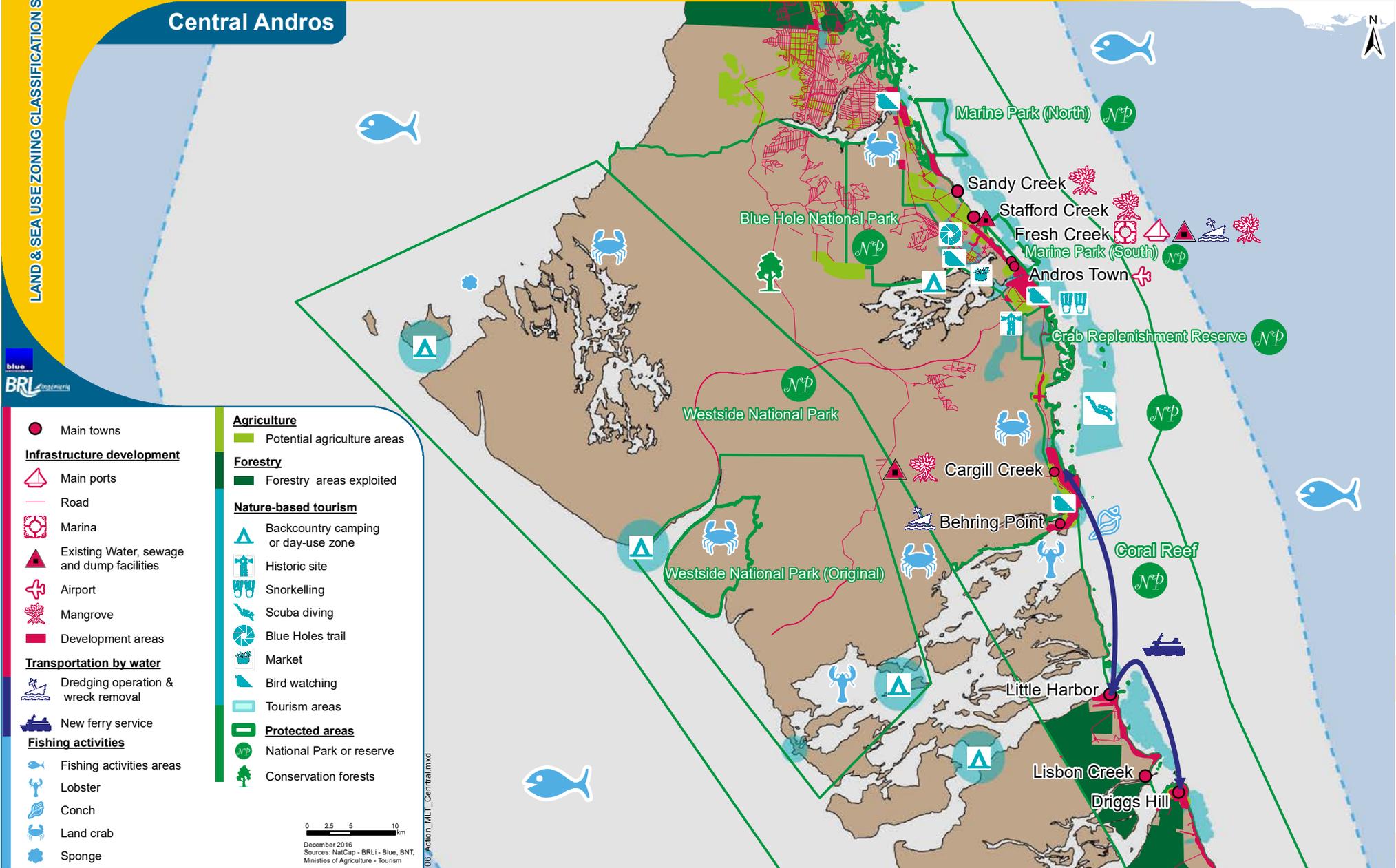
Andros Master Plan: Recommendations / actions for medium and long terms

(15 years - 2030)
(25 years - 2040)



LAND & SEA USE ZONING CLASSIFICATION SCHEME

Central Andros



| | |
|--|--|
| <ul style="list-style-type: none"> ● Main towns Infrastructure development ◁ Main ports — Road ⊞ Marina ▲ Existing Water, sewage and dump facilities ✈ Airport 🌿 Mangrove ■ Development areas Transportation by water 🚢 Dredging operation & wreck removal 🚢 New ferry service Fishing activities 🐟 Fishing activities areas 🦞 Lobster 🐚 Conch 🦀 Land crab 🍄 Sponge | <ul style="list-style-type: none"> Agriculture 🌱 Potential agriculture areas Forestry 🌲 Forestry areas exploited Nature-based tourism ⚖ Backcountry camping or day-use zone 🏛 Historic site 🤿 Snorkelling 🤿 Scuba diving 👣 Blue Holes trail 🏪 Market 🐦 Bird watching 🏖 Tourism areas Protected areas 🌳 National Park or reserve 🌳 Conservation forests |
|--|--|

0 2.5 5 10 km
December 2016
Sources: NatCap - BRLI - Blue, BNT, Ministries of Agriculture - Tourism

5.3 MANGROVE CAY

5.3.1 The vision for the future of Mangrove Cay

In the future, Mangrove Cay will be dedicated to nature-based tourism and fishing activities such as sponging and stone crabbing.

Whereas the peacefulness of this small fishing community will be maintained, the full value chain of the **sponge and stone crab industries** will be expanded, from sustainable harvest to packaging and export in New Providence and the USA.

Fishing activities will be encouraged by the improvement of harbor facilities and infrastructure in Little Harbor and Lisbon Creek. New policies will govern the monitoring and sustainable management of important fish species stocks such as conch, lobster, sponge, snapper, stone crab, in which the local communities will be largely involved.

Eco-tourism will be expanded through the further development of **nature-based activities** such as snorkeling and diving on the coral reef, bird watching in the forest, discovering blue holes, kayaking in mangroves, or exploring West Side National Park. These activities will be sustained by the implementation of the necessary infrastructure to access all the natural assets of the parks and reserves (composting toilets, solar lighting, boardwalks, pavilions and interpretive signage, etc.).

The local economy will also be sustained by the development of sustainable, **small-scale forest utilization activities**, including sap and lumber production.

Small-scale farming will be developed in the district through the designation of an agriculture officer, the creation of an agricultural cooperative, and the implementation of community education about sustainable agricultural practices. Cooperation between Mangrove Cay and South Andros agricultural cooperatives will reduce the duplication of products and allow for direct trade between the two districts. These initiatives will increase the self-sufficiency of the Mangrove Cay district.

The development of these activities will lead to increases in visitation and population that will be supported by improved transport and social infrastructure (such as roads, Little Harbor and Lisbon Creek ports, a clinic, a sport center) facilitating accessibility, connectivity and services. Moxey Town and Lisbon Creek settlements will be expanded to accommodate the increased population. Lisbon Creek Regatta site will be upgraded for an improved experience for tourists and boaters.

A **new ferry service** from Behring Point will connect North/Central Andros with Mangrove Cay and South Andros, facilitating the transport of economically important goods and services.

Through these strategic investments, the AMP reflects a future for Mangrove Cay where policy enforcement of protected areas, best management actions and sustainable practices in agriculture, forestry and fisheries blend socio-economic development and nature conservation goals to achieve a **nature-based economy** that can be sustained over time. Through the structural and physical changes brought to Mangrove Cay, this Master Plan will reshape the district creating **socio-economic benefits**.

From an economic point of view, the improvements in transportation infrastructure (new road from the seashore, improved harbors) and connectivity (ferry service), as well as the maintenance of key ecosystem services for tourism and fisheries, will expand **economic development and growth**. The increasing demand for tourist services will contribute to heightening the district's reputation and boosting the local economy, through increased incomes, employment rate and GDP. Unemployment is expected to decrease with the creation of many job opportunities related mainly to the **fisheries and tourism sectors**.

From a social point of view, the creation of the new sport center and the redesign of the clinic will develop social capital through **better education and health services**. The investments in educational programs related to the agriculture, forestry, fisheries and nature-based tourism sectors will enhance Mangrove Cay people's knowledge and skills, which will improve their access to job opportunities.

The drawing presented hereafter illustrates how Mangrove Cay will look like in 2040.

5.3.2 Recommendations and actions for Mangrove Cay

The tables and maps presented hereafter summarize all recommendations and actions foreseen for the future of Mangrove Cay for the short, medium and long term.

Mangrove Cay in 2040



New ferry service between Central Andros / Mangrove Cay / South Andros



Development of small-sized sustainable forest utilization



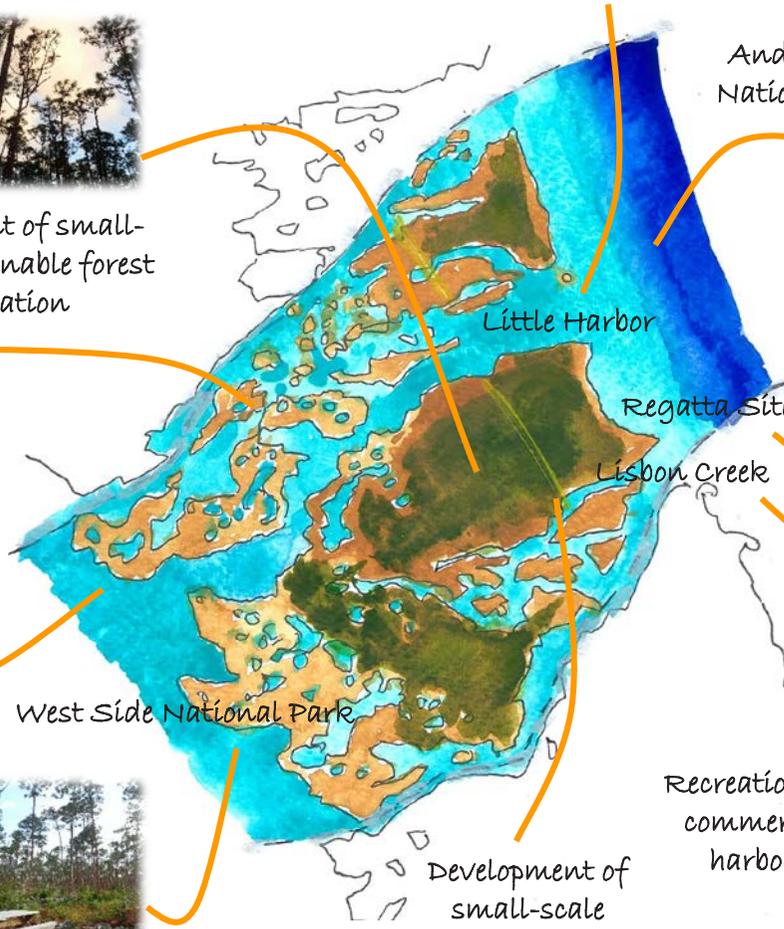
Bonefishing



Sustainable sponge industry



Exploring & camping



Andros Reef National Park



New nature-based activities



Regatta Site

Lisbon Creek

Recreational & commercial harbour



Development of small-scale farming



original watercolors © Beynet, 2016 www.beynet-art.com

Table 15: Recommendations and actions for Mangrove Cay for the short term

| Human activity sectors | Appendix | Action Sheet | Recommendations / Actions | Timeliness | | |
|-------------------------|----------|--------------|--|------------|---------|---------|
| | | | | ST 2020 | MT 2030 | LT 2040 |
| Infrastructure | A | | Prioritize nature-based solutions to reduce coastal risks | | | |
| | | | Develop sustainable management of existing dump/landfill/sewage | | | |
| | | 1 | Improve and maintain roads, the clinic, and build the new sport center | | | |
| | | 2 | Improve and manage Mangrove Cay Airport | | | |
| | | 3 | Improve facilities in Little and Lisbon Creek harbors: docks/ramps repaired and basic services implemented (potable water, electric power, fuel and communication systems) | | | |
| | | | Re-vamp Lisbon Creek Regatta Site | | | |
| Dredging & Mining | B | | Implement policies to limit ad-hoc dredging and mining | | | |
| | | 0 | Launch topo-bathymetric survey in Lisbon Creek | | | |
| | | 0 | Determine sustainable locations for quarry and offshore mining | | | |
| Transportation by water | C | | Move boat traffic to avoid travel on coral reef | | | |
| | | 6 | Improve conditions for maritime access: implementation of lights and buoys in Fresh Creek and Behring Point | | | |
| Fishing | D | | Renew enforcement of existing regulations | | | |
| | | | Implement new policy: catch and size limits, temporal closures, technique-based restrictions | | | |
| | | | Implement community education about sustainable fishing practices | | | |
| | | 8 | Monitor and manage important commercial fish species stocks | | | |
| Agriculture | E | | Establish relationship between local farmers and lodges | | | |
| | | | Designate Agriculture Officer | | | |
| | | | Create Mangrove Cay agricultural cooperative | | | |
| | | | Implement community education about sustainable agricultural practices | | | |
| | | | Launch feasibility study of canning/bottling | | | |
| | | | Raise healthy eating awareness | | | |
| Forestry | F | | Develop and implement Forestry areas management plans | | | |
| | | | Train Bahamians in sap and lumber production | | | |
| | | | Employ staff in the Forestry Department | | | |
| Nature-based tourism | G | | Develop training programs for guides for nature-based activities | | | |
| | | | Develop activities that attract tourists outside of bonefishing season | | | |
| | | | Improve road signs, tourist maps and websites for tourist information | | | |
| | | | Re-vitalize festivals | | | |
| | | 10 | Define marketing strategy for goods, services and tourism | | | |
| | | 11 | Develop birding areas and bird watching tours | | | |
| Protected areas | H | | Develop and implement marine, terrestrial and forestry protected areas management plans | | | |
| | | | Formally acknowledge Conservation Forests (Department of Forestry) | | | |
| | | | Enforce National Park policies | | | |

Andros Master Plan: Recommendations / actions for the short term (5 years - 2020)

LAND & SEA USE ZONING CLASSIFICATION SCHEME

Mangrove Cay

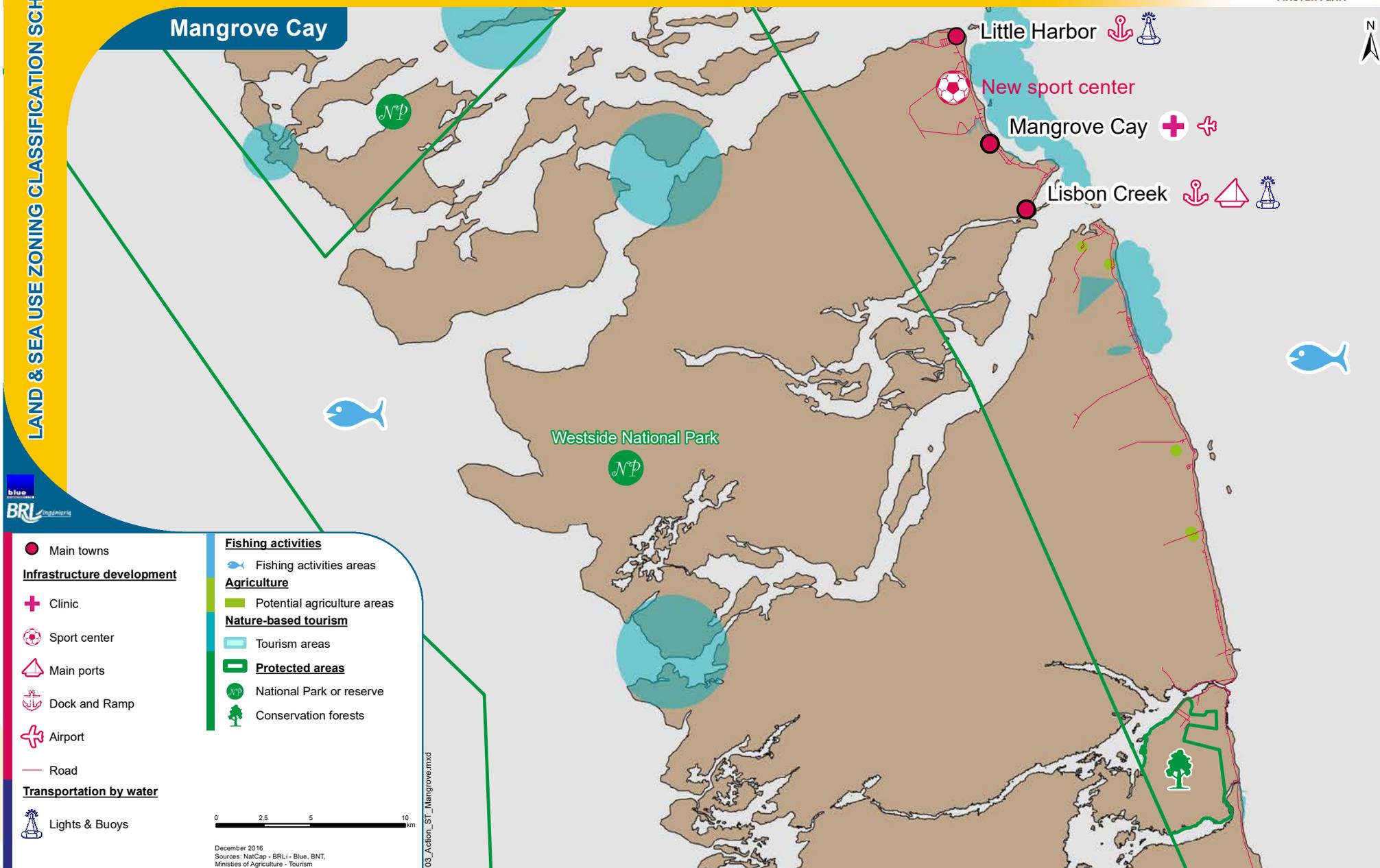
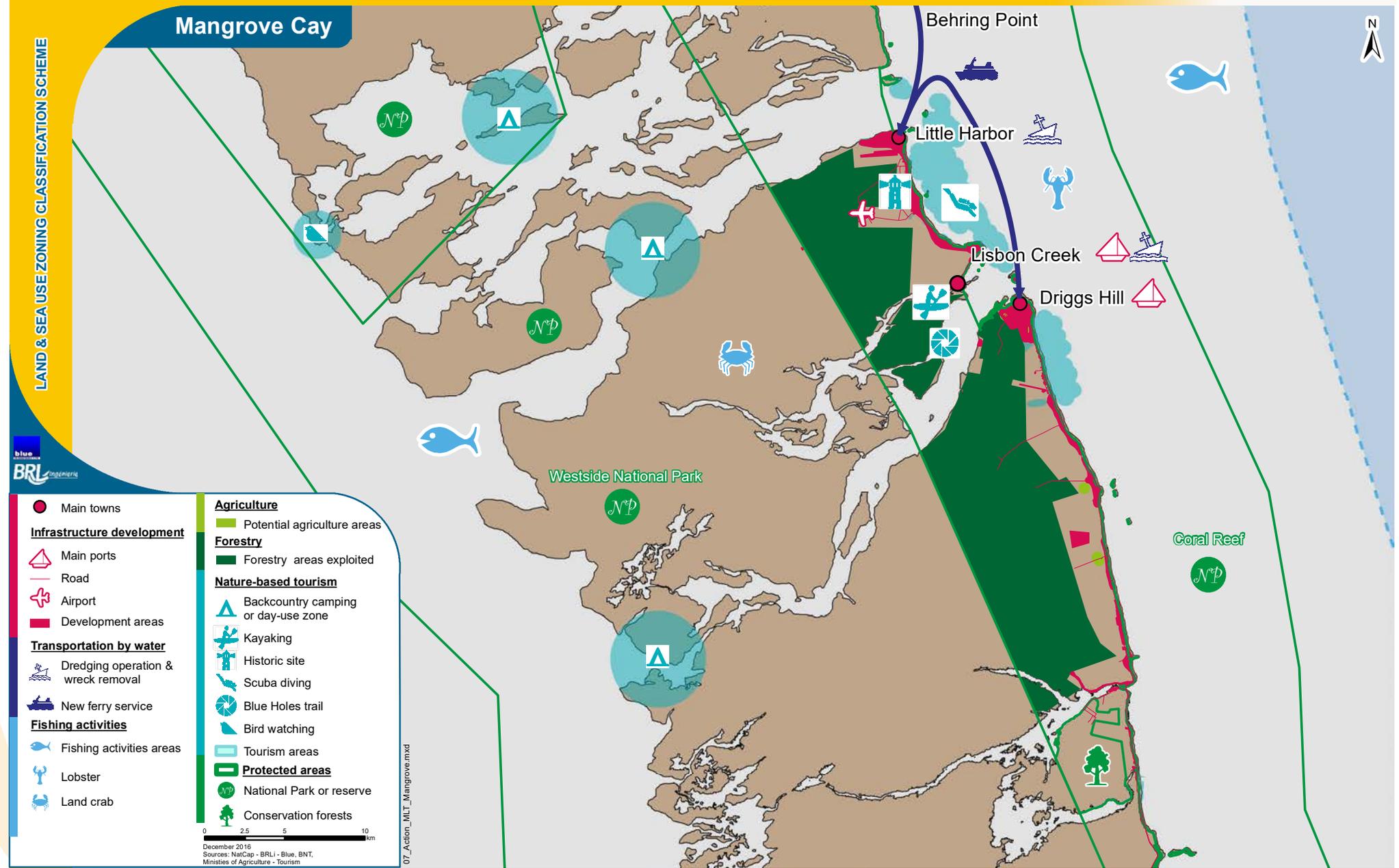


Table 16: Recommendations and actions for Mangrove Cay for the medium and long term

| Human activity sectors | Appendix | Action Sheet | Recommendations / Actions | Timeliness | |
|-------------------------|----------|--------------|---|------------|---------|
| | | | | MT 2030 | LT 2040 |
| Infrastructure | A | | Prioritize nature-based solutions to reduce coastal risks | | |
| | | | Develop sustainable management of existing dump/landfill/sewage | | |
| | | 2 | Improve and manage Mangrove Cay Airport | | |
| | | | Sustainable urban development considering coastal vulnerability | | |
| | | | Replace water mains | | |
| | | | Create new road out of the seashore connecting hurricane shelters | | |
| Dredging & Mining | B | | Implement policies to limit ad-hoc dredging and mining | | |
| Transportation by water | C | 6 | Improve channel access at Lisbon Creek and Little harbor (dredging operations + wreck removal) | | |
| | | 7 | Implement new ferry service between Central Andros - Mangrove Cay - South Andros | | |
| | | | Move boat traffic to avoid travel on coral reef | | |
| Fishing | D | | Renew enforcement of existing regulations | | |
| | | | Implement new policy: catch and size limits, temporal closures, technique-based restrictions | | |
| | | | Implement community education about sustainable fishing practices | | |
| | | | Launch fisheries research programs in collaboration with foreign centers of excellence for the monitoring/management of resources | | |
| | | 8 | Monitor and manage important commercial fish species stocks | | |
| Agriculture | E | | Establish relationship between local farmers and lodges | | |
| | | | Launch agriculture research programs in collaboration with foreign centers of excellence for the monitoring/management of natural resources | | |
| | | | Raise healthy eating awareness | | |
| | | | Restrict distance of farming to fresh water lenses and shorelines | | |
| | | | Implement best management practices in agriculture | | |
| | | 9 | Develop small-scale farming in Mangrove Cay | | |
| Forestry | F | | Launch forestry research programs in collaboration with foreign centers of excellence for the monitoring/management of natural resources | | |
| | | | Implement best management practices to avoid erosion and contamination of the freshwater lens | | |
| | | | Develop small sized sustainable forest utilization industry, including sap and lumber production | | |
| Nature-based activities | G | | Develop activities that attract tourists outside of bonefishing season | | |
| | | | Develop infrastructure to allow access to Blue Holes and other areas | | |
| | | | Improve road signs, tourist maps and websites for tourist information | | |
| | | | Re-vitalize festivals | | |
| | | 11 | Develop birding areas and bird watching tours | | |
| Protected areas | H | | Develop and implement marine, terrestrial and forestry protected areas management plans | | |
| | | | Designate Andros Barrier Reef National Park (multi-usage of the park under determined management strategies) | | |
| | | | Enforce National Park policies | | |

Andros Master Plan: Recommendations / actions for medium and long terms

(15 years - 2030)
(25 years - 2040)



5.4 SOUTH ANDROS

5.4.1 The vision for the future of South Andros

The local economy will be sustained by the development of **agribusiness opportunities** such as canning and bottling of goods, and joint ventures for the production, processing and export of fruit, vegetables, flowers and other labor-intensive crops. **Land crab and coconut products** will be largely highlighted as the specialty of the district, to be exported to other districts in Andros and New Providence.

Small-scale farming will be developed in the district through the designation of an agriculture officer and the implementation of community education about sustainable agricultural practices. Duncombe Coppice land will be developed for farming activities led by the community. These areas will be developed using alternative energy sources and green technology. These initiatives will increase the self-sufficiency of the South Androsians. Sustainable and **small-scale forest utilization**, including sap and lumber production, will also be developed.

The **craft and agricultural market of Long Bays Park** will be improved as an outdoor market to be more permanent and attractive for tourists.

Fishing activities will be encouraged by the improvement of harbor facilities and infrastructure in Driggs Hill, Little Creek and Mars Bay. New policies will govern the monitoring and **sustainable management of important fish species** stocks such as conch, lobster, sponge, snapper and land crab, in which the local communities will be largely involved. Community education programs will be developed on the importance and protection of the natural environment.

Eco-tourism will be expanded through the further development of **nature-based activities** such as snorkeling and diving on the coral reef, bird watching in the forest, discovering the blue holes connected by underwater caves, kayaking in mangroves, or exploring West Side National Park. These activities will be sustained by the implementation of the necessary infrastructure to access all natural assets of the parks

In the future, South Andros will be dedicated to nature-based tourism and small-scale farming and agribusiness activities.

and reserves (composting toilets, solar lighting, boardwalks, pavilions and interpretive signage, etc.). **Small eco-lodges** owned by South Androsians will be further developed.

Linkages between the farming and nature-based tourism sectors will be strengthened to achieve self-sufficiency. Small-scale farms will supply local lodges, restaurants and schools with their produce. The farm-to-table concept will be attractive for health-conscious visitors. The production of local goods such as coconut flour to supply bakers that in turn supply lodges, restaurants and homes will reduce the community's dependency on products imported from New Providence. These types of scenarios will create smaller businesses and financial stability.

The expansion of these activities will lead to increases in visitation and population that will be supported by improved transport and social infrastructure facilitating accessibility, connectivity and services. Driggs Hill harbor will be improved to provide better shelter and to offer better facilities and experiences for tourists and boaters. The settlements will be expanded to accommodate the increased population.

A **new ferry service** from Driggs Hill will connect North/Central Andros with Mangrove Cay and South Andros, facilitating the transport of economically important goods and services.



Through these strategic investments, the AMP reflects a future for South Andros where policy enforcement of protected areas, best management actions and sustainable practices in agriculture, forestry and fisheries blend socio-economic development and nature conservation goals to achieve a **nature-based economy** that can be sustained over time. Through the structural and physical changes brought to South Andros, this Master Plan will reshape the district creating **socio-economic benefits**.

From an economic point of view, the improvements in transportation infrastructure (improved harbors) and connectivity (ferry service), as well as the maintenance of key ecosystem services for tourism and fisheries, will expand **economic development and**

growth. The increasing demand for tourist services will contribute to heightening the district's reputation and boosting the local economy, through increased incomes, employment rate and GDP. Unemployment is expected to decrease with the creation of many job opportunities related mainly to the **agribusiness and ecotourism sectors**.

From a social point of view, the investments in educational programs related to the agriculture, forestry, fisheries and nature-based tourism sectors will enhance the South Androsians' knowledge and skills, which will improve their access to job opportunities.

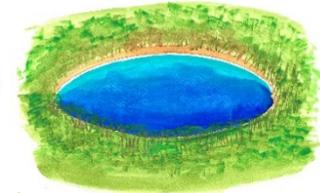
The drawing presented hereafter illustrates how South Andros will look like in 2040.

5.4.2 Recommendations and actions for South Andros

The tables and maps presented hereafter summarize all recommendations and actions foreseen for the future of South Andros for the short, medium and long term.

South Andros in 2040

New ferry service between Central Andros /
Mangrove Cay / South Andros



Blue hole nature trail



Development of
small-scale
farming

Driggs Hill



Small
Eco-Lodge

Development of small-
sized sustainable forest
utilization

The Bluff

Agrobusiness :
agriculture,
coconut and land
crab products



Bird watching tours



Bonefishing

West Side National Park

Andros Reef
National Park



Exploring & Camping





Table 17: Recommendations and actions for South Andros for the short term

| Human activity sectors | Appendix | Action Sheet | Recommendations / Actions | Timeliness | | |
|-------------------------|----------|--------------|---|------------|---------|---------|
| | | | | ST 2020 | MT 2030 | LT 2040 |
| Infrastructure | A | | Prioritize nature-based solutions to reduce coastal risks | | | |
| | | | Develop sustainable management of existing dump/landfill/sewage | | | |
| | | 0 | Launch study for enhancing Driggs Hill harbor protection during Northeast surges | | | |
| | | 1 | Improve and maintain roads and clinics | | | |
| | | 2 | Improve and manage Congo Town airport | | | |
| | | 3 | Improve facilities in Driggs Hill, Little Creek and Mars Bay harbors: docks/ramps repaired and basic services implemented (potable water, electric power, fuel and communication systems) | | | |
| | | | Add infrastructure for running water from the Bluff to Mars Bay | | | |
| Dredging & Mining | B | | Implement policies to limit ad-hoc dredging and mining | | | |
| | | 0 | Launch topo-bathymetric survey in Driggs Hill | | | |
| | | 0 | Determine sustainable locations for quarry and offshore mining | | | |
| Transportation by water | C | | Move boat traffic to avoid travel on coral reef | | | |
| | | 6 | Improve conditions for maritime access: implementation of lights and buoys in Driggs Hill and Mars Bay harbors | | | |
| Fishing | D | | Renew enforcement of existing regulations | | | |
| | | | Implement new policy: catch and size limits, temporal closures, technique-based restrictions | | | |
| | | | Implement community education about sustainable fishing practices | | | |
| | | 8 | Monitor and manage important commercial fish species stocks | | | |
| Agriculture | E | | Establish relationship between local farmers and lodges | | | |
| | | | Designate Agriculture Officer | | | |
| | | | Create South Andros agricultural cooperative | | | |
| | | | Implement community education about sustainable agricultural practices | | | |
| | | | Launch feasibility study of canning/bottling of coconut, crab etc. | | | |
| | | | Raise healthy eating awareness | | | |
| Forestry | F | | Develop and implement Forestry areas management plans | | | |
| | | | Training program for Bahamians in sap and lumber production | | | |
| | | | Employ staff in the Forestry Department | | | |
| Nature-based tourism | G | | Develop training programs for guides for nature-based activities | | | |
| | | | Develop activities that attract tourists outside of bonefishing season | | | |
| | | | Improve road signs, tourist maps and websites for tourist information | | | |
| | | | Re-vitalize festivals | | | |
| | | 10 | Define marketing strategy for goods, services and tourism | | | |
| | | 11 | Develop birding areas and bird watching tours | | | |
| | | | Improve the craft and farmer market at Long Bays Park (permanent wooden structures) | | | |
| Protected areas | H | | Develop and implement marine, terrestrial and forestry protected areas management plans | | | |
| | | | Formally acknowledge Conservation Forests (Department of Forestry) | | | |
| | | | Enforce National Park policies | | | |

Andros Master Plan: Recommendations / actions for the short term (5 years - 2020)

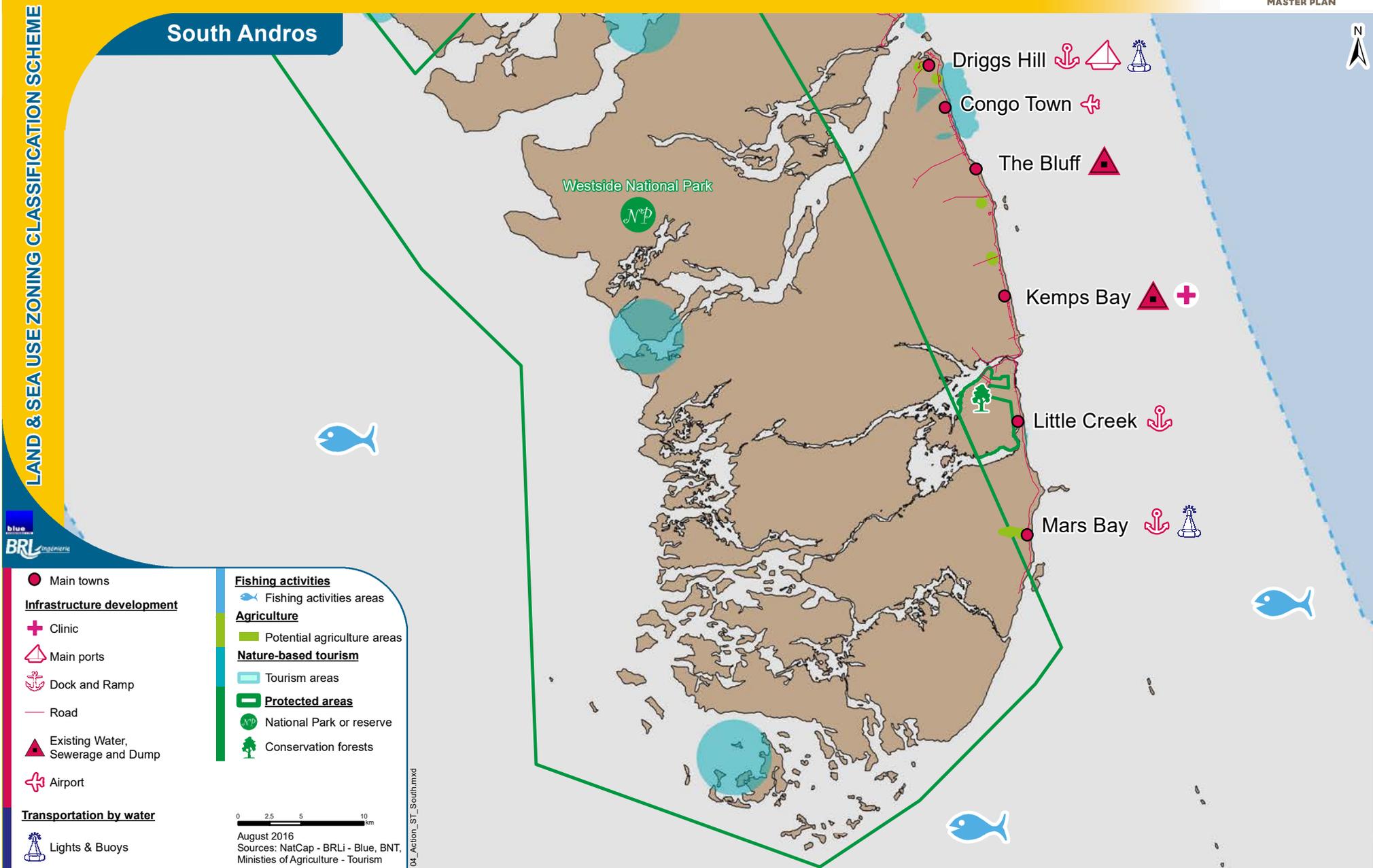


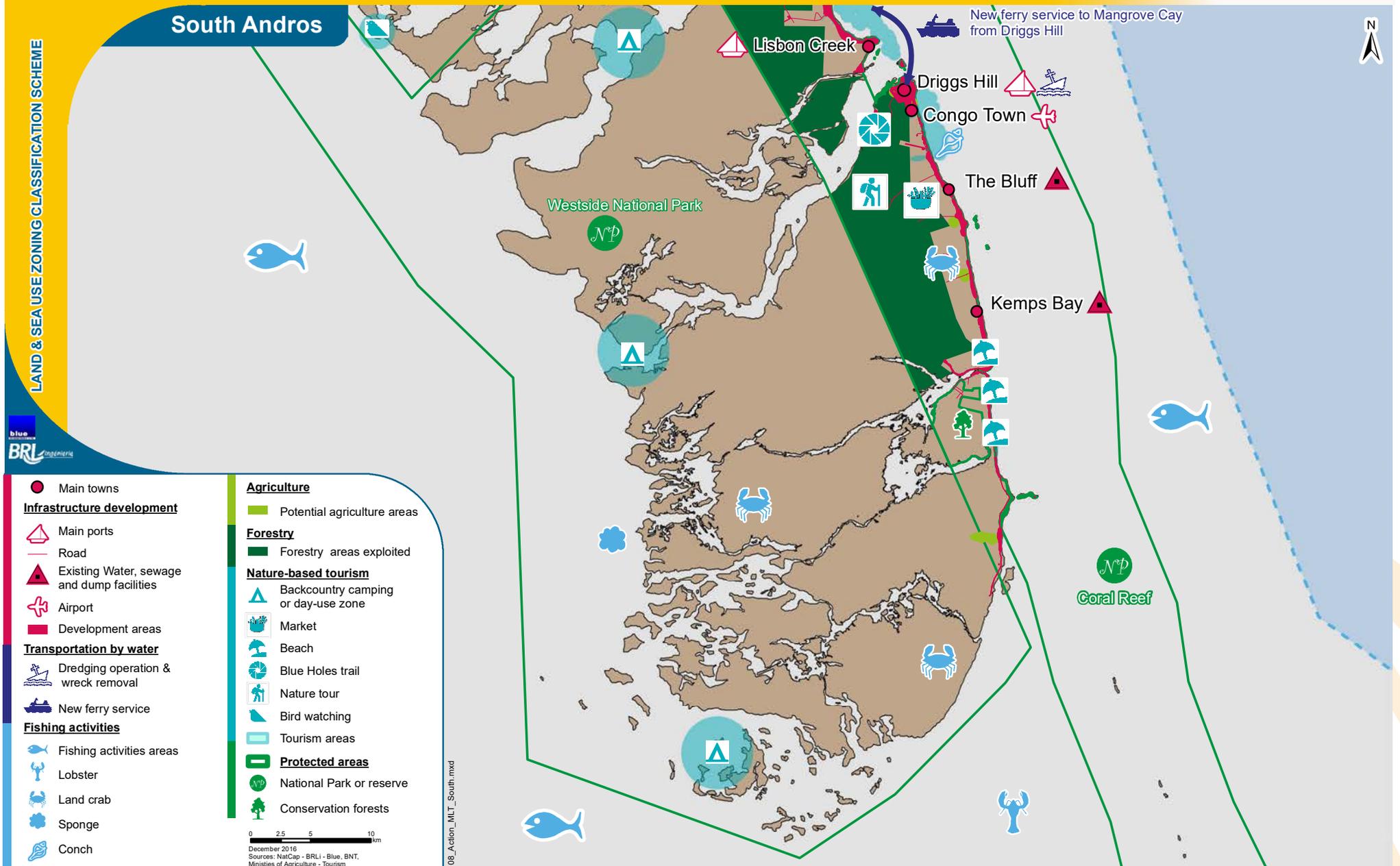


Table 18: Recommendations and actions for South Andros for the medium and long term

| Human activity sectors | Appendix | Action Sheet | Recommendations / Actions | Timeliness | |
|-------------------------|----------|--------------------------------|---|------------|---------|
| | | | | MT 2030 | LT 2040 |
| Infrastructure | A | | Prioritize nature-based solutions to reduce coastal risks | | |
| | | | Develop sustainable management of existing dump/landfill/sewage | | |
| | | | Sustainable urban development considering coastal vulnerability | | |
| | | 2 | Improve and manage Congo Town airport | | |
| Dredging & Mining | B | | Implement policies to limit ad-hoc dredging and mining | | |
| Transportation by water | C | 6 | Improve channel access at Driggs Hill (dredging operations + wreck removal) | | |
| | | 7 | Implement new ferry service between Central Andros - Mangrove Cay - South Andros, and between Nassau and South Andros | | |
| | | | Move boat traffic to avoid travel on coral reef | | |
| Fishing | D | | Renew enforcement of existing regulations | | |
| | | | Implement new policy: catch and size limits, temporal closures, technique-based restrictions | | |
| | | | Implement community education about sustainable fishing practices | | |
| | | | Launch fisheries research programs in collaboration with foreign centers of excellence for the monitoring/management of resources | | |
| | | 8 | Monitor and manage important commercial fish species stocks | | |
| Agriculture | E | | Establish relationship between local farmers and lodges | | |
| | | | Launch agriculture research programs in collaboration with foreign centers of excellence for the monitoring/management of natural resources | | |
| | | | Raise healthy eating awareness | | |
| | | | Restrict distance of farming to fresh water lenses and shorelines | | |
| | | | Implement best management practices in agriculture | | |
| | | 9 | Develop small-scale farming in South Andros | | |
| | | | Create processing plant for products from agriculture/crabs/coconut | | |
| Forestry | F | | Develop farm land of Duncombe Coppice | | |
| | | | Launch forestry research programs in collaboration with foreign centers of excellence for the monitoring/management of natural resources | | |
| | | | Implement best management practices to avoid erosion and contamination of the freshwater lens | | |
| Nature-based tourism | G | | Develop small sized sustainable forest utilization industry, including sap and lumber production | | |
| | | 11 | Develop birding areas and bird watching tours | | |
| | | | Develop activities that attract tourists outside of bonefishing season | | |
| | | | Develop infrastructure to allow access to Blue Holes and other areas | | |
| | | | Improve road signs, tourist maps and websites for tourist information | | |
| Protected areas | H | | Re-vitalize festivals | | |
| | | | Develop and implement marine, terrestrial and forestry protected areas management plans | | |
| | | | Designate Andros Barrier Reef National Park (multi-usage of the park under determined management strategies) | | |
| | | Enforce National Park policies | | | |

Andros Master Plan: Recommendations / actions for medium and long terms

(15 years - 2030)
(25 years - 2040)





Source: BRLI - December 2016





6. ANDROS MASTER PLAN BENEFITS & IMPACTS

*The Andros Master Plan reflects a management plan that is intended to **fill development gaps in terms of job creation, human well-being and protection of the environment** to work towards a sustainable, nature-based economy.*

This chapter presents the environmental and socio-economic benefits and impacts of the AMP under a Sustainable Prosperity scenario of development.

6.1 INVOLVEMENT OF ALL LOCAL STAKEHOLDERS TO PRODUCE A PARTICIPATORY MASTER PLAN

One of the principal goals was to ensure the sustainable future of Andros as visualized by the Androsians.

Therefore, the development of the plan was **about the people of Andros**: who they are; what they need and identify as their priorities; why they need these things; and when and how they need them — informed by the national context of The Bahamas as a whole. This is reflected in the plans' key pillars (food and water security, connectivity and accessibility, education and capacity building, coastal resilience, livelihoods and income equality, land tenure security, health

and wellbeing, strengthening local government), which emerged from **the different public consultations** held.

ACCOUNTABILITY & TRANSPARENCY

Oversight for the project remained the responsibility of the Technical Advisory Committee (TAC), convened by the Office of the Prime Minister, and comprised of a wide cross-section of stakeholders, including policymakers and community representatives, among them administrators from Andros. This gave decision-makers from the public and private sectors, together with local community stakeholders, the chance to **keep abreast of developments concerning the plan and to stay involved in helping to shape its directions and outcomes.**

COLLABORATION & BOTTOM-UP CONSULTATIONS

The project has relied on **collaboration**, including the identification of priorities, issues and/or challenges faced by Androsians and other key stakeholders to reach fruition. The first step was to consult with the people to tease out the context and frame for the plan and then to return to them through the TAC and subsequent public consultations to **further inform and validate its provisions**.

Briefly, the AMP is based on collaborative research works and bottom-up consultations. The formulation of the project fostered collaboration among a cross-section of local and national stakeholders.

ITERATIVE PLANNING AND EXECUTION

This approach provided the **opportunity for a wide cross-section of stakeholders** to weigh in on the planning and execution. Documents went through different iterations, each subject to feedback from stakeholders with the goal to **give them ownership of the document**, toward its later successful implementation.

6.2 ENVIRONMENTAL BENEFITS AND IMPACTS

Under the sustainable prosperity scenario, the Andros Master Plan will balance conservation of natural capital and sustainable development of social and economic capital. Infrastructure, transportation and nature-based activities will be developed in a **sustainable way**, through **best management practices** and the **implementation of new regulations**, in the respect of main natural resources and habitats.

The implementation of the Andros Master Plan will result in both positive and negative environmental impacts.

Actions, investments and regulations regarding the different human activity sectors will improve **food and water security** in Andros:

- Improved transportation infrastructure,
- Sustainable practices in agriculture, forestry, fishing activities,
- Limited dredging and mining activities,
- Increased access to freshwater and food supplies,
- Enforcement of protected area regulations.

Regarding conservation of natural capital, the habitat risk assessment results⁴⁵ indicate that the Andros Master Plan will **reduce the cumulative risk of human activities to some habitats and species** (e.g., mangrove and coral) **while increasing the risk for others** (e.g. seagrass, water resource, crabs) compared to the Business as Usual scenario.

⁴⁵The risk assessment model incorporates information about the exposure of habitats to human activities (e.g., coastal development, fisheries, and agriculture) and the consequences of that exposure. Exposure is a function of spatial and temporal overlap between habitats and human activities, for example, the extent and frequency with which boat traffic passes over the coral reef. In general, regions where habitats are at lower risk tend to be places with fewer human activities (i.e., just ocean transportation or just invasive species, not both) or activities with relatively smaller negative impacts (e.g., nature-based tourism).

POSITIVE IMPACTS

Compared to a future without new management guidelines or investments (Business as Usual scenario), the Andros Master Plan under the sustainable prosperity scenario is predicted to:

- Reduce the total area of key habitats⁴⁶ at high risk from human activities by 30%,
- Reduce the area of mangrove at high risk by 60 %,

This result is due to improved agricultural practices, small improvements in the management of mining, and some improvements in the management of invasive species.

NEGATIVE IMPACTS

Compared to the business as usual scenario, the Andros Master Plan under the sustainable prosperity scenario is predicted to:

- Increase the area of seagrass at high risk by approximately 20 %,

The area of seagrass at high risk is small under both scenarios, constituting less than 1% of the total seagrass habitat. Increased seagrass at high risk is the result of a larger development footprint along the coast. Importantly, improved fishing practices under the Sustainable Prosperity scenario ensure that the remainder of seagrass is at low risk, unlike under a Business as Usual scenario where the remainder of seagrass is at moderate risk.

- Reduce the area of coral at high risk by 10 %,

This result is due to the diversion of marine transportation routes away from the coral reef, to reduce the risk of degradation from pollution and anchoring (under the Andros Master Plan, less than 2% of the total coral area is at high risk).

- Increase the area with populations of high risk crab by approximately 15 % (from 1,900 to 2,200 km²),

This result is due to targeted development of infrastructure in and around several settlements; however, the increase is minimal compared to a future scenario characterized by extractive activities and massive infrastructure development (2,900 km² of area with crab at high risk).

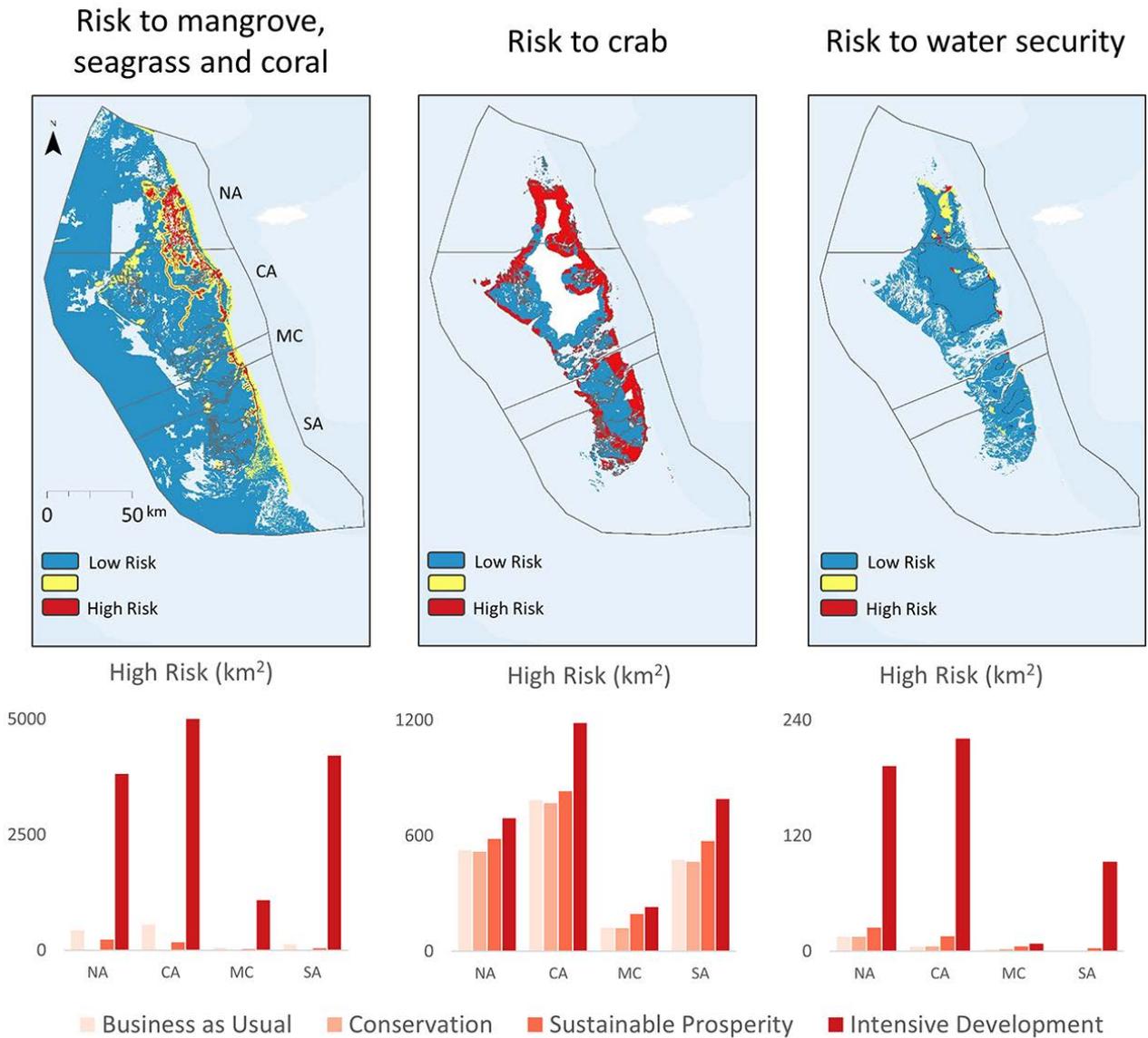
- Nearly double the extent of freshwater at high risk,

Increased risk to freshwater is the result of an expanded footprint of agriculture and development that coincides with critical water resources. However, even with the increased extent of freshwater at high risk, the area at high risk still represents less than 1% of the total area. Further, risk under the Sustainable Prosperity scenario is minimal compared to the more than 20-fold increase forecasted under a future characterized by intensive development (up to 10% of the total area).

⁴⁶Mangrove and wetland, coppice, pineland, blue holes, beaches, bonefish, seagrass, and coral

The following figure illustrates both the positive and negative environmental impacts to mangrove, seagrass, coral, land crab and water security.

Figure 34: Environmental impacts to key habitats, land crab, and water security. The districts are North Andros (NA), Central Andros (CA), Mangrove Cay (MC), and South Andros (SA).



Source: NatCap - 2016

6.3 BENEFITS AND IMPACTS REGARDING COASTAL RISKS

The implementation of the Andros Master Plan will result in both positive and negative impacts regarding coastal risks and coastal resilience.

POSITIVE IMPACTS

Reduced risk to coastal and marine ecosystems such as coral reefs, mangroves and wetlands, seagrass and coppice is important for **coastal resilience** because **these ecosystems provide natural buffers against flooding and erosion.**

These ecosystems currently buffer more than 55% of the populated east coast of Andros. Under a Sustainable Prosperity scenario, the Master Plan will **maintain the climate and coastal resilience** of Andros relative to the Business as Usual scenario. On the contrary, **a scenario with extensive new coastal development (i.e. the Intensive Development scenario) would increase the length of shoreline at risk by 30%.** These results would be due to degradation of corals, mangroves, seagrasses and coastal forests caused by expanding coastal development, destructive fishing practices and poor management of mining, dredging and invasive species.

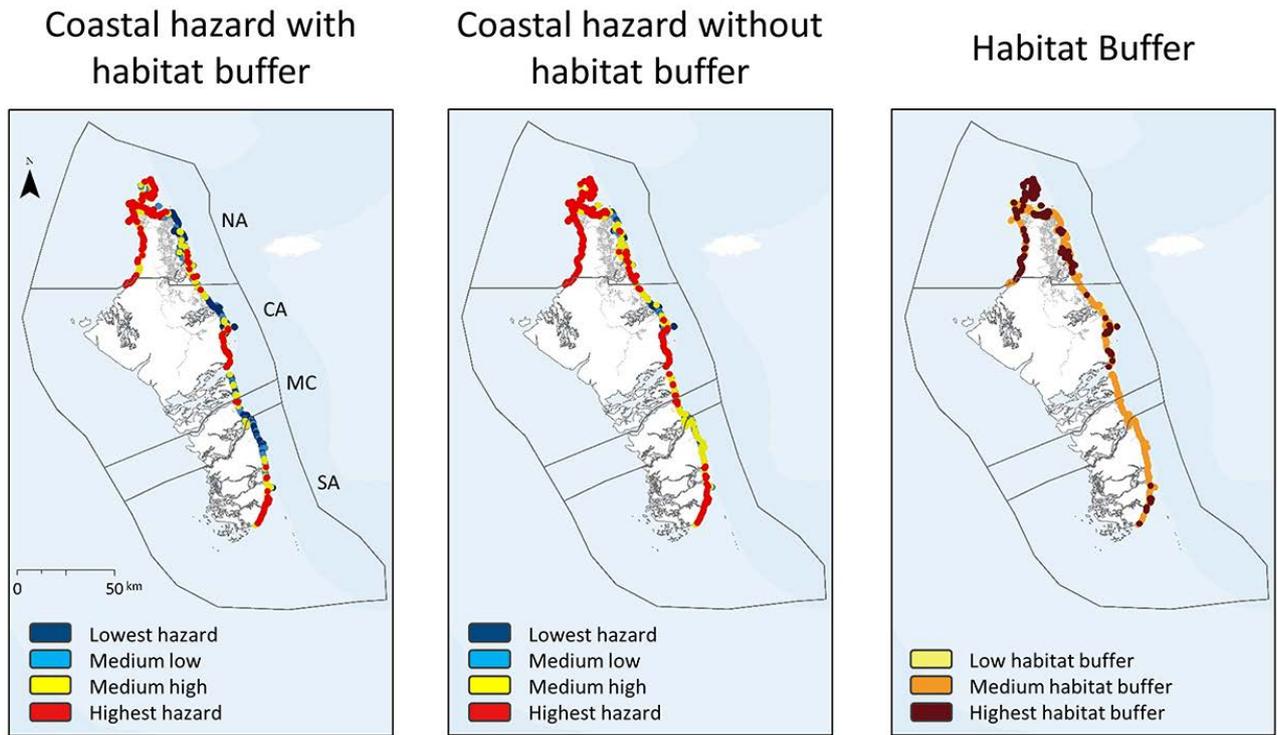
The habitat buffers are particularly important along several stretches of coastline including in and around Morgan's Bluff, Small Hope Bay, Behring Point and Mars Bay.



Source: BRLi - December 2016

The following maps show the coastal hazard (flooding and erosion) with and without habitat buffer (far left and central). The final map (on the right) shows the difference in the numerical values of the index and thus depicts the relative role of habitat in buffering the coastline from flooding and erosion. These results incorporate the quality of coral reefs, mangroves, wetlands and seagrass based on the distribution of human activities under the sustainable prosperity scenario.

Figure 35: Coastal hazard with and without habitat buffer



Source: NatCap - 2016

The implementation of the Andros Master Plan will have a positive impact on coastal hazards as the central, north, and southern parts of Andros will benefit greatly from the habitat buffer, which protects against erosion and flooding.

NEGATIVE IMPACTS

Due to the increase in numbers of people living on Andros in the future, the number of people at risk from coastal hazards will slightly increase compared to the Business as Usual scenario (+ 7 % of people at risk), despite the positive impact of the Master Plan on the habitat buffer. However, under an Intensive Development scenario, 3 times as many people would be at risk.

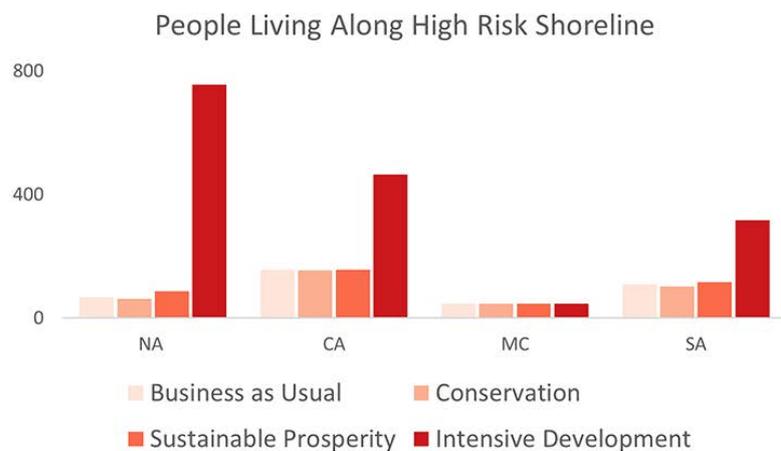
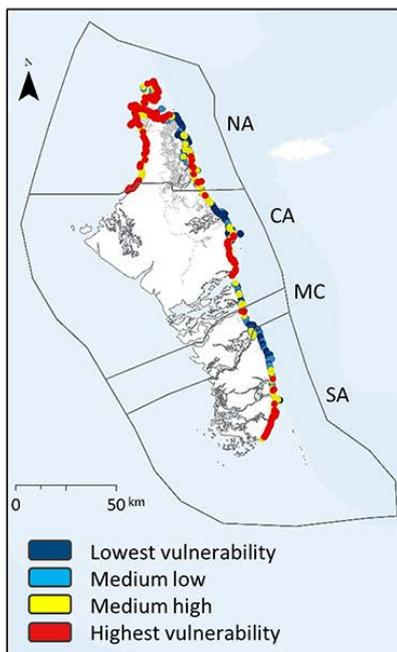
The figure below shows the relative exposure of the occupied eastern and northern coast of Andros under the sustainable prosperity scenario. It accounts for the cumulative risk of human activities to habitats such as coral reefs, mangroves, seagrass and coppice that buffer coastlines against coastal hazards such as flooding and erosion. Estimates of people living along high-risk shoreline are based on outputs from the coastal hazard model combined with 2010 census data from the Department of Statistics extrapolated to developed areas under the sustainable prosperity scenario.

The increase in numbers of people at risk is mostly the result of small increases in infrastructure expansion around existing settlements and increases in population in the sustainable prosperity scenario. In addition, some habitats that serve as natural buffers against coastal hazards expand and increase in habitat quality while others are at higher risk.

A future emphasizing extractive activities and extensive coastal development (intensive development scenario) would **more than triple the numbers of people living in highest hazard areas along the coast.**

Figure 36: Coastal hazard with habitat buffer

Coastal hazard with habitat buffer



Source: NatCap - 2016

6.4 SOCIOECONOMIC BENEFITS AND IMPACTS

The implementation of the Andros Master Plan will result in large positive socio-economic impacts.

Actions, investments and regulations regarding the different human activity sectors will improve **connectivity and accessibility, education and capacity building, livelihoods and income equality, land tenure security, health and well-being, and will strengthen local government** in Andros.

6.4.1 Benefits for Andros' economy and people

Recent history has not been favorable to Andros' economic development. The large employment industries brought on by sponging, boat building and timber harvesting have petered out. Tourism boomed in Andros in the 1960s, but while other parts of the country ran forward with tourism development, Andros has only shuffled along. Nowadays, the fragile economy of Andros is sustained mainly by nature-based tourism, agriculture, fisheries and craft sectors, in need of development. Unemployment is currently estimated at 17%⁴⁷, with many of the Island's talented youth and young families leaving in search of economic prosperity elsewhere.

Under the sustainable prosperity scenario, the Andros Master Plan is intended to **fill development gaps in terms of education, livelihood and well-being** to work the way towards a **sustainable nature-based economy**.

Through strategic investments in each human activity sector, the AMP reflects a future where policy enforcement, best management actions and sustainable practices foster human livelihood and well-being while reducing risk to ecosystems and the services they provide to people. It blends socio-economic development and nature conservation goals to achieve

a nature-based economy that can be sustained over time. Through the structural and physical changes brought to Andros, this Master Plan will reshape the island creating **socio-economic benefits**.

From an economic point of view, the improvements in transportation infrastructure and connectivity, which will improve access to markets, as well as the maintenance of key ecosystem services for tourism and fisheries, will **expand economic development and growth**. Better facilities and accessibility will revive the economic life in Andros through an expected increase in the number of local and foreign visitors. The increasing demand of tourism services (transportation, accommodation, yachting, recreational fishing, access to protected areas and natural parks) will contribute to heightening the island's reputation and boosting the local economy, through **increased incomes, employment rate and GDP**. Retail activities in shops and markets, handicrafts, agriculture, fishing and the cultural sector will also be positively impacted, growing with the internal demand. Unemployment is expected to decrease with the creation of many job opportunities related to each human activity sector.

⁴⁷World Bank, 2016

From a social point of view, the improvements in public infrastructure such as schools and clinics will **develop social capital** through **better education and health services**. The investments in educational programs related to agriculture, forestry, fisheries and nature-based tourism sectors will **enhance Androsian people's knowledge and skills**, which will improve their access to job opportunities.

Master Planning is also **the engagement of the local people and users in defining and being involved in the process of change**.

6.4.2 Increasing export revenues from lobster fisheries

Under the Sustainable Prosperity scenario, the Andros Master Plan will **benefit the spiny lobster fishery**, which is the highest value export fishery in The Bahamas, producing nearly 17 million lbs. and more than US\$ 66 million annually⁴⁸.

More than a fifth of the country-wide catch is attributable to Andros annually (second only to Abacos), due to the extensive system of mangroves, seagrasses, sand flats and creeks in and around the island that provide nursery habitat to lobster and the proximity of Andros to the Great Bahama Bank. Andros encompasses the largest percentage of mangrove habitat in The Bahamas (more than one-third of the total area of mangroves in the entire archipelago) and 14% of the seagrass habitat of The Bahamas.

The Andros Master Plan provides a roadmap for **ensuring the sustainability of spiny lobster catch and revenue** through the enforcement of existing regulations, the implementation of new policy for catch and size limits, temporal closures, technique-based restrictions, best management practices and the monitoring of stocks, which safeguard nursery habitat for lobster from human stressors.

Compared to a future without a master plan, **the lobster revenue provided by Andros nursery habitats would increase by nearly 40% and US\$ 6 million**⁴⁹. In a future characterized by massive infrastructure development across the North and South and poor invasive species and fisheries management, spiny lobster catch and revenue would plummet by US\$ 8 million to US\$ 6 million, which is less than half of the value provided by Andros nursery habitat to the country-wide catch annually.

6.4.3 Significant benefits for the tourism sector

Under the Sustainable Prosperity scenario, Andros Master Plan would benefit the eco-tourism sector by **increasing the total expenditure from tourism** in each of the four districts as well as **employment in the tourism sector**.

⁴⁸NatCap, 2016

⁴⁹NatCap, 2016

TOTAL EXPENDITURE FROM TOURISM

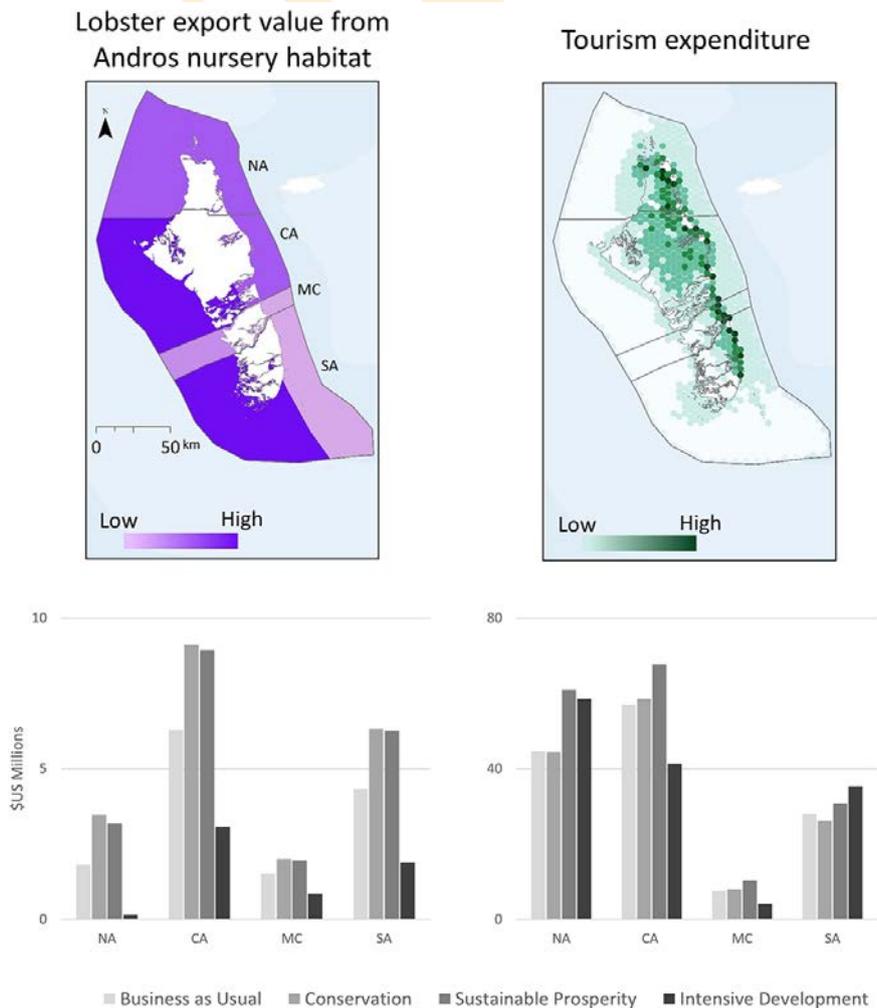
Through targeted investment in roads, harbors, artisanal fishing hub, cultural heritage village and other tourism related infrastructure, guides training programs, improvements to airports and the development of new nature-based activities (bird-watching), the Andros Master Plan would increase:

- ▶ The total expenditure from tourism in **Central Andros by 19% to nearly US\$ 68 million**, compared to a future with little new investment in development or conservation.
- ▶ The total expenditure from tourism in **North Andros by 37% to US\$ 61 million**, compared to a future with little new investment in development or conservation.

Similarly, in **South Andros and Mangrove Cay, tourism expenditure would increase by 10% and 35%**, respectively, with the investments and guidelines assured by a Master Plan under the Sustainable Prosperity scenario, compared to a future with little new investment in infrastructure or training nor guidelines to inform management (i.e. Business as Usual scenario).

In contrast, a future emphasizing large-scale infrastructure development across North, Central and South Andros along with massive increases in extractive activities such as mining, no improvements to causeways nor guidelines for dredging and fishing would decrease tourism revenues in Mangrove Cay and Central Andros, by 45 and 27%, respectively.

Figure 37: Lobster export value from Andros nursery habitat and tourism expenditure under the Sustainable Prosperity scenario. The districts are North Andros (NA), Central Andros (CA), Mangrove Cay (MC), and South Andros (SA).



Source: Natcap - 2010

TOURIST INDUSTRY EMPLOYMENT

Under the Sustainable Prosperity scenario, the Andros Master Plan will **positively influence the number of staff and guides employed in eco-tourism related activities.**

More than 400 people were employed to staff overnight visitor accommodation, guided fishing trips, scuba diving and other eco-tourism related activities in 2009⁵⁰.

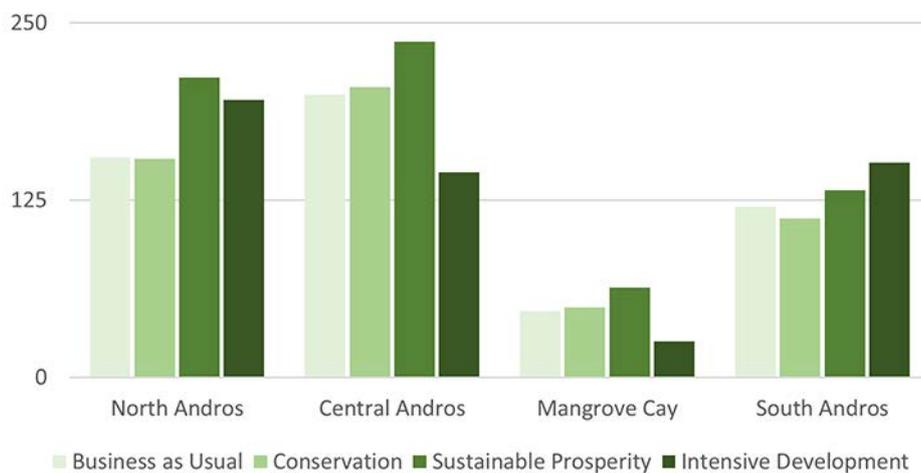
The greatest number of staff and guides were located in Central Andros (159 people), followed by North Andros with 134, South Andros with 103 and Mangrove Cay with 39 (Hargreaves-Allen 2011, p43).

A Master Plan including improvements in critical infrastructure for tourism such as roads, harbors, an Eco lodge, an Ecomuseum, birding areas and amenities for visiting blue holes, as well as training programs for guides, would increase the number of staff employed by eco-tourism related activities by approximately **125 staff compared to a Business as Usual scenario.**

The greatest increase in staff would be **by 37% to 210 in North Andros, followed by an increase of 36% in Mangrove Cay to 63 people.**

The following figure shows the staff and guides working in the tourist industry based on outputs from the ecosystem services assessment combined with survey data⁵¹. The results assume a similar distribution of tourism activities (e.g., largely eco-tourism) as the current scenario and thus do not include cruise ship related staff in North Andros in the Intensive Development scenario.

Figure 38: Number of tourism staff and guides under each of the four future scenarios and for each region



Source: NatCap - 2016

⁵⁰ Hargreaves and Allen, 2011

⁵¹ Hargreaves and Allen, 2011

6.5 SYNTHESIS OF AMP'S BENEFITS AND IMPACTS

Through changes brought to Andros in each human activity sector, this Master Plan will **reshape the island from an environmental and socioeconomic point of view**, addressing the eight key pillars raised by the Androsians.

Under the Sustainable Prosperity scenario, the Master Plan will result in:

- **Both positive and negative environmental impacts:**

 - ➔ Enforced food and water security,
 - ➔ Preservation of the main natural capital of Andros: the AMP will reduce the cumulative risk of human activities for some habitats and species (e.g., mangrove and coral) while increasing the risk for others (e.g. seagrass, water resource, crabs) compared to the Business as Usual scenario. However, risk under the Sustainable Prosperity scenario remains minimal compared to risk under a future characterized by intensive development. Moreover, this habitat degradation risk could be attenuated through sustainable and best management practices in each human activity sector, as foreseen in the plan.
- **Both positive and negative impacts regarding coastal risks and resilience:**

 - ➔ Enhanced coastal protection through preserved natural buffers,
 - ➔ Maintained climate and coastal resilience,
 - ➔ Due to the increase in numbers of people living on Andros in the future, a slight increase in population and activities exposed to coastal hazards (which is minimal compared to the Intensive Development scenario that would more than triple the numbers of people living in the highest hazard areas along the coast). Nevertheless, this increase could be attenuated by means of “green and grey” approaches to strengthen coastal resilience, as foreseen in the plan.
- **Large positive socio-economic impacts:**

 - ➔ Expansion of economic capital and growth,
 - ➔ Improved connectivity and accessibility,
 - ➔ Increased incomes, employment rate and GDP,
 - ➔ Increased tourism expenditure,
 - ➔ Increased lobster revenue,
 - ➔ Improved education and capacity building,
 - ➔ Increased number of staff and guides employed in eco-tourism related activities,
 - ➔ Improved livelihoods and income equality,
 - ➔ Expansion of social capital,
 - ➔ Improved health and well-being,
 - ➔ AMP based on collaborative research works and bottom-up consultations, involving a cross-section of local and national stakeholders.

The following table synthesizes the **AMP’s general impacts on each of the key pillars:**

Table 19: AMP’s general impacts on each of the key pillars

| Andros Master Plan under the Sustainable Prosperity scenario | | |
|--|---|--|
| Food and water security | Improved transportation infrastructure – Sustainable practices in agriculture, forestry, fishing activities – Limited dredging and mining activities – Increased access to freshwater and food supplies - Enforcement of protected area regulations | |
| Connectivity and accessibility | Improved transportation infrastructure and facilities (roads, bridges, ports, airports) – Airport and port of entry in each district – New intra-district ferry service | |
| Education and capacity building | Improved social infrastructure – Training on sustainable practices in agriculture, forestry and fishing activities – Implementation of a new satellite of the University of the Bahamas | |
| Climate change and coastal resilience | Enforcement of protected area regulations – Increased natural buffer protecting coastline | Slight increase in population exposed to coastal hazards |
| Livelihoods and income equality | Economic development of fishing, agricultural, forestry and nature-based activities – Increased visitation and total expenditure | |
| Land tenure security, land use planning and enforcement | Definition of authorized development areas | |
| Health and wellbeing | Improved health infrastructure and facilities – Better connectivity with Nassau – Sustainable practices in agriculture and fishing activities | |
| Strengthening local government | Development of local activities governed by enforced or new regulations | |

| | | |
|----------------|--------------------------------|-------------|
| Impacts | Major positive impact | Dark Green |
| | Contribution (positive impact) | Light Green |
| | No effect | White |
| | Potential negative impact | Orange |

Source: BRLi – 2016

The following table sums up the benefits and impacts of the AMP under the Sustainable Prosperity scenario.

Table 20: Impacts of the AMP under the Sustainable Prosperity scenario versus the Business as Usual scenario

| IMPACTS | | DIFFERENCE BETWEEN THE TWO SCENARIOS (SUSTAINABLE PROSPERITY VERSUS BUSINESS AS USUAL) |
|--|--|--|
| Consultation and cooperation during master planning process | Androsians – Local and national stakeholders | <ul style="list-style-type: none"> Choice of the Sustainable Prosperity scenario of development by the Androsians during bottom-up consultations Involvement of all local stakeholders in the master planning process Raised awareness of the importance of sustainable development Development of cooperation on sustainable projects |
| | | |
| Environmental | General | <ul style="list-style-type: none"> Preservation of natural capital of Andros |
| | Coral | <ul style="list-style-type: none"> - 10% of area at high risk |
| | Mangrove | <ul style="list-style-type: none"> - 60% of area at high risk |
| | Seagrass | <ul style="list-style-type: none"> + 20% of area at high risk |
| | Land crab | <ul style="list-style-type: none"> + 15% of area at high risk |
| | Water security | <ul style="list-style-type: none"> + 50% of freshwater area at risk (less than 1% of total area) |
| Coastal risks and resilience | General | <ul style="list-style-type: none"> Improvement of the habitat buffer protecting the coast from erosion and flooding Maintenance of climate and coastal resilience + 7 % of population exposed to coastal hazards |
| | | |
| Socioeconomic | General | <ul style="list-style-type: none"> Sustainable expansion of the social and economic capital of Andros |
| | Lobster fisheries | <ul style="list-style-type: none"> Sustainable spiny lobster catch and revenue + 40% of the revenue (USD 6 Million) |
| | Tourism | <p>Tourism expenditure:</p> <ul style="list-style-type: none"> Central Andros: + 19% (USD 68 Million) North Andros: + 37% (USD 61 Million) South Andros: + 10% Mangrove Cay: + 35% <p>Tourism employment: + 125 staff</p> |

In orange: negative impacts, **in green:** positive impacts

Source: BRLi / NatCap - 2016



Source: BRLi - 2016





7. CONCLUSION

The Andros Master Plan has been informed by **extensive public consultations** and designed to ensure **a stakeholder-led process**. In it, the Androsians have shared their vision for the future of Andros.

The Master Plan has been designed according to an **ecosystem-services approach** that addresses the crucial link between **climate change risks, biodiversity conservation** and the **sustainable management of natural resources** providing multiple benefits.

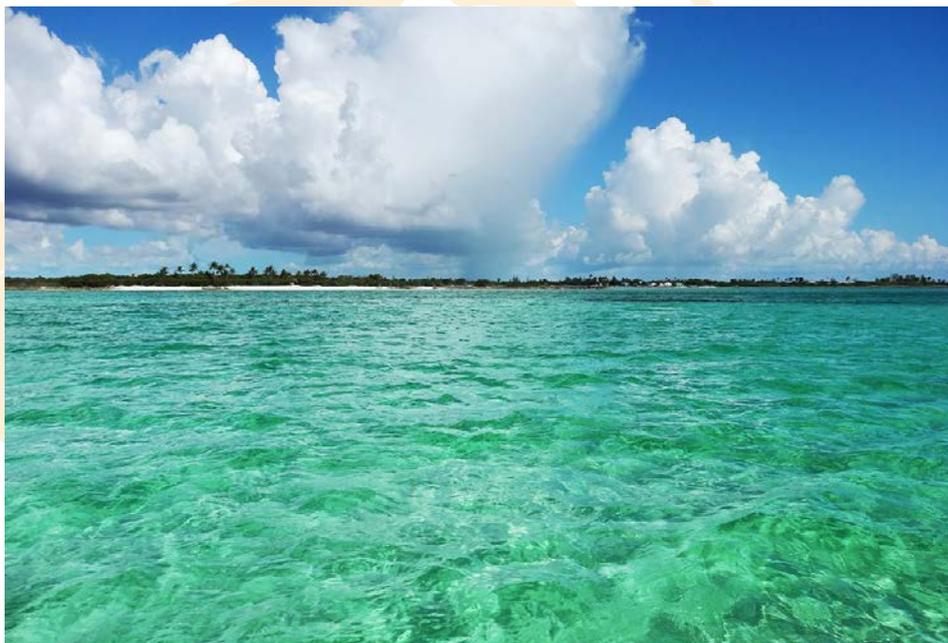
It provides an actionable management plan to guide the **sustainable development of the island** for both its people and its environment, founded on the **eight key pillars** identified by the Androsians as the most important issues to be addressed.

Through **three strategic stages** (up to 2020, up to 2030, and up to 2040) and the implementation of multiple recommendations and actions regarding the different human activity sectors, this Master Plan reshapes Andros into a future nature-based economy, balancing the **conservation of natural capital and the sustainable development of social and economic capital**.

Despite some both negative and positive environmental and coastal impacts, it brings substantial socio-economic benefits to Andros, improving growth, incomes, employment, education, health and livelihoods.

By 2040, Andros will **sustainably harness its wealth of natural assets**, without sacrificing the very ecosystems that underlie its economy and sustain the **well-being of its citizens**.

Figure 39: Mangrove Cay

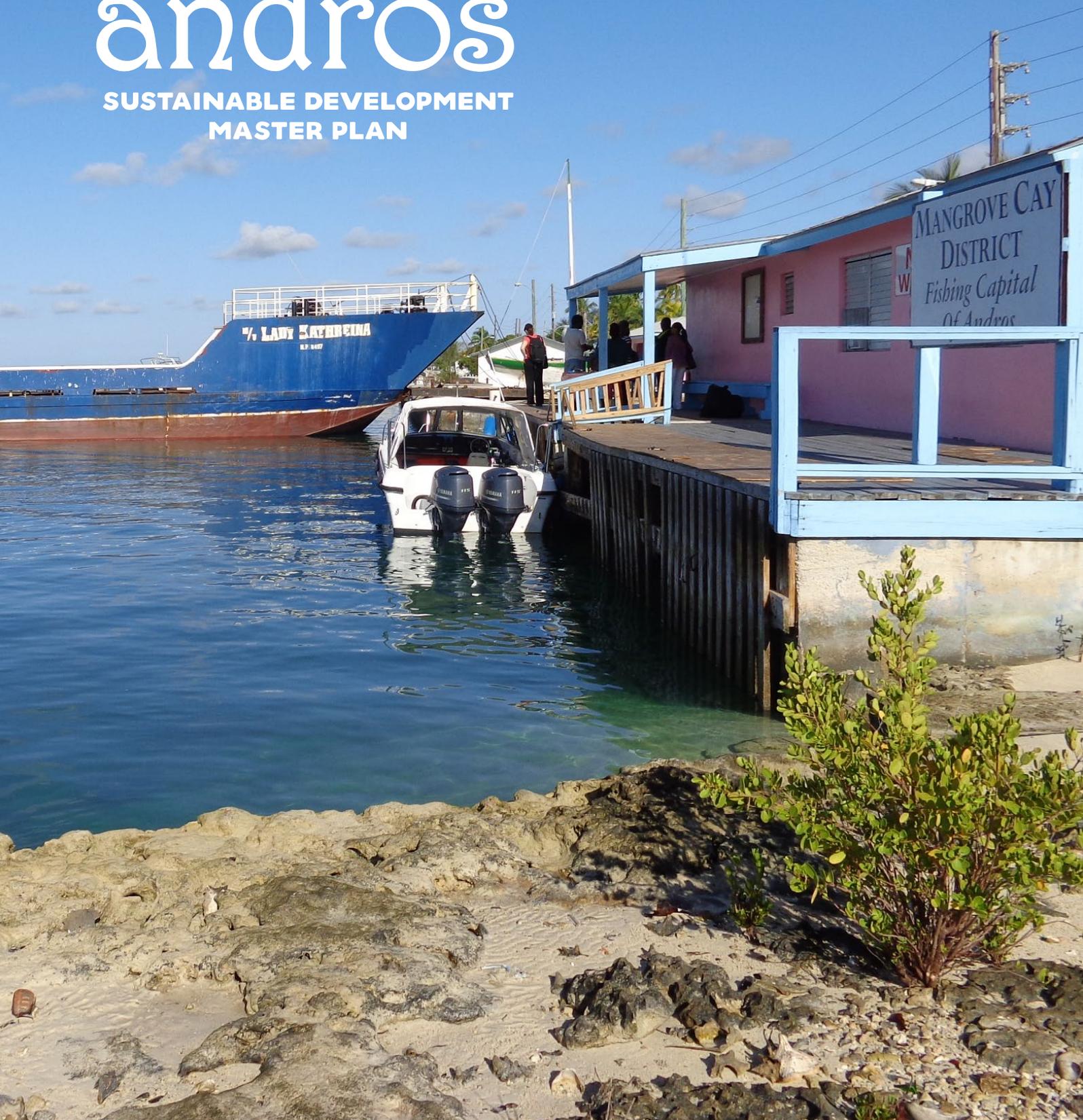


Source: BRLi 2016



andros

**SUSTAINABLE DEVELOPMENT
MASTER PLAN**





APPENDIX A.

RECOMMENDATIONS AND ACTION SHEETS
FOR INFRASTRUCTURE DEVELOPMENT

INFRASTRUCTURE DEVELOPMENT

1. STRATEGY AND RECOMMENDATIONS

The recommendations regarding infrastructure development are the following:

► **Prioritize nature-based solutions to reduce coastal risks**

Andros has different characteristics that underscore its overall vulnerability to climate change, climate variability and sea-level rise:

- Low-lying island,
- Plentiful natural resources partially stressed due to unsustainable human activities,
- Concentration of population, socio-economic activities and infrastructure along the east coastal zone,
- High exposure to frequent and more intense tropical cyclones (hurricanes) and to associated storm surge and droughts,
- Relative isolation despite its close proximity to New Providence,
- Inadequate infrastructure in most sectors (roads, bridges, harbors),
- Insufficient financial, technical and institutional capacities, seriously limiting the capacity of Andros to mitigate and adapt to any adverse impacts of climate change.

For all these reasons and to ensure its sustainable future, it is crucial to precisely assess Andros' vulnerability and risks regarding climate change and sea level rise, and to adapt the development strategy, decisions and actions of this master planning process.

Traditional civil engineering works ("grey" infrastructure) – such as coastal protection installations, dykes and groynes – have often been preferred because of their effectiveness and the fact that their cost is easy to determine and compare. However, such infrastructure, which is often very costly, frequently generates unexpected secondary effects such as coastal erosion and requires long-term monitoring and maintenance, which can be very expensive. For example on Andros, there are some areas where seawalls appear to be exacerbating erosion.

Figure 1 : Seawall in disrepair in South Andros



Source: Katie Arkema - 2016

In recent years, new approaches have been tried to promote natural solutions aimed at adapting places to changes in climate (“green” infrastructure). Around the globe, governments, NGOs and coastal property owners are increasingly exploring natural approaches to shoreline protection such as conservation and restoration of coastal ecosystems (e.g. mangrove restoration). A growing body of evidence suggests that coral reefs, mangrove and coppice forests, and seagrass beds can dampen waves and currents in the nearshore and retain sediments, affording protection for coastal communities and infrastructure while maintaining or restoring the multiple benefits of coastal habitats for people and ecosystems now and in the future. The potential role of ecosystems in coastal protection depends on a variety of factors such as the type of habitat, magnitude and return period of the coastal hazard, shoreline type and elevation. Several of these factors also affect the suitability of an area for habitat restoration (e.g., mangroves and seagrass require soft sediments).

Figure 2 : Mangrove restoration in Belize and coral reef restoration in the Florida Keys



Source: Nadia Bood / NatCap - 2016

These two “grey” and “green” approaches have often been presented as exclusive alternatives to strengthen coastal resilience. Now, in many cases, a **combination of grey and green infrastructure** can constitute a better solution in terms of sustainable resistance to climate change and of cost-effectiveness. For example, a coastal protection installation and a wetland zone can each provide protection against coastal flooding. Their combination can turn out to be an economical protection against submersion, a fundamental habitat for fishermen and a factor in the preservation of the quality of coastal waters. It can also constitute a barrier against severe storms. “Grey” infrastructure such as breakwaters or groynes can also be implemented to create favorable conditions (sedimentation, modification of movement conditions, etc.) when “green” solutions are implemented (e.g. mangroves restoration to protect areas from flooding).

Those approaches using plants, sand and, sparingly, building materials to provide coastal protection and to maintain valuable habitats, seem particularly suitable for increasing the resilience of Andros’ coastal populations, mainly because of their excellent cost-benefit ratio.

► **Develop sustainable management of dump/landfill/sewage**

The dumps/landfills on Andros are not sustainably managed and the landfills in Mangrove Cay and Central Andros have not been completed. The sites are not separated; they are not turned often enough, and are often set on fire. Indiscriminate dumping is also an issue. Cans are shipped off the island but no other recycling process exists.

As there are no piped sewerage systems in Andros, septic tanks are used. Once full, they must be emptied and the contents disposed of somewhere. As there are no identified locations for disposal, the septic tank contents are improperly disposed of, hence a negative impact on the environment. In addition, some areas have no pumper truck to empty septic tanks resulting in sewage spillage.

The sustainable management of dumps/landfills and sewage will be key to the health of Andros. It is recommended that best practices be put in place for the sustainable management of landfill/dump sites and that illegal dumping be penalized and better enforced. The recycling of a greater number of types and volumes of waste should be introduced. It is also recommended that locations be designed and designated as solid waste disposal locations and pump trucks be available at all districts. In the long term, sewerage systems should be developed.

► **Studies conducted on Sandy Creek, London Creek, Fresh Creek, Cargill Creek and Stanyard Creek to improve creek health**

There are a number of creeks that are understood to have suffered from their reduction in cross sectional area by the construction of bridges and causeways. It is considered important to improve creek health for the natural habitat that they provide and for bonefishing in particular. Little is known about the impacts that have occurred as a result of the structures, however, through aerial imagery and discussions with knowledgeable locals, it is understood that the order of importance in terms of addressing the issues at the various locations is as follows; Sandy Creek, London Creek, Cargill Creek and Stanyard Creek. In the short term, studies should be conducted to determine the best means of improving the creek's health with solutions implemented in the medium and long term. Particular attention should be given to Stanyard Creek Bridge given that this structure is currently in poor condition and in need of replacement. Current plans are to replace this bridge in the immediate term therefore it may be necessary to delay its replacement to ensure that the replacement is the most suitable.

► **Sustainable urban development considering coastal vulnerability**

The expansion of towns is inevitable with population increase, which is hoped for and already experienced in some parts of Andros. The development of town centers is important for the future of Andros; however, it is difficult to plan due to limited knowledge regarding **climate change impacts (erosion, sea level rise, flooding)** and **land ownership issues**. It is important to restrict development in areas vulnerable to climate change, and in areas hosting valuable habitats.

Urban development should be guided by a **sustainable planning and management vision** that promotes interconnected green space, a multi-modal transportation system, and mixed-use development. Development should be directed to be centralized rather than dispersed.

Further assessment of climate change impacts and coastal vulnerability is necessary, as well as improvements to deal with land ownership issues. Once these studies are conducted, further consideration can be given to the expansion of areas and the zoning of areas as no-build areas given their vulnerability. Rather than developing only where land is available or will be granted the land acquisition system should consider the feasibility of a land swap arrangement so that those who wish to develop land but own land in no build zones can swap their land for developable land. Construction within any no-build zone would require a waiver agreement, necessitating a review process which should be determined from well informed decision making within standard requirements.

Further consideration should also be given to the development of ecological pilot centers, which would be solar powered, energy efficient centers, and from which lessons could be learnt for future development throughout Andros and The Bahamas.

The planning should allow for the following;

- Less motorized trips, shorter travel distances and more productivity.
- More pedestrian and bicycle trips, better public health,
- Less GHG emissions, less per capita solid waste, less energy consumption,
- More human interaction, more exposure to creativity and innovation,
- Cultural, social and economic progress,
- Places thriving environmentally,
- Emergence of responsible tourism,
- Less vulnerable structures.

Without further information regarding the vulnerability of the different parts of Andros, it is not desirable to indicate areas for town expansion; however it is necessary to draw up a provisional plan prior to vulnerability analysis. It can then be updated following such studies.

Figure 3 : Example of sustainable urban development (Kent State's Cleveland Urban Design)



Source : <http://einside.kent.edu/Management%20Update%20Archive/news/newsdetail581d.html?newsitem=5D6C09E6-FC14-8AFA-543DD490E5A8485E>

The following outlines the vision for the districts:

- **North Andros**

The overall vision for North Andros' expansion should expand Nicholl's Town as the main administrative town and residential area of Andros. Future developments should be focused at high ground and away from the coast. The area of the Administrator's Office, the High School, Food store and Gas station near the main highway and the junction to Lowe Sound may be most suitable given the location and the infrastructure already in place. Development should also be aligned away from the Queens Highway and consideration given to reviewing the width of the right of way for Andros' main roads in particular to accommodate multi-lane traffic, central reserves with lighting, drainage, bus stops, cycle paths and sidewalks in the future.

The town centres should be planned to focus shops into a single area such as a mini mall with parking and adequate space for future expansion and to locate a main grocery store. Plans should be such that green spaces are incorporated and clearing of sites limited.

Lowe Sound should be the fishing center of North Andros given that the majority of fishing takes place at this location mainly due to its proximity to good fishing grounds. Many fishermen from Lowe Sound as well as those from much further afield launch their boats at this location to fish. Recognizing Lowe Sound as a vulnerable location in terms of climate change and natural disaster effects, it will be necessary to ensure that any infrastructure and facilities provided are adequately designed. Further consideration should be given to providing improved protection at this area by way of the provision of green solutions such as mangrove restoration. Further studies will be necessary to best determine what is appropriate. Whilst the nearby Joulter Cays are likely to become a national park area, it is unlikely that the National Park would prohibit fishing to an extent that would have a major impact on fishing activities.

The existing port at Morgan's Bluff should be better utilized with the port facilities improvements, and should provide the main port for North Andros and Andros as a whole. It is well developed already and close to Nicholl's Town and Lowe Sound (the fishing centre) and therefore ideal for this purpose.

The area around BAMSI is somewhat developed for agriculture. It should be limited in development with a bus service providing access to the nearby area of Nicholl's Town. Development should be limited to the expansion of BAMSI and residential areas for farmers.

The area at Red Bays Road and the Queens Highway Junction should be developed as an industrial area with packing houses etc. There is already a packing house at this location which is ideal given that it is located in between the airport and the port at Morgan's Bluff and close to the main town, agricultural centre and fishing centre. Expansion of this area should incorporate agri-tourism that can be captured thanks to tourists visiting the Red Bays Heritage Centre/Village. This might include attractions such as a guava jam processing and packaging plant tour with a gift shop.

- *Central Andros*

The overall vision for Central Andros' expansion should expand Andros Town and Cargill Creek as the main administrative and residential areas. Future developments should be focused on high ground and away from the coast. Consideration should also be given to reviewing the width of the right of way for Andros' main roads and bridges, in particular to accommodate multi-lane traffic, central reserves with lighting, drainage, bus stops, cycle paths and sidewalks in the future.

The existing port facilities at Fresh Creek should be improved and a recreational marina created to offer a better experience to tourists and boaters. Fresh Creek should become the maritime port of entry to the district and its tourism center, providing easy access and day-trips to all the protected areas to be visited, and to all nature-based activities available. The harbor should provide a Tourist Information Center, some grocery shops and restaurants. It should be easily linked with Andros Town.

Andros Town and Cargill Creek centers should be planned to focus shops into a single area such as a mini mall with parking and adequate space for future expansion and to locate a main grocery store. Plans should be such that green spaces are incorporated and clearing of sites limited.

A bus service should be developed to link the town centers of Cargill Creek and Andros Town with Fresh Creek and the different protected areas.

- *Mangrove Cay*

The overall vision for Mangrove Cay expansion should expand Moxey Town and Lisbon Creek as the main administrative and residential areas. Particular attention should be given to the coastal vulnerability, to define no-build areas threatened by erosion or marine submersion. Future developments should be focused at high ground and away from the coast.

The town centers should be planned to focus shops into a single area such as a mini mall with parking and adequate space for future expansion and to locate a main grocery store. Plans should be such that green spaces are incorporated and clearing of sites limited.

Little Harbor should be the fishing center of Mangrove Cay given that the majority of fishing takes place at this location mainly due to the proximity to good fishing grounds.

The existing port at Lisbon Creek should be better utilized with the improvements to the port and should provide the main commercial port for Mangrove Cay.

A bus service should be developed to link the towns centers of Lisbon Creek and Moxey Town.

- *South Andros*

The overall vision for South Andros' expansion should expand Driggs Hill and The Bluff as the main administrative and residential areas. Future developments should be focused at high ground and away from the coast. Consideration should also be given to reviewing the width of the right of way for Andros main roads, in particular to accommodate multi-lane traffic, central reserves with lighting, drainage, bus stops, cycle paths and sidewalks in the future.

The existing port facilities at Driggs Hill should be improved to offer better shelter for boaters. Driggs Hill should become the maritime portal of entry to the district and its tourism center, providing easy access to all the nature-based activities available. The harbor should provide a Tourist Information Center, some grocery shops and restaurants. It should be easily linked with The Bluff town center.

Driggs Hill and The Bluff centres should be planned to focus shops and services into a single area such as a mini mall with parking and adequate space for future expansion and to locate a main grocery store. Plans should be such that green spaces are incorporated and clearing of sites limited.

A bus service should be developed to link the towns centers of Driggs Hill and The Bluff with other southern settlements.

Again, it must be emphasized that further studies are necessary to determine the **suitability of these areas for expansion with particular reference to climate change and natural disasters** (erosion, marine submersion).

Further consideration should also be given to having **stricter building code requirements in Andros**. Andros lends itself as a pilot for such requirements given the profound interest Androsians have for their natural environment. This might include for instance margins of no development around mangrove areas, energy efficient and renewable energy based development and the building of structures on stilts.

Figure 4 : Example of building code that could be applied in Andros, considering climate change risks



Source : Blue Engineering - 2016

► **Develop a new satellite campus of the University of Bahamas**

Higher education and research are strong driving forces for local development that respects the environment and its natural balances. Many university campuses across the globe have been built away from large town centers in huge, quiet, protected natural areas.

North Andros offers a great many assets for this type of development:

- An existing skills and research cluster, BAMSI, that is more than ready to be expanded and strengthened,
- BAMSI could become the core of a campus and much larger research laboratories with an international outlook, where part of the activities would stem around studying the natural resources of The Bahamas and their utilization, biodiversity conservation and the analysis of the consequences of climate change and ways of adapting to it,
- Natural resources (fishing resources and forest) and potential for developing agriculture and agricultural products, opening up pathways for university research or research and development activities,
- Land that is available to build a huge campus where students can work peacefully,
- Relative proximity to Nassau and communications links (connectivity with other islands, international flights) facilitating access for students.

At present, Andros' population is decreasing mainly due to the lack of job opportunities. The younger generations in particular are leaving the island. At long term, the implementation of a new satellite of the University of The Bahamas in North Andros would allow:

- Population growth,
- Employment opportunities,
- Economic growth related to agriculture, fishing and nature-based sectors,
- A better connectivity with Nassau, viable from an economic point of view.

Figure 5 : Example of future campus building



Source: Jean-Marc BEYNET – BRLi – December 2016

► **Develop Fresh Creek marina and lighthouse site**

Fresh Creek is the main commercial and recreational harbor in Central Andros, and is a port of entry. Currently, different types of traffic access Fresh Creek (commercial and recreational traffics) however traffic levels are low and could be improved if Fresh Creek offered better facilities and services.

The Lighthouse Yacht Club & Marina docks are believed to be in fair condition but in need of repairs. Ownership is to be with the Government's Hotel Corporation.

By developing infrastructure and services at the marina docks, more recreational boats (pleasure or fishing boats) should be attracted on a daily/monthly basis. The establishment of port taxes could make the harbor profitable.

A preliminary list of activities and investments to be undertaken at the Lighthouse Yacht Club & Marina are presented below:

- Short term:
 - Wooden dock repair,
 - Basic public services such as electric power, potable water, fueling facilities, restrooms/showers, customs/immigration and communication systems are improved or added,
 - Nautical access secured: lights and buoys added along the channel of entrance,
 - A bathymetric survey is undertaken to assess the dredging needs to allow access for bigger recreational vessels.
- Medium term:
 - Nautical access is improved by dredging operations and wreck removal,
 - The Lighthouse Club Hotel is sold to a private investor,
- Long term:
 - A yachting marina is developed including new floating pontoons, tourist information bureau, shops, restaurant, boutique hotel,
 - The lighthouse site is revamped.

Some of these actions are developed in the action sheets 3 and 6 regarding respectively the improvement of port facilities and the improvement of conditions for maritime access for the main harbors of Andros.

Figure 6 : Lighthouse Club Marina Docks



Source: BRL/Blue – 2016

Figure 7 : Example of future revamped lighthouse



Source: Jean-Marc BEYNET – BRLi – December 2016

► **Improve air quality and reduce noise levels at the BEC station at Fresh Creek and conduct a study on the feasibility of relocation**

At present, a BPL (formerly BEC) station is located at the Fresh Creek main dock. Even if this location is preferable for delivery of fuel, it results in limiting the dock's development. The plant also produces smoke and noise at a level that causes discomfort to people. The station also has a negative impact on the picturesque landscape of the port. In the short term, solutions should be sought to reduce the noise and air pollution, and a study be carried out to determine the feasibility of the relocation of the station in full or part.

► **Construct a concrete plant to support the construction of needed public infrastructure**

In the case of an island, the works costs depend directly on the availability of materials. Regarding Andros, not much aggregate material should be extracted due to the environmental impacts on natural habitats and resources.

Thus, the construction of a concrete plant in North Andros at medium term could support the creation of a new satellite of the University at long term, and any construction of needed public infrastructure or urban development, at reasonable costs.

Figure 8 : Typical design of concrete plant



Source : <http://civilengineerspk.com/>

► **Re-vamp Lisbon Creek Regatta Site**

Lisbon Creek Regatta Site is located just nearby Lisbon Creek harbor in Mangrove Cay, and it is currently abandoned. Improvements are considered necessary at Lisbon Creek to facilitate both fishing and mail boat services to support local industry (sponge and stone crab), by becoming a port of entry. To accompany the harbor improvement, the Regatta Site should be re-vamped through:

- Cleaning and landscaping,
- Development of the beach,
- Playground and picnic area.

Lisbon Creek harbor improvements are developed in the action sheets 3 and 6 regarding respectively the improvement of port facilities and the improvement of conditions for maritime access to the main harbors of Andros.

Figure 9 : Lisbon Creek Regatta Site



Source: BRL/Blue – 2016

Figure 10 : Example of revamped beach



Source: Jean-Marc BEYNET – BRLi – December 2016

▶ **Create a new road away from the seashore connecting hurricane shelters in Mangrove Cay**

In Mangrove Cay, the only road is close to the shoreline. As it is flooded during heavy rains, high spring tides and hurricanes, it is impossible to connect both ends of the island and leads to unsafe situations. There is therefore a need to:

- Improve the drainage system along the shore,
- Build a road inland connecting the two hurricane shelters (from the School towards the Clinic).

▶ **Replace water mains in Mangrove Cay**

Water and Sewerage have issues with their water mains bursting in Mangrove Cay. It is understood that inadequate pipes were installed originally and that the water mains need to be replaced. Residents are without water, the road negatively affected and water lost during repairs. In the short term, adequate materials and equipment should be available on Mangrove Cay to facilitate quick repairs. In the long term, the water mains should be replaced.

▶ **Add infrastructure for running water from The Bluff to Mars Bay in South Andros**

Whilst most of the residents of Andros have adequate water supply, people in South Andros rely on domestic well water. The effects of climate change have meant that these wells are no longer acceptable for water supply, mainly due to salt-water intrusion.

A project to improve the water supply in South Andros has recently been approved. Works to improve the water supply between The Bluff and Mars Bay should commence in 2017.

2. ACTION PROGRAM

The action sheets developed regarding infrastructure development are as follows:

- ▶ **0 - Physical studies,**
- ▶ **1 - Improvement of the main public and social infrastructure,**
- ▶ **2 - Improvement and management of Andros airports,**
- ▶ **3 - Improvement of port facilities: infrastructure repair and implementation of basic services,**
- ▶ **4 - Development of Morgan's Bluff harbor,**
- ▶ **5 - Development of an artisanal fishing center in Darel Island – Lowe Sound.**

| | | | | | | |
|---|--|-------------------------------|-----------|-----------|-----------|-------------------------------------|
|  | Infrastructure – Dredging & Mining – Transportation by water | <h2>0 - Physical studies</h2> | | | | |
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1. OBJECTIVE

The overall objective is to launch physical studies at short term, to better assess needs and to better specify recommendations/actions regarding infrastructure, dredging and mining, and transportation by water sectors.

The sub-objectives include:

- ▶ Launch bathymetric surveys,
- ▶ Launch Andros climate change vulnerability, impacts and resilience study,
- ▶ Launch study analyzing the impacts of currents and flows on mangrove areas, taking into account all bridges and causeways, so as to design mitigation solutions to preserve mangrove health,
- ▶ Launch study to enhance Driggs Hill harbor's protection during Northeast surges,
- ▶ Launch study to determine the most sustainable locations for quarry and offshore mining.

2. LOCATION

This action sheet concerns Andros generally.

Locations are specified in the description chapter that follows.

3. ACTION PROGRAM

3.1 BATHYMETRIC SURVEYS

OBJECTIVE

- ▶ Assess dredging needs in the main harbors of Andros.

JUSTIFICATION

No recent bathymetric surveys have been performed in the main harbors of Andros since their construction.

Nowadays, many channels are not enough deep to allow boats to enter whatever the tide, entrance channels are not secured, wrecks are left in the waters and port infrastructure is in need of repair.

Morgan's Bluff (North Andros)

Morgan's Bluff has always been considered as one of the main commercial and recreational ports of Andros.

Currently, different types of traffic access Morgan's Bluff:

- ▶ G&G, Seacor and Bimini Shipping boats – they have containers sitting there,
- ▶ Mail boat: the "Lady Rosalind" connects North Andros (Morgan's Bluff) to Nassau sailing on Wednesdays, return on Tuesdays, once a week,
- ▶ Fuel barge every two months,
- ▶ Local fishermen,
- ▶ Bahamian and American boaters - from January to May 2016, around 100 recreational boats came in at Morgan's Bluff but moved on to Exuma and Abaco islands,
- ▶ Bahamas Fast Ferries used to come into Morgan's Bluff, but it was not profitable enough for them to maintain the route.

These types of traffic are low and could be improved if Morgan's Bluff offered better conditions for maritime access:

- ▶ The nautical access is not safe: channel buoys and lights are lacking,
- ▶ Unused water pipes are lying on the quay in the large dock,
- ▶ Several wrecks need to be removed,
- ▶ A bathymetric survey has to be undertaken to define dredging needs in the channel and in the harbor basin.

Fresh Creek (Central Andros)

Fresh Creek is the main commercial and recreational harbor in Central Andros and is a port of entry. Currently, different types of traffic access Fresh Creek, however, traffic levels are low and could be improved if Fresh Creek offered better conditions for maritime access.

At present, a bathymetric survey has to be undertaken to define dredging needs in the channel and in the harbor basin. The shallow depth prevents ships from coming into the harbor; they have to wait for high tide because the channel is too narrow and there is not enough space to turn around. One wreck needs to be removed at the entrance of the harbor, which is not secured: lights and buoys are lacking.

Behring Point (Central Andros)

Behring Point Dock is a newly (2015/2016) built concrete dock used by fishing boats.

The harbor was dredged in 2015 by AAA Marine Works (ordered by the Ministry of Works), but it is understood that it was insufficient and additional dredging needs to take place because the tide gets extremely low and boats are unable to access the dock. Further, it has created a situation whereby a number of boats have to queue up as the area is not wide enough to facilitate more than one boat at a time, and there is no turning basin so boats have to drive in and reverse out in order to stay in the deep-water areas. A bathymetric survey has to be undertaken to define dredging needs.

There are no facilities to tie boats up and locals have made their own arrangements for keeping their boats at this location. Boats have difficulty getting close to the dock due to the dock arrangement. The channel was dredged 20 feet wide, which is insufficient for larger vessels especially in poor weather conditions. A jetty was not constructed and as a result, the channel is refilling. The entrance channel is not secured: lights and buoys are lacking.

Little Harbor (Mangrove Cay)

Little harbor is situated in Moxey town. It is a concrete dock in bad condition that needs repairs. It is used by local fishermen. A bathymetric survey has to be undertaken to define dredging needs, as large boats cannot come in at low tide.

One wreck needs to be removed and the dock is not secured: lights and buoys are lacking.

Lisbon Creek (Mangrove Cay)

Currently, different types of traffic access Lisbon Creek harbor: local fishermen, the ferry from South Andros (there is a harbor terminal – around 50 persons per day use this service) and the mail boat (the “Lady Katherina” connects Mangrove Cay to Nassau on Thursdays, return on Mondays, once a week).

It is not a port of entry; there is no dock master nor customs/immigration, which is a hindrance to the local sponge and stone crab industry (economic wheel of Mangrove Cay) for exportation. Improvements are considered necessary at Lisbon Creek to facilitate both fishing and mail boat services to support local industry.

The Government Dock at Lisbon Creek is steel sheet pile bulkhead with a concrete deck. It is believed to be in good condition and in need of minor repairs. The existing ramp is in bad condition (currently closed), and in need of repair. A bathymetric survey has to be undertaken to define dredging needs as vessels can only visit at high tide. Two wrecks need to be removed and the channel entrance is not secured: lights and buoys are lacking.

Driggs Hill (South Andros)

Driggs Hill is considered as the main commercial and recreational port for South Andros. Currently, different types of traffic access Driggs Hill harbor: local fishermen, recreational boats, the ferry from Mangrove Cay (there is a harbor terminal - around 50 persons per day use this service) and different commercial vessels, including the mail boat (the "Captain Moxey" connects South Andros to Nassau on Mondays, return on Wednesdays, once a week). Around 50 boats per week visit Driggs Hill.

There are two docks at Driggs Hill, the main one is referred to as Driggs Hill Dock while the other is the Driggs Hill old Ferry Dock, which used to be used by the ferry.

► Driggs Hill Dock

There is a breakwater, which provides harbor protection. The dock is a concrete bulkhead on piles, with an asphalt storage surface behind, both in good condition, in need of minor repairs. It is believed it was constructed in 1990. The basin depth is about 10 feet at high tide. The area is used by the mail boats to carry passengers as well as for managing freight and fuel.

At present, there is inadequate depth at the dock, as the harbor has not been dredged since it was built. The dimensions of the 1000 foot long channel are also inadequate (not deep and wide enough) as boats have difficulties entering the harbor during Northeast swell. It is considered likely that a depth of 8 feet at low tide and 12 feet at high tide would be sufficient for its present use. However, it remains unclear as to why this depth is considered necessary given that the dock is used by relatively small vessels.

A bathymetric survey has to be undertaken to define dredging needs in the channel and in the harbor basin.

There are no buoys, channel markers or lights in the channel. Moreover, the harbor is not safe during Northeast surges. The opening of the northwestern portion of the dock channel to make it a safer harbor and the relocation of the dock was considered. Another suggestion was to install a jetty.

► Driggs Hill old Ferry Dock

The Driggs Hill Ferry Dock is an old dock located on the North West Side. It is now a decaying, dangerous metal frame destroyed by a hurricane around 1990. The Chief Councilor indicated that investigations regarding the removal of the old dock were carried out, but that due to the cost at the local level, an overlay of the dock was deemed a more practical approach. He further indicated that if such an approach was taken then the modified structure would facilitate the ferry service between South Andros and Mangrove Cay; and the local fishermen would be able to use the dock for ease of access. However, these solutions do not seem to be technically feasible. The old dock therefore needs to be removed for safety reasons.

TECHNICAL DESCRIPTION

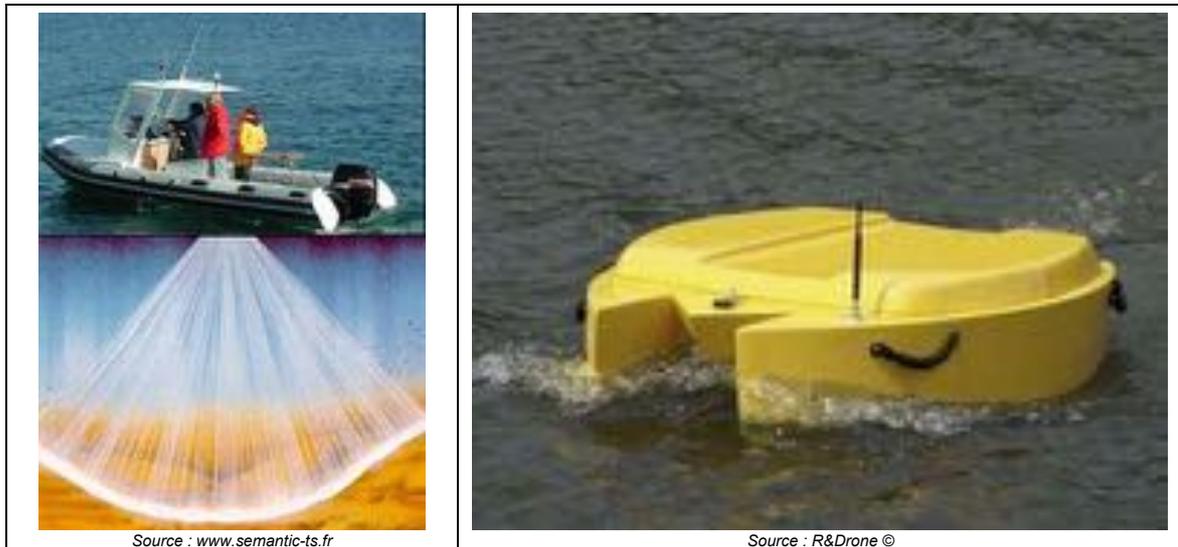
The objectives of the surveys are the following:

- Seabed mapping of all sites (channel and harbor basin) in order to assess the amount of dredging necessary to ensure the required draught.
- Illustration in coastal altimetry profiles.
- Physical-chemical analysis of sediment:
 - Determination of pollutant content for each type of contaminant,
 - Determination of sediment grain size in order to define possible sustainable dredging spoil recycling/reuse.

The apparatus used will be as follows:

- ▶ Bathymetry: it will be possible to use a small boat as only the recording equipment needs to be used in situ. A multibeam echosounder will be sufficient to record precise X, Y and Z measurements. The data will need to be rectified to compensate for parasitic effects due to vessel movements. Shallow zones will have to be surveyed using topographic apparatus, or if marine conditions so permit (i.e. calm waters and little current), with a marine drone. These systems are relatively simple to use and do not require too many resources.

Figure 1 : Type of boat needed and marine drone for bathymetric surveys



- ▶ Altimetric profiles: the topographic surveys can be carried out by an operator measuring ground altimetry point by point with a base station and a GNSS (Global Navigation Satellite System) receiver. This type of equipment offers accuracy down to the centimetre in all its measurements. For places that are difficult to access, an alternative solution would be to use a drone equipped with the appropriate sensors. The big advantage of this solution is that huge distances can be covered in very little time.

Figure 2 : Topographic equipment



- ▶ Physical-chemical analysis: sampling will be done by divers using a grab sampler. Each sample will then be analysed in a suitable laboratory.

3.2 ANDROS CLIMATE CHANGE VULNERABILITY, IMPACTS AND RESILIENCE STUDY

OBJECTIVE

- ▶ Assess Andros' vulnerability and risks regarding climate change and sea level rise, to adapt development strategy, decisions and actions.

JUSTIFICATION

Andros has different characteristics that underscore its overall vulnerability to climate change, climate variability and sea-level rise:

- ▶ Low-lying island,
- ▶ Plentiful natural resources partially stressed due to unsustainable human activities,
- ▶ Concentration of population, socio-economic activities and infrastructure along the east coastal zone,
- ▶ High exposure to frequent and more intense tropical cyclones (hurricanes) and to associated storm surge and droughts,
- ▶ Relative isolation and great distance to New Providence,
- ▶ Inadequate infrastructure in most sectors (roads, bridges, harbors),
- ▶ Insufficient financial, technical and institutional capacities, seriously limiting the capacity of Andros to mitigate and adapt to any adverse impacts of climate change.

For all these reasons and to ensure its sustainable future, it is crucial to precisely assess Andros' vulnerability and risks regarding climate change, sea level rise, to adapt the development strategy, decisions and actions of this master planning process.

TECHNICAL DESCRIPTION

Input data

The associated study requires the following input data:

- ▶ *Latest IPCC estimations regarding sea level rise in 2100*
The Intergovernmental Panel on Climate Change (IPCC) is the international body for assessing the science related to climate change. The IPCC was set up in 1988 by the World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP) to provide policymakers with regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation. IPCC assessments provide a scientific basis for governments at all levels to develop climate related policies and they underlie negotiations at the UN Climate Conference – the United Nations Framework Convention on Climate Change (UNFCCC). The assessments are policy-relevant but not policy-prescriptive: they may present projections of future climate change based on different scenarios and the risks that climate change poses and discuss the implications of response options, but they do not tell policymakers what actions to take.
- ▶ *Island-wide topographic and coastal bathymetric data*
These data are crucial for the assessment of sea level rise impacts. They must be accurate enough (X, Y, Z) with centimeter precision, such as LIDAR data.

LIDAR, which stands for Light Detection and Ranging, is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth. These light pulses—combined with other data recorded by the airborne system— generate precise, three-dimensional information about the shape of the Earth and its surface characteristics.

A LIDAR instrument principally consists of a laser, a scanner and a specialized GPS receiver. Airplanes and helicopters are the most commonly used platforms for acquiring LIDAR data over broad areas. Two types of LIDAR are topographic and bathymetric. Topographic LIDAR typically uses a near-infrared laser to map the land, while bathymetric LIDAR uses water-penetrating green light to also measure seafloor and riverbed elevations.

LIDAR systems allow scientists and mapping professionals to examine both natural and manmade environments with accuracy, precision, and flexibility. NOAA scientists are using LIDAR to produce more accurate shoreline maps, make digital elevation models for use in geographic information systems, to assist in emergency response operations, and in many other applications.

Methodology

The study can be divided into the following different steps:

► *First step - Assessment of coastal hazard (coastal erosion + marine submersion)*

- Coastal erosion hazard

This hazard is generally assessed by a historical analysis of the retreat of the coastline (based on satellite imagery), which seems to be the best way to assess erosion hazard (e.g. declining areas showing an average of X m/year of retreat).

- Marine submersion

Considering low-lying areas such as Andros, marine submersion hazard is closely linked with the sea level rise issue that cannot be properly assessed without accurate topography data such as LIDAR. Marine submersion hazard can be assessed by the implementation of wave propagation numeric models, taking into account sea level rise projections and reproducing different weather and sea conditions (hurricane for example).

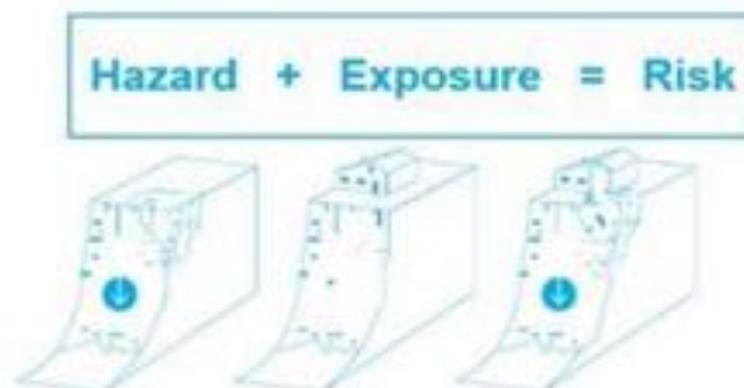
► *Second step - Assessment of human stakes / exposure*

This assessment must take into account several parameters:

- Type and economic value (private settlements, public infrastructure, etc.),
- Distance to shore line,
- Altitude / elevation.

► *Third step – Assessment of coastal risks and island vulnerability*

Depending on the physical **hazards** (erosion + marine submersion) and the characteristic **exposure** of each site (human stakes), the **vulnerability of coastal areas** can be determined and a first **coastal risk assessment** produced.



► *Final step – Defining coastal management strategies*

Managing a coastal area means taking action to reduce its vulnerability, to preserve or enhance its heritage value and possibly resolve conflict between using the area and protecting its natural heritage. This may mean maintaining certain activities, protecting exposed places or more simply keeping an eye on natural evolution in order to maintain or modify ecological balances as a function of precise conservation and sustainable development goals. In some circumstances, doing nothing is the best way of maintaining balance. It is intentional and deliberately conducted and is a management method in itself.

In risk management, several coastline management strategies are possible:

- *Monitoring natural evolution where there is not enough exposure to justify coastline management action*

This may sometimes be the best option, especially when the erosion affects natural areas.



- *Limited action to accompany the natural process of moving coastlines*

This is not always possible: only certain environmental conditions and site configurations allow coastline evolution to be slowed down.



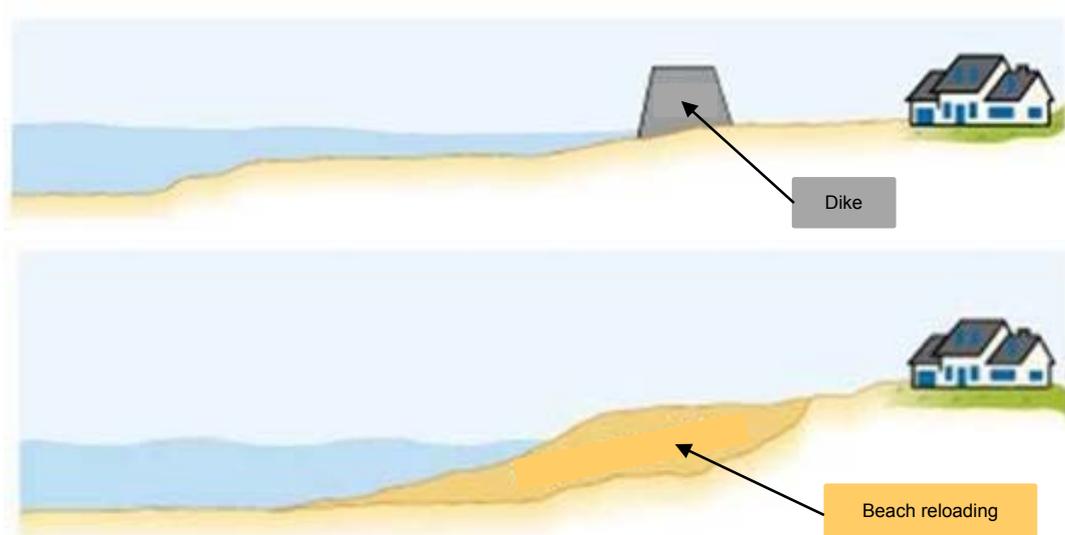
- *Organizing the strategic retreat of existing constructions behind a new natural or constructed line of protection*

This is suitable for areas that are not highly exposed where the cost / benefit analysis does not justify technical engineering or in areas where it is the only option to guarantee the required amount of protection.



- *Maintaining the coastline by modifying or building new coastal protection structures*

This is suitable in highly exposed areas. The methods used can be hard or soft engineering methods or a combination of the two (green and gray solutions).



Traditional civil engineering works (“grey” infrastructure) – such as coastal protection installations, dykes and groynes – have often been preferred because of their effectiveness and the fact that their cost is easy to determine and compare. However, such infrastructure, which is often very costly, frequently generates unexpected secondary effects such as coastal erosion and requires long-term monitoring and maintenance, which can be very expensive. In recent years, new approaches have been tried to promote natural solutions aimed at adapting places to changes in climate (“green” infrastructure).

These two “grey” and “green” approaches have often been presented as exclusive alternatives to strengthen coastal resilience. Now, in many cases, a combination of grey and green infrastructure can constitute a better solution in terms of sustainable resistance to climate change and of cost-effectiveness. For example, a coastal protection installation and a humid zone can each provide protection against marine submersion. Their combination can turn out to be an economical protection against submersion, a fundamental habitat for fishermen and a factor in the preservation of the quality of coastal waters. It can also constitute a barrier against severe storms. “Grey” infrastructure such as breakwaters or groynes can also be implemented to create favorable conditions (sedimentation, modification of movement conditions, etc.) when “green” solutions are implemented (e.g. the planting or rehabilitation of mangroves).

Those approaches using plants, sand and, sparingly, building materials to provide coastal protection and to maintain valuable habitats, seem particularly suitable for increasing the resilience of Andros’ coastal populations, mainly because of their excellent cost-benefit ratio.

3.3 STUDY ANALYZING THE IMPACTS OF CURRENTS AND FLOW ON MANGROVE AREAS

OBJECTIVE

The aim of this study is twofold: to assess the impacts of currents and flow on mangrove health, taking into account bridges and causeways, and to provide mitigation solutions.

JUSTIFICATION

Andros Island has some of the most intact coastal and marine ecosystems in The Bahamas, including vast mangroves and wetlands, coppice and pine forests, seagrasses, coral reefs and hundreds of small inlets and cays, connected by estuaries and tidal marshes. These habitats support many rare and endangered species and provide numerous benefits, or 'Ecosystem services' (Daily et al. 1997), to the Bahamian people.

It has been estimated¹ that:

- ▶ More than 20% of the total lobster production for all of The Bahamas (nearly 4 million pounds) can be attributed to Andros nursery habitats, including wetlands, mangroves and seagrass in and around the island.
- ▶ Nearly 40 miles of the populated east coast of Andros is highly vulnerable to storms and sea-level rise, with coastal habitats such as mangrove and coppice forests, coral reefs and seagrass reducing the risk of almost 71% of the coastline.
- ▶ Tourism, lobster and coastal protection services depend on, in part, approximately 6,500 square miles of functional coastal and marine habitat.

Mangrove areas are thus crucial for the natural, economic and social capital of Andros. However, mangroves are suffering from urban infrastructure pressures (bridges / causeways can modify natural currents and sediment transport) and global climate change, creating urgent need to protect and conserve mangrove estuaries. Management of these coastal ecosystems is important for using their resources and sustainably developing the respective habitats for the future.

TECHNICAL DESCRIPTION

The study can focus on the following different creeks and mangrove areas: London Creek, Sandy Creek, Fresh Creek, Stafford Creek, Staniard Creek and Cargill Creek.

Input data

The study requires the following input data:

- ▶ Bathymetric data on each creek but also for the whole maritime region of Andros,
- ▶ Data (direction, intensity, frequency) regarding weather and sea conditions (sea level, winds, regional currents, storms),
- ▶ Infrastructure documentation and technical drawings.

¹ BH-T1040: Ecosystem-based Development for Andros Island, The Bahamas – Natural Capital Project – August 2016

Methodology

The study should be based on the use of a 2-D hydraulic numerical model used to estimate currents, surface elevations due to tides, river flows and the effects of all bridges and/or causeways on the flow.

The rapid development of computing technology has indeed furnished a large number of models to be employed in coastal hydrodynamic problems. A variety of coastal models are available and the modelling techniques have become quite mature [3]. The numerical technique can be based on the finite element method, finite difference method, boundary element method, finite volume method and Eulerian-Lagrangian method.

An analysis of coastal hydraulics and water quality often demands the application of heuristics and empirical experience, and is accomplished through certain simplifications and modelling techniques according to the experience of specialists. However, the accuracy of the prediction is to a great extent dependent on open boundary conditions, model parameters and the numerical scheme. The adoption of a proper numerical model for a practical coastal problem is a highly specialized task. These predictive tools inevitably involve certain assumptions and/or limitations and can be applied only by experienced engineers who possess a comprehensive understanding of the problem domain. This leads to severe constraints on the use of models and large gaps in understanding and expectations between the developers and practitioners of a model.

The models used should take into account the following phenomena:

- ▶ Propagation of long waves, taking into account non-linear effects,
- ▶ Bed friction,
- ▶ Influence of meteorological factors: atmospheric pressure and wind,
- ▶ Turbulence,
- ▶ Torrent and river flows,
- ▶ Influence of horizontal temperature or salinity gradients on density,
- ▶ Dry areas in the computational domain: intertidal flats and flood plains,
- ▶ Current entrainment and diffusion of a tracer, with source and sink terms
- ▶ Treatment of singular points: sills, dikes, pipes.

Several models will be set-up for all creeks and mangrove areas to be studied (London Creek, Sandy Creek, Fresh Creek, Stafford Creek, Staniard Creek and Cargill Creek...).

Models will be calibrated using current measurements taken at specific locations (like under certain critical bridges).

The results will allow the assessment of infrastructure impacts on currents and flow within the creeks (changes in direction, intensity, accumulation of sediments...) and consequently on the water quality of the mangrove areas. Several simulations will be carried out to help define mitigation solutions like modifying certain bridges, removing causeways...

3.4 STUDY TO ENHANCE DRIGGS HILL HARBOR PROTECTION DURING NORTHEAST SURGES

OBJECTIVE

The aim of this study is to define solutions to enhance Driggs Hill harbor protection during northeast surges.

JUSTIFICATION

Driggs Hill is considered as the main commercial and recreational port for South Andros. Currently, different types of traffic access Driggs Hill harbor: local fishermen, recreational boats, the ferry from Mangrove Cay (there is a harbor terminal - around 50 persons per day use this service) and different commercial vessels, including the mail boat (the "Captain Moxey" connects South Andros to Nassau on Mondays, returning on Wednesdays, once a week). Around 50 boats per week visit Driggs Hill.

The harbor was constructed in 1990. The basin depth is about 10 feet at high tide. At present, there is inadequate depth at the dock, as the harbor has not been dredged since it was built. The dimensions of the 1000 foot long channel are also inadequate (not deep and wide enough) as boats have difficulties entering the harbor during Northeast swell. It is considered likely that a depth of 8 feet at low tide and 12 feet at high tide would be sufficient for its present use.

There are no buoys, channel markers or lights in the channel. Moreover, the harbor is not safe during Northeast surges.



TECHNICAL DESCRIPTION

Input data

The study requires the following input data:

- ▶ Statistical ocean wave data (satellite data) over a minimum period of 15 to 20 years,
- ▶ Statistical water level data,
- ▶ Bathymetric and topographic data on the port,
- ▶ As-built drawings of the port infrastructure.

Methodology

The study should be based on the use of a 2-D wave propagation numerical model. This kind of scientific software is dedicated to the simulation of wave propagation towards the coast or into harbors, over a geographical domain of about a few square km. The domain may be larger for simulation of long waves or resonance. The frequency dependence and directional spreading of the wave energy is generally taken into account. The computation retrieves the main wave characteristics over the computational domain: significant wave height, wave incidence, orbital velocities, breaking rate, ...

With a consistent set of boundary conditions, the model used should be able to model the following processes:

- ▶ Bottom refraction,
- ▶ Diffraction by obstacles,
- ▶ Depth induced wave breaking,
- ▶ Bottom friction,
- ▶ Full or partial reflections against walls, breakwaters, dikes, ...,
- ▶ Radiation or free outflow conditions.

Results for several weather conditions (particularly Northeast swell) will allow better understanding of the phenomena and help to define mitigation solutions.

3.5 STUDY TO DETERMINE THE MOST SUSTAINABLE LOCATIONS FOR QUARRY AND OFFSHORE MINING

OBJECTIVE

- ▶ Determine the most environmentally sustainable locations where quarry and offshore mining is worth developing in Andros.

JUSTIFICATION

Dredging and mining take place on land and in the ocean for quarry, sand, aragonite and other minerals. Whilst the majority of high quality mined materials is generally sourced from Grand Bahama, some is sourced locally. Sand and aggregate are in high demand in large volumes for development with most construction being done with concrete. In addition, the roads are constructed using a limestone base and double sand seal requiring large quantities of locally sourced materials.

The demand for construction materials means that some of Andros' beaches are being mined for sand. The practice is often very destructive and poorly managed (or unmanaged). This theft of beach and dune sand is a direct cause of erosion along many shorelines. It is very damaging to the beach fauna and flora, ruinous to beach aesthetics, and frequently causes environmental damage to other coastal ecosystems associated with the beach such as mangroves and wetlands.

Another major impact of beach sand mining is the loss of protection from storm surges associated with hurricanes. Mining is particularly senseless at a time of rising sea levels when sand is sorely needed as a storm energy buffer.

Where mining takes place inland, the issue is much the same. Too often, it takes place in a fashion that leaves scars, often intermittent ponds beside the road, since the interest of a works contractor is to source materials close to where they are to be used (and most large quantities of materials are for road building).

Dredging generally takes place in the ocean to maintain transportation pathways. Dredging for marinas and canals is a significant problem due to sedimentation that suffocates corals and buries sea grass beds.

Thus, extractive activities such as mining and dredging aggravate coastal and marine degradation and must be carefully managed.

TECHNICAL DESCRIPTION

The study must determine what resource is worth developing and where, and how to effectively extract the reserves in an environmentally sustainable way that makes financial and economic sense, taking into account the needs for Andros.

This type of study includes technical, environmental, economic and legal insight:

- ▶ *Technical analysis* to determine what quantum of mineral reserves exists and their technical characteristics,
- ▶ *Environmental analysis*, such as a baseline study to understand project starting points and environmental impact considering Andros' ecosystems and habitats to be preserved,
Mining can become more environmentally sustainable by developing and integrating practices that reduce the environmental impact of mining operations. These practices include measures such as reducing water and energy consumption, minimizing land disturbance and waste production, preventing soil, water and air pollution at mine sites, and conducting successful mine closure and reclamation activities.
- ▶ *Economic analysis*, including economic parameters and project economics, to assess whether continuing the project makes economic sense.
- ▶ *Legal analysis*, ranging from permitting issues to verifying land status and mining claims.

This type of study could be conducted with the following stepwise approach:

- ▶ Assess the actual and future mineral extraction needs in Andros in terms of quantity and quality (sand, rocks...). This should be done through:
 - An analysis of all recent works (number of permits delivered, type of buildings and materials used...),
 - An analysis and assessment of incoming projects (new public buildings, road works...),
 - An analysis of figures related to construction materials imported to Andros.
- ▶ Identify various (legal and illegal) extraction sites currently used on the island through field visits and interviews.

- ▶ Map all potential and constraints with respect to mineral extraction on Andros (for both quarry and offshore mining) taking into account the natural capital to be preserved (freshwater lenses, protected areas, coral reef...). That map should present:
 - What kind of mineral is available and where,
 - Where are the potential sites for mining and the corresponding thickness of exploitable layers,
 - What is the potential volume of materials available for each site.
- ▶ Implement geological survey/measurements if needed,
- ▶ Implement public consultation process,
- ▶ Propose several scenarios of mining activities development and analyze their environmental impacts,
- ▶ Define the most sustainable locations for quarry and offshore mining on Andros.

3.6 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effect regarding the different key pillars related to the Sustainable Prosperity development scenario:

| | |
|---------------------------|--|
| Major positive impact | |
| Contribution | |
| No effect | |
| Potential negative impact | |

| Physical studies | |
|---|--|
| Food and water security | |
| Connectivity and accessibility | |
| Education and capacity building | |
| Climate change and coastal resilience | |
| Livelihoods and income equality | |
| Land tenure security, land use planning and enforcement | |
| Health and wellbeing | |
| Strengthening local government | |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| | Sub activities | Institution responsible | Source of funding |
|-------------------|---|-------------------------|-------------------------|
| Short term | Physical studies | | |
| | Bathymetric surveys for Morgan's Bluff, Fresh Creek, Behring Point, Little Harbor, Lisbon Creek and Driggs Hill harbors | Port authorities | Public |
| | Andros climate change vulnerability, impacts and resilience study | MEH / MWUD / BNT / BEST | MEH / MWUD / BNT / BEST |
| | Study analyzing the impacts of currents and flows on mangrove health | MEH / MWUD / BNT / BEST | MEH / MWUD / BNT |
| | Study to enhance Driggs Hill harbor protection during Northeast surges | Port authorities | Public |
| | Study to determine the most sustainable locations for quarry and offshore mining | MAMR | Public |

4.2 ESTIMATION OF COSTS

| Sub activities | | Estimated cost | | |
|-------------------|---|----------------|--------------------|--|
| | | Unit | Total amount (k\$) | |
| Short term | Physical studies | | | |
| | Bathymetric surveys for Morgan's Bluff, Fresh Creek, Behring Point, Little Harbor, Lisbon Creek and Driggs Hill harbors | U | 150 | |
| | LIDAR survey for accurate topographic data for the entire island (for the climate change impacts study) | U | 200 | |
| | Andros climate change vulnerability, impacts and resilience study | U | 150 | |
| | Study analyzing the impacts of currents and flows on mangrove health | U | 90 | |
| | Study to enhance Driggs Hill harbor protection during Northeast surges | U | 50 | |
| | Study to determine the most sustainable locations for quarry and offshore mining | U | 80 | |
| Total | | | 720 | |

4.3 SOURCES OF FUNDING

Government agencies should fund these studies.

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

The physical studies will benefit the master planning process generally, helping to assess needs regarding infrastructure, dredging and mining, and transportation by water sectors. One consultant should be mandated for each study.

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|---|--|---|
| Economic, Social & Environmental | <ul style="list-style-type: none"> • Improved knowledge about dredging needs and costs, • Improved knowledge about infrastructure impacts on mangrove health, • Improved knowledge about Andros' vulnerability and coastal zone strategy for resilience, • Improved knowledge about technical solutions and associated costs to enhance Driggs Hill harbor protection, • Improved knowledge about sustainable locations for quarry and offshore mining in Andros. | <ul style="list-style-type: none"> • Time-limited validity of results and propositions (around 10 years) |

6. PRODUCTS & INDICATORS

OUTPUT

- ▶ Bathymetric surveys,
- ▶ Study regarding Andros climate change vulnerability, impacts and resilience,
- ▶ Study regarding impacts of currents and flows on mangrove health,
- ▶ Study regarding Driggs Hill harbor protection during Northeast surges,
- ▶ Study regarding the most sustainable locations for quarry and offshore mining in Andros.

OUTCOME

- ▶ Assessment of dredging needs for Morgan's Bluff, Fresh Creek, Behring Point, Little Harbor, Lisbon Creek and Driggs Hill to improve conditions for maritime access (entrance channel and harbor basin),
- ▶ Assessment of Andros' vulnerability to coastal risks and sea level rise, and definition of coastal management strategy for each district,
- ▶ Assessment of infrastructure and currents impacts on mangrove health and definition of mitigation solutions,
- ▶ Assessment of agitation conditions in the basin and proposition of different technical solutions to enhance harbor protection,
- ▶ Assessment of the most sustainable locations for quarry and offshore mining in Andros.

INDICATORS

- ▶ Volume of materials to be excavated in the six above-mentioned harbors,
- ▶ Index of vulnerability of Andros' coastal zone,
- ▶ Differences in current characteristics (direction, intensity) with or without infrastructure (bridge or causeway),
- ▶ Agitation characteristics (wave direction, intensity) in Driggs Hill harbor basin during Northeast surges, and number of protection solutions,
- ▶ Number of sustainable locations for quarry and offshore mining.

| | | | | | | |
|---|---|--|----|----|----|-------------------------------------|
|  | Infrastructure | 1 - Improvement of main public and social infrastructures | | | | |
| | All districts | | | | | |
| | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; width: 33%;">ST</td> <td style="text-align: center; width: 33%;">MT</td> <td style="text-align: center; width: 33%;">LT</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table> | | ST | MT | LT | <input checked="" type="checkbox"/> |
| ST | MT | LT | | | | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | |

1. OBJECTIVE

The overall objective is to improve the main public and social infrastructure such as bridges, clinics, schools and sport centers.

The sub-objectives include:

- ▶ Repairs/upgrades/reconstruction/construction of new roads,
- ▶ Repairs/reconstruction/improved flow at existing bridges at Stafford Creek, Staniard Creek, Fresh Creek and Cargill Creek,
- ▶ Upgrades to existing Clinics at Red Bays, Nichols Town, Mastic Point, Stafford Creek, Staniard Creek, Cargill Creek, Behring Point, Mangrove Cay and Kemp's Bay, and Residences at Mangrove Cay, Nicholl's Town, Kemp's Bay, Fresh Creek and Staniard Creek,
- ▶ Improvements at Fresh Creek and Behring Point Schools,
- ▶ Upgrades to existing Sports Centre at Fresh Creek school and a new sports center at Mangrove Cay,
- ▶ Returning Sandy Creek, London Creek, Cargill Creek and Staniard Creek to original Creek Health prior to road construction,
- ▶ Develop soft coastal protection measures in Andros,
- ▶ Improve sports centers,
- ▶ Improve hurricane shelters,
- ▶ Possible development of a University in Andros.

It should be noted that the following infrastructure elements are covered in separate action sheets:

- ▶ Improvement and management of Andros airports,
- ▶ Improvement of port facilities: infrastructure repair and implementation of basic services,
- ▶ Development of Morgan's Bluff harbor,
- ▶ Development of an artisanal fishing center in Darrell Island.

2. LOCATION

The locations requiring infrastructure improvements are spread out throughout Andros. They are mainly in the more developed areas all of which are close to the main roads and the east coast of Andros. The locations where infrastructure is to be addressed are as follows:

- ▶ North Andros: Nicholl's Town, Red Bays and Mastic Point,
- ▶ Central Andros: Stafford Creek, Staniard Creek, Fresh Creek and Cargill Creek,
- ▶ Mangrove Cay,
- ▶ South Andros: Kemps Bay.

The main current terrestrial, coastal and marine habitats present around these locations are pines, mangrove, wetland, beach, coral reef, land crab / lobster / conch habitats.



3. ACTION PROGRAMME

3.1 KEY ISSUES AND OPPORTUNITIES

NORTH ANDROS

Roads

One of the main issues with regard to infrastructure in North Andros is the state of the roads. The roads have been in a very poor state mainly due to the poor condition of the road surface and the presence of potholes making it difficult to traverse. People travelling the roads have suffered long travel times and damage to vehicles. The Government of the Bahamas is currently undertaking a \$7 million project to repair the road between San Andros Airport and Fresh Creek. In April 2016, a majority of this main road was complete. Other roads that will follow include Mastic Point Road, Fresh Creek Roads and Red Bays Road.

Government Buildings

There is an Administration Office, the Ministry of Works, Health Clinic, National Insurance Board, Road Traffic, Police, BEC, BTC and North Andros High School in Nicholl's Town. These locations were not inspected however there were no issues raised during consultations.

Clinics

There are Clinics serving the number of people per the 2010 census in brackets in Nicholls Town (pop. 1,771), Mastic Point (pop. 1,091), Red Bays (pop. 284) and Stafford Creek (pop. 161). These locations were not inspected and few issues were raised during consultations. The Department of Public Health has however identified issues as follows:

Nicholls Town

According to the Department of Public Health despite renovations in 2009, there are concerns about the roof and repeated repair of structural cracks to the Clinic. The building is in need of painting on the interior and exterior. Rotten cabinetry is in need of replacement and the building is in need of being redesigned to support workflow and diagnostic services. It is understood that in order to address these issues and to improve the integrity of the facility and support for the expansion of services a project costing \$2,500,000 is recommended. Details are unknown at this time other than that drawings are completed for sign off by the Minister however; this rate seems high to address the issues.

The Doctor's and nurse's residence (2,894 square feet in plan area) has a leaking roof, termite issues, requires general sundry repairs and the building flow process is flawed. Schematic drawings are complete and the estimated cost is \$200,000, which could increase if an additional apartment is added for relief doctor, nurses and medical and nursing students.

Stafford Creek

According to the Department of Public Health, this Clinic is in need of painting on the interior, exterior, and extreme termite treatment. \$100,000 has been estimated for the cost however there is a Clinic nearby at Staniard Creek. Stafford Creek is six (6) miles north of Staniard Creek and 17 miles from Fresh Creek. Stafford Creek is also 21 miles south of Mastic Point Clinic and 25 miles from Nicholl's Town Clinic. These are two much smaller settlements in Andros very close to one another. The population of Stafford Creek is 161 and the population of Staniard Creek is 270. It is therefore appropriate to consider closing Stafford Creek Clinic. This building can then be used to provide accommodation for the Staniard Creek Clinic Nurse or alternatively used for an alternate purpose or sold.



Stafford Creek Clinic

Mastic Point Clinic

Mastic Point Clinic is 2,880 square feet and is in need of reconfiguration and sundry repairs. The flow of the facility is considered unacceptable for health care standards and poses increase risk of confidentiality being breached. DPH considers the work to be done at Mastic Point to be necessary in order to affect repairs at Nicholl's Town and thereby eliminate the need for current rental location for the Nicholl's Town clinic. Estimated costs are \$350,000.

Red Bays Clinic (pop. 284)

The existing Clinic at Red Bays is a Private Clinic housed in a substandard rental facility where the landlord is unwilling to upgrade. The Department of Public Health is proposing to provide a new clinic at an estimated cost of \$1,500,000. This is a particularly large sum for the number of persons to benefit (\$5,281 per resident) and further consideration should be given.

Schools

There is one high school and four primary schools (three of them with a pre-school attached) in North Andros. North Andros High School is in Nicholls Town, Bertram A Newton Primary School in Red Bays, Rev. Campbell Henry Pre-School in Lowe Sound, Mastic Point Primary School in Mastic Point and Lowe Sound Primary School in Lowe Sound. These locations were not inspected; however, there were no issues raised during consultations.

It should also be noted that BAMSI (The Bahamas Agriculture and Maritime Sciences Institute) is located in North Andros where training takes place for students from all over the Bahamas. There is also the International Field Studies at Forfar Field Station.

There is also the U.S. Navy's Atlantic Undersea Test and Evaluation Center (AUTEK), which is an instrumented laboratory that performs integrated three-dimensional hydrospace / aerospace trajectory measurements covering the entire spectrum of undersea-simulated warfare: calibration, classifications, detection, and destruction. Its vital mission is to assist in establishing and maintaining naval ability of the United States through testing, evaluation, and underwater research. They have a number of facilities all over Andros including cables covering the seafloor. They also have a school for children from pre-school to middle school.

Sports Centers

There is a perceived need for a softball field.

Police Stations

There are Police Stations in Nicholls Town, Morgan's Bluff and Lowe Sound. These locations were not inspected however there were no issues raised during consultations.

Utilities

Underground water mains and overhead electricity and telecommunication lines service North Andros. There are BEC and BTC offices in Nicholls Town These locations were not inspected; however, there were no issues raised during consultations.

Other infrastructure of mention are the fish processing houses at Lowe Sound and Mastic Point, Scotiabank at Nicholls Town, North Andros packing house in San Andros, various churches and various stores, restaurants and bars throughout.

CENTRAL ANDROS

Roads

As with North Andros one of the main issues with regards to infrastructure in Central Andros has been the state of the roads however as indicated above a project is currently underway to rectify the situation.

Bridges/Causeways/Seawalls

Stafford Creek Bridge

The Stafford Creek Bridge is located at the Stafford Creek settlement approximately 15 miles north of Fresh Creek. The bridge is a vital transportation link for the island as it currently provides the only crossing of Stafford Creek, a natural creek that bisects the eastern side of Andros. The bridge is a seven span structure, built in 1968, with an overall length of 233 feet. At present it accommodates a single alternating lane of traffic, there are no separate sidewalks on the bridge.

The inspection of the bridge in 2014 found the bridge to be in generally good condition, but that several components are showing signs of significant localized deterioration, including the structural steel girders and diaphragms, pre-stressed concrete piles, concrete pier caps, steel coating system on girders, railings and curbs, steel railings and joints. The extent of damage is such that repair is appropriate however further work is necessary to determine whether the bridge is a major concern environmentally in terms of creek health.

The cost of repairs was estimated at \$652,000 in 2014. This work is currently budgeted by the Ministry of Works to take place in 2017/18.

| | |
|---|---|
|  |  |
| <p><i>Stafford Creek Bridge Central Support Pad</i></p> | <p><i>Stafford Creek Bridge Parapet</i></p> |
|  |  |
| <p><i>Stafford Creek Bridge Central Support Pad</i></p> | <p><i>Stafford Creek Bridge End Piers</i></p> |
|  | |
| <p><i>Stafford Creek Bridge Northern Approach</i></p> | |

The Staniard Creek Bridge is located just west of the settlement of Staniard Creek, approximately 10 miles north of Fresh Creek. The bridge is located on Staniard Creek Road, which connects Staniard Creek to the Queen’s Highway. The bridge is vital to the settlement of Staniard Creek being the only road crossing of Staniard Creek. It is a three span concrete structure with an overall length of 56’-8” and an overall width of 25’-10”. The bridge carries 2-lane traffic and is likely to have been built in the early 1930s after a Hurricane destroyed the original bridge. The ease and cost of repair is such that reconstruction is appropriate however further work is necessary to determine whether the bridge is a major concern environmentally in terms of it being a bottleneck and affecting creek health.

It is believed that the bridge is contributing to the infilling of the creek entrance. Moreover, the reopening of the creek system needs to be undertaken as it is believed it would allow for the re-establishment of the water flow between the creek and the open ocean. Studies should be conducted to determine the extent and measures appropriate to increasing the opening at Staniard Creek bridge and should be a priority given that the replacement of the bridge is currently at the design stage with replacement planned for the near future.



Fresh Creek Bridge – The Fresh Creek Bridge is located in the settlement of Andros Town (Fresh Creek) and provides the only crossing of Fresh Creek. It was built in 1968 and is a thirteen span concrete voided slab beam and steel girder/deck grating structure with an overall length of 30 feet. The bridge accommodates a single 12-foot wide traffic lane and two (2) 18” wide concrete curbs. The structure is supported on two (2) reinforced concrete abutments and twelve (12) piers, which consist of a reinforced concrete pier cap and 12” square prestressed concrete piles. Several elements are showing signs of significant localized deterioration and require replacement or rehabilitation in the near future (mainly two of the spans).

The repairs will cost in the order of \$1.2 million and are planned to be carried out by the Ministry of Works in 2017/18. A life cycle cost analysis has not been conducted for the bridge however repairs are considered appropriate. The police should be consulted to determine the number and severity of accidents that occur at the bridge in its current arrangement.

Cargill Creek Bridge – The Cargill Creek Bridge is located approximately 17 miles south of Andros Town (Fresh Creek). It is the only bridge crossing Cargill Creek and makes a connection between Behring Point and the rest of Central Andros and North Andros. It was built in 1988 and is a single span voided slab beam structure with an overall length of 36 feet and an overall width of 16 feet. The bridge accommodates a single lane of traffic and is supported on two (2) steel sheet piled abutments. Both approaches to the bridge are atop a man-made causeway.

The bridge is in generally good condition however, the guiderails on all four (4) corners need to be replaced and maintenance work is necessary. The repairs will cost in the order of \$50,000 and is planned to be carried out by the Ministry of Works in 2016/17.

The bridge is reported to be causing the creek to close up affecting the health of the creek and bonefish habitat of most concern to locals.



Cargill Creek Bridge

Government Buildings

There is an Administration Office, Health Clinic, National Insurance Board, Ministry of Tourism, Road Traffic, Police, BEC, BTC and WSC in Fresh Creek. There is the Ministry of Education in Stafford Creek and the Ministry of Works in Love Hill. These locations were not inspected however there were no issues raised during consultations other than for the clinic.

Clinics

There are clinics in Staniard Creek, Stafford Creek, Fresh Creek, and Cargill Creek (Bowen Sound clinic being closed).

Staniard Creek Clinic and Residence

Staniard Creek Clinic and Residence is a 2,754 square foot building. It was recently repaired in 2014 when minor work was needed. It is now in need of fumigation for termites for the whole building, and electrical upgrades to provide for separate meters. The residence needs new gypsum board and ceiling repairs, new kitchen cabinets, interior painting and termite treatment. The estimated cost by DPH is \$150-200,000.

Fresh Creek Clinic

The community regarding the clinic at Fresh Creek as follows raised health issues and concerns:

- ▶ Clinic need to be relocated and rebuilt,
- ▶ There is no ambulance for emergency transport,
- ▶ There are no X-ray machines; and
- ▶ They are unable to do any blood work at the existing clinic.

The Fresh Creek Clinic is in need of roof repair, painting of interior and exterior, termite treatment of cabinetry, upgrade of M&E systems, redesign of workflow to allow diagnostic services and health education. The facility is considered similar to Nicholl's Town and is estimated by DPH to cost \$1,500,500.

The Fresh Creek Doctor's residence is a 1,161 square foot building in need of new windows, termite extermination, a new roof, crack repairs, updated electrical fittings and new plumbing and is estimated by DPH to cost \$200,000.

Cargill Creek Clinic

Cargill Creek Clinic is a 672 square foot clinic in need of expansion for a waiting area and redesign for workflow and is estimated by DPH to cost \$80,000.

Schools

There is a high school and five primary schools (three with a pre-school) in Central Andros. These include Central Andros High School, Fresh Creek Secondary School, Behring Point Primary (36 students, Grades K – 3), Bowen Sound Primary (32 students, Grades 4 – 6), Fresh Creek Primary (110 students, Grades K – 6), Staniard Creek Primary (24 students, Grades K – 3), Stafford Creek Primary (24 students, Grades 4 – 6). Mention was made of a need for a Primary school in Fresh Creek. Presently it is a make-shift school (as of twelve (12) years ago) and junior and high schools are combined however, there are an insufficient number of students to warrant this at present. It is understood that the present site is subject to flooding and that when it rains, they have to bus students to their classroom and because of the flooding, the toilets incur many issues and lost days occur because the sanitary situations are not conducive to a healthy and clean teaching environment.

| | |
|---|--|
|  |  |
| <p><i>Behring Point Primary School is understood to flood at times and locals consider a new school at a new location as necessary.</i></p> | <p><i>Behring Point Primary School Entrance</i></p> |
|  | |
| <p><i>Behring Point Primary School Exit</i></p> | |

Sports Centers

The ball park and track and field area behind Fresh Creek School are in need of improvements including new bleachers.



Police Stations

There is a Police Station in Fresh Creek. This location was not inspected however there were no issues raised during consultations.

Utilities

Underground water mains and overhead electricity and telecommunication lines service Central Andros. There are BEC, BTC and WSC offices in Fresh Creek. BEC presently poses a health risk (air and noise pollution) to the neighboring communities because of the low smoke stack and loud engines within 20 feet of residences. Otherwise these locations were not inspected however there were no issues raised during consultations.

Other

Other infrastructure of mention are the Royal Bank of Canada at Calabash Bay, Andros Town, the Androsia factory, various churches and various stores, restaurants and bars throughout. AUTECH has a 285-foot long concrete pier with a controlling depth of 17 feet (5.2 meters) at mean low tide. An adjacent wharf is approximately 240 feet long (72 meters) with a controlling depth of 15 feet at mean low tide. 440 VAC power is available at both locations (200 and 60 Amp at the pier and 60 Amp at the wharf). Facilities at the pier/marine area include fully equipped machine/fabrication and marine overhaul shops. There are also other facilities around Andros a number of which it is understood to be in various states of disrepair and are slated to be decommissioned. There is a concern for the impact this will have on the environment if adequate measures are not taken in the process, in particular the towers placed along the reef and AUTECH's channel.

The in-water portion of the Weapons Range covers 500 square nautical miles (1,700 km²). Use of the total range is referred to as "Weapons Range". There are cables placed within this area.

MANGROVE CAY

Roads

The main road connecting Moxey Town with Lisbon Creek is flooded during heavy rain and hurricanes and it becomes very dangerous for driving purposes. There are currently seawalls along portions of the road that is beside the coast; however, some of these are limited in their effectiveness. It has been estimated that at present there are approximately 3 miles of seawalls in need of repair. Alternatives to seawall repair and new construction is considered likely to be appropriate. The area of main concern is the portion of road that is along the coast at Burnt Rock. This is the only road that connects north and south Mangrove Cay. This road is flooded during high tides and storms. One major concern is that the road is impassable during these times thereby disconnecting the two hurricane shelters in Mangrove Cay. A road has been partially constructed parallel to this road further inland. The road has been paved for a portion with other portions having been cleared; however, it is necessary to grade a hill and pave the remainder of the road to complete this access road. This is considered preferable to any repairs to seawalls along the coast.

Government Buildings

There is an Administration Office, Health Clinic, Department of Youth and Sports, Bahamas Agricultural and Industrial Corporation (BAIC), Road Traffic, Social Services and Tourism, National Insurance Board (NIB), Police, BEC, BTC and WSC in Mangrove Cay. These locations were not inspected however there were no issues raised during consultations.

There are issues with the existing buildings that accommodate the various governmental agencies – Bahamas Agricultural and Industrial Corporation (BAIC), National Insurance Board (NIB), Road Traffic, Social Services and Tourism because:

- ▶ When it rains, buildings are flooded;
- ▶ Power outages;
- ▶ This building is used as the Command Centre during a hurricane.

Clinics

Mangrove Cay Clinic (pop. 892)

There is a Clinic at Moxey Town in Mangrove Cay, which was renovated in 2009; however, the building has a termite problem, which necessitated the relocation of the clinic in February 2016. However, the rental space is not capable of meeting the community's needs, as there is no space for a clerical office in the building and the building floods during heavy rains. A building that will facilitate each area in the clinic including a triage area is needed. The building was constructed more than 15 years ago and is in need of repairs to the roof, repairs to MEP¹, termite fumigation, a morgue cooler and reconfiguration for workflow. Also, the clinic is reported to be short of personnel as there are about 11 staff, but another five staff are considered necessary. The clinic is in urgent need of repair. The redesign of the facility is complete other than for MEP, which are currently being done. The project has been signed off by the Minister of Health to advance the work.

Mangrove Cay Nurses Residence

The Mangrove Cay Nurses Residence is in need of general sundry repairs and termite fumigation. The building can be converted into a two-bedroom residence thereby eliminating two rentals at \$850 per month each or \$20,400 per annum. The estimated cost by the DPH is \$180,000 - \$200,000.

¹ Mechanical, electrical and plumbing

Schools

There is one high school, Mangrove Cay High (with 120 students), and one primary school, Burnt Rock Primary (with about 85 students). Note that student numbers fluctuate based on time of year.

These locations were not inspected however there were no issues raised during consultations. Later discussions identified that there is a need for a library/resource center. There is a building sited in front the school, which used to be a teachers' cottage that can be used. This could then also lend itself to being an aftercare facility. There is a need for school furniture and technology infrastructure (Internet/WiFi) as well as more electrical outlets. The computer lab needs repair (as termites are a problem) and additional computers are needed as they have about 10, and need 10 more to meet the needs of more students.

Police Stations

There are Police Stations in Mangrove Cay. The location was not inspected however there were no issues raised during consultations.

Utilities

Underground water mains and overhead electricity and telecommunication lines service mangrove Cay. There are BEC, BTC and WSC offices in Mangrove Cay. Water and Sewerage have problems with their pipes bursting; therefore, the pipes need to be replaced.

Other

Other infrastructure of mention are the need to build a new sports complex. The plans for this were submitted since 1998. The land has already been granted, and there was a correspondence sent to the authorities since 2015, but they are still waiting for a response. The public cemetery is filled, but a new location has been identified however, there are environmental concerns. Also at present, the method used at the landfill is that of they just push and burn as the landfill has not been completed.

The issues that need to be addressed in the short-term and that are critical for Mangrove Cay are the road, the clinic and the port.

SOUTH ANDROS

Roads

The Queen's Highway, a two lane paved and illuminated road without traffic lights, runs approximately 40 miles (64 km) from the northernmost edge of South Andros which is the port of Driggs Hill, to the dockside settlement of Mars Bay. At Mars Bay the road ends in a cul de sac but the island extends approximately 20 further miles south without roads or services, inaccessible except by boat. In its course from Driggs Hill to Mars Bay, the highway crosses two bridges, one at Deep Creek and one further south at Little Creek, both refurbished in 2012.

Almost the entire population of South Andros lives in housing abutting the Queen's Highway and a few short, paved roads trailing off it. The only other significant road is that leading west, inland, along the north side of Deep Creek, to Black Point, where there are a handful of additional homes.

Bridges/Causeways

The main highway crosses two bridges, one at Deep Creek and one further south at Little Creek, both refurbished in 2012. There are currently no issues with the bridges.

Clinics

There are clinics in Kemp's Bay and Deep Creek. There were no issues raised during consultations for these locations however, the DPH has advised that works are needed at the Kemps Bay Clinic as follows:

Kemp's Bay Miriam Greene Clinic (pop. 1465)

Kemp's Bay Clinic is reported as needing electrical and A/C repairs, improved water supply, (there is no Government water available at this location), cesspit repairs, termite fumigation and general sundry repairs. The DPH estimates the cost to address these issues to be \$1,300,000.

Kemp's Bay Doctor's Residence

The Kemp's Bay Doctor's Residence is a 1,161 square foot residence in need of termite treatment, electrical upgrade, new windows, new roof and general sundry repairs. Repairs are needed in order to eliminate rent. The DPH estimates the cost of these works at \$150,000.

Kemp's Bay Nurse's Residence

The Nurse's Residence at Kemp's Bay has suffered roof damage, severe termite infestation and other general repairs. It is further recommended to convert the building into a 1-2 bedroom unit and a one-bedroom unit. The DPH estimates the cost of these works at \$250,000 thereby eliminating reliance on rental properties.

Schools

There is one high school (with 130 students) in South Andros and two primary schools (one with 55 students and the other 110). These are namely South Andros High, Deep Creek Primary and High Rock Primary. The schools are used for hurricane shelters and most of them are in good condition, except Deep Creek Primary School located in the South, where there is no potable water. In addition, the bathrooms are separated from the school, and during the hurricane, this is a problem, because most of the persons who come to the shelter are elderly. It was mentioned that preparations are being made to enclose the space between the school and the bathroom. There are also Long Bay Cays Preschool and Victoria Point Preschool.

South Andros has a library but it is closed most of the time because there is nobody to man it. Students currently use the resource center next to the Superintendent of Education's office. The computer lab is currently being repaired, but is in need of additional computers.

Police Stations

There are Police Stations at Kemps Bay and High Rock. These locations were not inspected however there were no issues raised during consultations.

Utilities

Government provided electric, telephone and rubbish disposal services are available to all homes, with a major power generation plant located mid-island in the settlement called The Bluff or Bluff town. Water is supplied from a combination of reverse osmosis and wellfields to much of the district inhabitants but for residents in the southern part of the island, water is obtained by catchment or private well, the quality of which has been deteriorating over time and at present is generally unsafe for use in most areas. There is currently a project underway to install a reverse osmosis plant to provide water to the remaining inhabitants. Natural gas and drinking water is purchased by the tank, brought in weekly by mail boat from Nassau.

Other

Other infrastructure of mention are various churches and various stores, restaurants and bars throughout. There are also a limited number of places where visitors can stay so increasing accommodations is considered important.

Other Issues

Local Government has little say in infrastructure projects, which are mainly directed by offices in Nassau.

The creation of city centers in Nicholl's Town, Lowe Sound and Red Bays is difficult due to land ownership issues. For instance, land in old Nicholl's Town is all already owned, such as generation property. There is no housing system or plan with all development being along the main road because utilities are on the main road. Moving housing off of the road means having your house serviced by utility companies is more expensive.

3.2 DEVELOPMENT STRATEGY

Infrastructure is key to the development of a nation. Of particular importance is accessibility and therefore airports, ports (covered under separate action sheets), roads, bridges, coastal protection, clinics, educational facilities and sports centers. A number of issues with regards to this infrastructure were raised in consultation with Androsians and for these reasons, as well as their being basic necessities, they are addressed within this action sheet.

The overall strategy is to develop infrastructure in Andros in a sustainable manner and in most cases provide a level of amenity to the public, which is overdue. The improvement of road, bridge, clinic, school, and sports center infrastructure would be developed in three different steps, corresponding to three different stages in time:

- ▶ At short term, existing infrastructure is repaired, land and designs sought, funding is secured and studies are launched,
- ▶ At medium term, infrastructure and protective measures are further improved and investors for long term development are sought,

By developing infrastructure and services throughout Andros, more recreational and commercial persons should be attracted to Andros and less Androsians find it necessary to leave Andros.

The list of activities and investments to be undertaken are presented below:

Short term – up to 5 years (2020)

- ▶ *Road projects currently underway are completed and road maintenance schedules prepared for Andros,*
- ▶ *Instead of a road to the West side National Park boat tours are arranged to a limited number of persons to limited locations,*
- ▶ *Trails are developed to locations of ecological interest while prohibiting or restricting access by vehicles,*
- ▶ *Initiate a traffic sign improvement project for Andros including signage of protected areas,*

- ▶ *Bridges at Staniard Creek, Fresh Creek, Stafford Creek, and Cargill Creek are repaired with particular attention given to the need to increase openings at Staniard Creek, Stafford Creek and Cargill Creek. Priority at this time should be given to determining the extent and measures appropriate to increasing the opening at Staniard Creek Bridge location given that the replacement of the bridge is currently at the design stage with replacement planned for the near future. The re-opening of Sandy Creek should also be considered in tandem, as these would affect one another.*
- ▶ *Studies to determine the preferred solutions to open up London Creek are developed,*
- ▶ *Studies to determine ideal Pilot scheme locations for coastal protection measures and initiation of pilot coastal protection projects (present locations for consideration and potential development include but are not limited to; South Mastic Point; Deep Creek; Blister Rock; Burnt Rock and Love Hill),*
- ▶ *Traffic volumes are monitored at Fresh Creek and Stafford Creek bridges,*
- ▶ *Andros climate change vulnerability, impacts and resilience study is initiated,*
- ▶ *Quantity surveyors assessment of Department of Public Health infrastructure improvements and initiation of clinic and Doctor's and Nurse's residence improvements,*
- ▶ *Land and designs acquired for Public Library (to also be used as after-school facility (with computer lab) as well as an internet access location for the public). This technology infrastructure would support open and distance learning The location of this facility should be central to all settlements in North and Central Andros and address climate change/natural disaster issues,*
- ▶ *New school furniture for Mangrove Cay as well as repairs to computer lab and additional 10 computers,*
- ▶ *Increased access to South Andros Library by having persons available to run,*
- ▶ *South Andros school additional computers,*
- ▶ *All future infrastructure to be designed to support students with special needs (blind, deaf, mobility issues). We do not have statistics on special needs students but recommend that a classroom or two be constructed at an existing school(s). Efforts made to ensure that most, if not all, schools are properly retrofitted to allow access to, for example, students using wheel chairs. So ramps; reconfigured bathrooms; wider classroom doors,*
- ▶ *Land and designs acquired for new school in Fresh Creek,*
- ▶ *Study to address flooding issues at Behring Point School,*
- ▶ *Land and designs acquired for new sports center in Mangrove Cay,*
- ▶ *Improvements to Sports Center at Fresh Creek,*
- ▶ *Assessment of adequacy of hurricane shelters in Andros and new hurricane shelters provided in Mangrove Cay and South Andros,*
- ▶ *A study to determine feasibility of relocating BEC in part or whole from current Fresh Creek location to alternate location with reduced emissions,*
- ▶ *A study is undertaken to determine feasibility of developing a COB Campus followed by University in Andros in the long term.*

Medium term – up to 10 years (2030)

- ▶ *Works to open up Sandy Creek, London Creek, Cargill Creek and Staniard Creek are developed,*
- ▶ *Pilot schemes for coastal protection measures have been initiated, some results obtained and further projects identified and initiated,*
- ▶ *Recommendations of climate change studies are initiated and no build zones identified,*
- ▶ *Continued improvements of Department of Public Health Clinics and Doctor's and Nurse's residences,*

- ▶ *New Public Library constructed for North and Central Andros,*
- ▶ *Mangrove Cay teacher's cottage in front of school to be converted into a new Public Library/Resource Centre,*
- ▶ *Improvements at Fresh Creek School (improved separation of lower and higher schools),*
- ▶ *Flooding issues at Behring Point School addressed,*
- ▶ *Construction of new sports center in Mangrove Cay,*
- ▶ *Relocation of BEC in part or whole from current Fresh Creek location to alternate location with reduced emissions.*

Long term – up to 25 years (2040)

- ▶ *Development of a University in Andros.*

3.3 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effects regarding the different key pillars related to the Sustainable Prosperity Scenario of development:

| | |
|---------------------------|--|
| Major positive impact | |
| Contribution | |
| No effect | |
| Potential negative impact | |

| Action | |
|---|--|
| Food and water security | |
| Connectivity and accessibility | |
| Education and capacity building | |
| Climate change and coastal resilience | |
| Livelihoods and income equality | |
| Land tenure security, land use planning and enforcement | |
| Health and wellbeing | |
| Strengthening local government | |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| | Sub activities | Institution responsible | Source of funding |
|---|---|---|---|
| Short term | Description | | |
| | Boat tours are arranged to a limited number of persons to limited locations to the West side National Park | MT / BNT | MT / BNT |
| | Trails are developed to locations of ecological interest prohibiting and restricting access by vehicles. | MT / BNT | MT / BNT |
| | Traffic sign improvement project | MWUD | MWUD |
| | Repair of bridges at Staniard Creek, Fresh Creek, Stafford Creek, and Cargill Creek with particular attention given to the need to increase openings for Creek health | MWUD | MWUD |
| | Study analyzing the impacts of currents and flows on mangrove health | MEH / MWUD / BNT / BEST /Bahamas Sport Fishing Conservation Association | MEH / MWUD / BNT / Bahamas Sport Fishing Conservation Association |
| | Studies to determine ideal Pilot scheme locations for coastal protection measures and initiation of pilot coastal protection projects | MEH / MWUD / BEST | MEH / MWUD |
| | Traffic volumes are monitored at Fresh Creek and Stafford Creek bridges, | Police / MWUD | Police / MWUD |
| | Andros climate change vulnerability, impacts and resilience study | MEH / MWUD / BNT / BEST | MEH / MWUD / BNT / BEST |
| | Quantity surveyors assessment of Department of Public Health infrastructure improvements and initiation of clinic and Doctor's and Nurse's residence improvements, | MH / MWUD | MH /MWUD |
| Land and designs acquired for school improvements in Fresh Creek, | Lands and Surveys /Ministry of Education / MWUD | Ministry of Education /MWUD | |

| | | | |
|--|--|---|--|
| | Land and designs acquired for Public Library for North and Central Andros | Lands and Surveys / Ministry of Education | Ministry of Education / MWUD |
| | New school furniture for Mangrove Cay as well as repairs to computer lab and additional 10 computers. | Ministry of Education | School / PTA Funding |
| | Increased access to South Andros Library by having persons available to run, | Ministry of Education | Ministry of Education |
| | South Andros school additional computers, | Ministry of Education | School / PTA Funding |
| | All future infrastructure to be designed to support students with special needs (blind, deaf, mobility issues). We do not have statistics on special needs students but recommend that a classroom or two be constructed at an existing school(s). | Ministry of Education | Ministry of Education |
| | Study to address flooding issues at Behring Point School, | Ministry of Education / MWUD | Ministry of Education / MWUD |
| | Land and designs acquired for new sports center in Mangrove Cay, | Department of Lands and Surveys/ Ministry of Education / Ministry of Sports | Ministry of Education/ Ministry of Sports |
| | Improvements to Sports Center at Fresh Creek, | Ministry of Education / Ministry of Sports | Ministry of Education / Ministry of Sports |
| | Assessment of adequacy of hurricane shelters in Andros and new hurricane shelters provided in Mangrove Cay and South Andros, | MWUD | MWUD |
| | A study to determine feasibility of relocating BEC in part or whole from current Fresh Creek location to alternate location with reduced emissions, | BPL | BPL |
| | A study is undertaken to determine feasibility of developing a COB Campus followed by University in Andros in the long term. | Ministry of Education | Ministry of Education |

| Description | | | |
|--------------------|---|---|--|
| Medium term | Works to open up Staniard Creek, London Creek, Sandy Creek and Cargill Creek in this order of priority are developed. | MWUD / Bahamas Sport Fishing Conservation Association | MEH /MWUD / BNT / Bahamas Sport Fishing Conservation Association |
| | Pilot schemes for coastal protection measures have been initiated, some results obtained and further projects identified and initiated, | MWUD / MEH | MWUD / MEH |
| | Recommendations of climate change studies are initiated and no build zones identified, | MWUD / MEH | MWUD / MEH |
| | Continued improvements of Department of Public Health Clinics and Doctor's and Nurse's residences, | DPH | DPH |
| | New Public Library constructed for North and Central Andros, | MWUD / MEH | MWUD / MEH |
| | Mangrove Cay teacher's cottage in front of school to be converted into a new Public Library/Resource Centre, | MWUD / MEH | MWUD / MEH |
| | Improvements at Fresh Creek School (improved separation of lower and higher schools). | MWUD / MEH | MWUD / MEH |
| | Flooding issues at Behring Point School addressed, | MWUD / MEH | MWUD / MEH |
| | Construction of new sports center in Mangrove Cay, | Ministry of Sports | Ministry of Sports |
| | Relocation of BEC in part or whole from current Fresh Creek location to alternate location with reduced emissions, | BPL | BPL |
| | Completion of road further inland and parallel to existing coast road at Burnt Rock to be completed to provide access between the two hurricane shelters in Mangrove Cay. | MWUD | MWUD |
| Long term | Description | | |
| | Development of a University in Andros. | Ministry of Education | Ministry of Education |

4.2 COSTS ESTIMATION

| Sub activities | | Estimated costs | |
|--|---|-----------------|--------------------|
| | | Unit | Total amount (k\$) |
| Short term | Boat tours are arranged to a limited number of persons to limited locations to the West side National Park | U | 50 |
| | Trails are developed to locations of ecological interest prohibiting and restricting access by vehicles. | U | 300 |
| | Traffic sign improvement project | U | 300 |
| | Study analyzing the impacts of currents and flows on mangrove health | U | 90 |
| | Studies to determine ideal Pilot scheme locations for coastal protection measures and initiation of pilot coastal protection projects | U | 300 |
| | Repair of bridge at Staniard Creek | U | 1,500 |
| | Repair of bridge at Fresh Creek | U | 1,200 |
| | Repair of bridge at Stafford Creek | U | 530 |
| | Repair of bridge at Cargill Creek | U | 50 |
| | Traffic volumes are monitored at Fresh Creek and Stafford Creek bridges, | U | 10 |
| | Andros climate change vulnerability, impacts and resilience study | U | 150 |
| | Quantity surveyors assessment of Department of Public Health infrastructure improvements | U | To be Determined. |
| | Mangrove Cay Clinic Improvements | U | To be Determined. |
| | Mangrove Cay Nurse's Residence Improvements | U | 180-200 |
| | Nicholl's Town Clinic Improvements | U | 2,500 |
| | Nicholl's Town Doctor's and Nurse's Residence Improvements | U | 200 |
| | Kemp's Bay Clinic Improvements | U | 1,300 |
| Kemp's Bay Doctor's Residence Improvements | U | 150 | |
| Kemp's Bay Nurse's Residence Improvements | U | 250 | |

| | | |
|--|---|-------------------|
| Bowen Sound Clinic (Rental) Closure | U | To be Determined. |
| Fresh Creek Clinic Improvements | U | 1,500 |
| Fresh Creek Doctor's and Nurse's Residence Improvements | U | 200 |
| Cargill Creek Clinic | U | 80 |
| Staniard Creek Clinic and Residence | U | 150-200 |
| Stafford Creek Clinic | U | 100 |
| Mastic Point Clinic | U | 350 |
| Red Bays Clinic | U | 1,500 |
| Land and designs acquired for school improvements in Fresh Creek, | U | To be Determined. |
| Land and designs acquired for Public Library for North and Central Andros | U | To be Determined. |
| New school furniture for Mangrove Cay as well as repairs to computer lab and additional 10 computers. | U | 10 |
| Increased access to South Andros Library by having persons available to run, | U | To be Determined. |
| South Andros school additional computers, | U | 5 |
| All future infrastructure to be designed to support students with special needs (blind, deaf, mobility issues). We do not have statistics on special needs students but recommend that a classroom or two be constructed at an existing school(s). | U | To be Determined. |
| Study to address flooding issues at Behring Point School, | U | To be Determined. |
| Land and designs acquired for new sports center in Mangrove Cay, | U | 200 |
| Improvements to Sports Center at Fresh Creek, | U | 10 |
| Assessment of adequacy of hurricane shelters in Andros and new hurricane shelters provided in Mangrove Cay and South Andros, | U | To be Determined. |
| A study to determine feasibility of relocating BEC in part or whole from current Fresh Creek location to alternate location with reduced emissions, | U | To be Determined. |

| | | | |
|--|---|-------------------|-------------------|
| | Completion of road further inland and parallel to existing coast road at Burnt Rock to be completed to provide access between the two hurricane shelters in Mangrove Cay. | U | To be Determined. |
| | | | |
| Medium Term | Works to open up Sandy Creek, London Creek, Cargill Creek and Staniard Creek are developed. | U | To be Determined. |
| | Pilot schemes for coastal protection measures have been initiated, some results obtained and further projects identified and initiated, | U | To be Determined. |
| | Recommendations of climate change studies are initiated and no build zones identified, | U | To be Determined. |
| | Continued improvements of Department of Public Health Clinics and Doctor's and Nurse's residences, | U | To be Determined. |
| | New Public Library constructed for North and Central Andros, | U | 300 |
| | Mangrove Cay teacher's cottage in front of school to be converted into a new Public Library/Resource Centre, | U | 300 |
| | Improvements at Fresh Creek School (improved separation of lower and higher schools), | U | To be Determined. |
| | Flooding issues at Behring Point School addressed, | U | To be Determined. |
| | Construction of new sports center in Mangrove Cay, | U | To be Determined. |
| Relocation of BEC in part or whole from current Fresh Creek location to alternate location with reduced emissions, | U | To be Determined. | |
| | | | |
| Long term | Development of a University in Andros. | U | To be Determined. |
| | | | |

4.3 SOURCES OF FUNDING

These investments can be funded by Government, Development banks, Multinational, private equity firms and the local private sector through Public Private Partnership, or Foreign Direct Investment.

4.4 MANAGEMENT MODEL

Roads, bridges, clinics, schools and sports centers cost estimates, tendering, construction and maintenance will be managed by the MOWUD. Regarding studies, these will be mainly managed by the MOWUD with input from other authorities including but not limited to the BEST Commission and the Bahamas National Trust.

4.5 STUDIES NEEDED FOR EXECUTION

- ▶ Land tenure verification,
- ▶ Feasibility studies,
- ▶ Environmental impact studies.

4.6 PRIORITY AND RELATION TO OTHER INITIATIVES

- ▶ Aligned with Vision2040: The National Development Plan.

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

Beneficiaries include:

- ▶ Local residents in most communities in Andros, most notably; Nicholl's Town, Red Bays and Mastic Point in North Andros; Stafford Creek, Staniard Creek, Fresh Creek and Cargill Creek in Central Andros; Mangrove Cay, and Kemps Bay in South Andros,
- ▶ The local authorities of North Andros,
- ▶ Foreign and domestic visitors.

INFRASTRUCTURE INVESTMENT IMPACTS ON JOBS CREATION IN ANDROS

A precise estimate of the impact of infrastructure development investment on jobs creation in Andros is rather difficult. This has to be based first upon growth elasticity to infrastructure, and secondly on the employment elasticity to growth.

Investments in infrastructure as an input into growth creates jobs across sectors including infrastructure itself. Thus, this section will only estimate the impact of investment in infrastructure on jobs creation at a macroeconomic level. These investments are described in this Action Sheet and relate directly to constructing, repairing and renovation of roads, buildings, public buildings... they aim to give a new dynamic to transportation for both improving the internal connectivity on Andros and the external accessibility to Nassau and to the Family islands and doing so, give a new economic dynamic to the island for tackling the immediate, medium and long term needs targeted in the Sustainable Prosperity scenario for a balanced development in its social, cultural and environmental components.

Some components of public spending contribute not only to short-term relief, but also to economic growth and general development through the accumulation of physical and human capital: physical, in particular through the development and maintenance of useful public infrastructure (mainly transport and housing), and human through skills development of workers and the promotion of SMEs involved in implementation, and social sectors (education, water and sewage, and other public sectors).

Improving access through the maintenance and rehabilitation of roads is an efficient recipe. In addition, a significant part of these works can be executed through small or medium-scale contractors or micro-enterprises.

Infrastructure investment with an employment focus has a strong employment multiplier effect. It creates **direct jobs** for those directly involved if a local resource-based approach is adopted. As a result, local consumption and demand is stimulated from higher local incomes with a resulting induced effect for the local economy. In the present investment project in infrastructure, direct jobs will be created first in the construction and transportation sectors. As a consequence, potential jobs will be created due to the increase of the internal demand for cement, asphalt production, steel and rolling stock industries. Consequently, in other sectors like fishing and agriculture, new jobs may be created as producers may better deliver their products through better integrated transport infrastructures. **Indirect jobs** are also created as a consequence of a possible growth of delivery services.

These infrastructure investments to be launched must target two objectives:

- ▶ To build up capital for sustainable development and inclusive growth: human capital including skills, employment (including green jobs) and entrepreneurship development, and physical capital such as construction, rehabilitation and maintenance of infrastructure and natural and productive resources,
- ▶ To assess the overall labour outcome of these investments in terms of direct and induced employment, not only to assess their short-term effects but also the longer-term impact on growth and its distributional effects.

During the AMP consultation process, Androsians clearly outlined the need for a greater decentralization process. Indeed, decentralized decision-making processes are usually faster and make the local population more committed to the projects. It improves targeting and its proper use and maintenance. Secondly, the works undertaken are usually on a smaller scale and involve less expensive tenders, which means there is less need for heavy machinery, and hence greater job creation for the amount invested. Third, decentralized decision making changes the scope of work and machinery involved.

PUBLIC INVESTMENT IN AN ECOSYSTEM-BASED APPROACH

The Andros Master Plan is an “Ecosystem-based development” one. Thus, responding to the increasing demand for a Green economy and adapting to climate change presents new opportunities for jobs, skills and entrepreneurship development. Infrastructure investments supporting new low emission production and consumption patterns, and the restoration of the productive natural resource base (protecting against floods regaining agricultural lands and forests, etc.) are crucial elements of a Green Jobs approach.

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|------------------------------|---|--|
| Economic & Social | <ul style="list-style-type: none"> • Direct economic benefits to communities through improved transportation on roads, • Direct economic and social benefits to communities through improved health care, • Direct economic and social benefits to communities through improved educational facilities, • Direct economic and social benefits to communities through improved sports facilities, • Direct economic and social benefits to communities through improved coastal protection arrangements, • Direct economic and social benefits to communities through improved access to areas of environmental interest, • Improved environment increasing the touristic appeal, | <ul style="list-style-type: none"> • Temporary impacts during construction – limited access to roads, bridges, schools, clinics and sports centers, • Temporary impacts during construction – noise, vibration and traffic due to construction vehicles. |
| Environmental | <ul style="list-style-type: none"> • Reduced emission levels from traffic and electricity production, • Improved Creek health, • Reduced impacts of flooding and other effects of climate change | <ul style="list-style-type: none"> • Water quality risk through increased suspended sediments / sedimentation during construction, • Noise and vibration pollution during construction. |

6. PRODUCTS & INDICATORS

OUTPUT

- ▶ Road and bridge infrastructure in good condition,
- ▶ Climate change study assessing infrastructure needs,
- ▶ Trails to locations of ecological interest,
- ▶ Traffic signage,
- ▶ Solutions to open up Sandy Creek, London Creek, Cargill Creek and Staniard Creek for restoring creek health are determined,
- ▶ Soft coastal protection measures in place and expanding into other locations replacing the need for improved or new seawalls,
- ▶ Traffic volumes at Fresh Creek and Stafford Creek bridges determined,

- ▶ New Public Library for North and Central Andros,
- ▶ Clinic and Doctor's and Nurse's residence improvements,
- ▶ Improved school in Fresh Creek,
- ▶ Flooding issues addressed at Behring Point School,
- ▶ New sports center in Mangrove Cay,
- ▶ Fresh Creek Sports Center Improved,
- ▶ New hurricane shelters provided in Mangrove Cay and South Andros,
- ▶ BEC relocated to alternate location with reduced emissions,
- ▶ Improved health of Sandy Creek, London Creek, Cargill Creek and Staniard Creek,
- ▶ New access road at Burnt Rock to provide access between hurricane shelters during high tides and storms,
- ▶ No build zones identified,
- ▶ Possible development of a University in Andros.

OUTCOME

- ▶ Reduced road travel times and vehicle deterioration,
- ▶ Improved safety on roads and bridges,
- ▶ Maintenance of roads and bridges addressed and future expense reduced and life span of infrastructure increased,
- ▶ Reduced erosion at coast and increased awareness of benefits of soft solutions as compared to hard coastal protection measures (i.e. seawalls),
- ▶ Improved Creek health,
- ▶ Increased knowledge of impacts of climate change to Andros,
- ▶ Improved health service,
- ▶ Improved safety during hurricanes,
- ▶ Increased benefits from economic and/or cultural activities in the districts,
- ▶ Increased employment related to economic / cultural activities,
- ▶ Reduced impacts of emissions from electricity production, improved aesthetics at Fresh Creek and space available for expansion of Fresh Creek Public Dock.

INDICATOR

- ▶ Reduced road travel times and vehicle deterioration,
- ▶ Limited degree of erosion at shorelines,
- ▶ Level of use of new Public Library,
- ▶ Benefits from economic and/or cultural activities in the districts,
- ▶ Number of jobs created in the districts,
- ▶ Improved Creek health,
- ▶ Improved health service.

| | | | | |
|---|-------------------------------------|-------------------------------------|-------------------------------------|--|
|  | Infrastructure | | | <h2>2 - Improvement and management of Andros airports</h2> |
| | All districts | | | |
| | ST | MT | LT | |
| | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | |

1. OBJECTIVE

The overall objective is to improve access to Andros in terms of safety and security as well as amenities and reliability.

The sub-objectives include:

- ▶ Upgrade existing airport facilities and services,
- ▶ Improve connectivity internationally, domestically as well as with other districts of Andros,
- ▶ Improve tourism in Andros,
- ▶ Reduce cost and travel time for travelers to and from Andros,
- ▶ Committing to an investment strategy to complete initial activities related to compliance of critical infrastructure and upgrades to existing airport facilities and services as necessary,
- ▶ Implementing revenue generation strategies (airport improvement fees, leases, concession agreements, airline charges, etc.) as leverage funding for the investment strategy,
- ▶ Implementing systems to formalize responsibilities, including budgeting, from a centralized to airport site-level operating model,
- ▶ Improve some landside investments, which although are not a high priority for compliance purposes, so support the economic development of the island economy by providing travelers with an inviting and welcoming processing area,
- ▶ Implement energy and water conservation efforts.

2. LOCATION

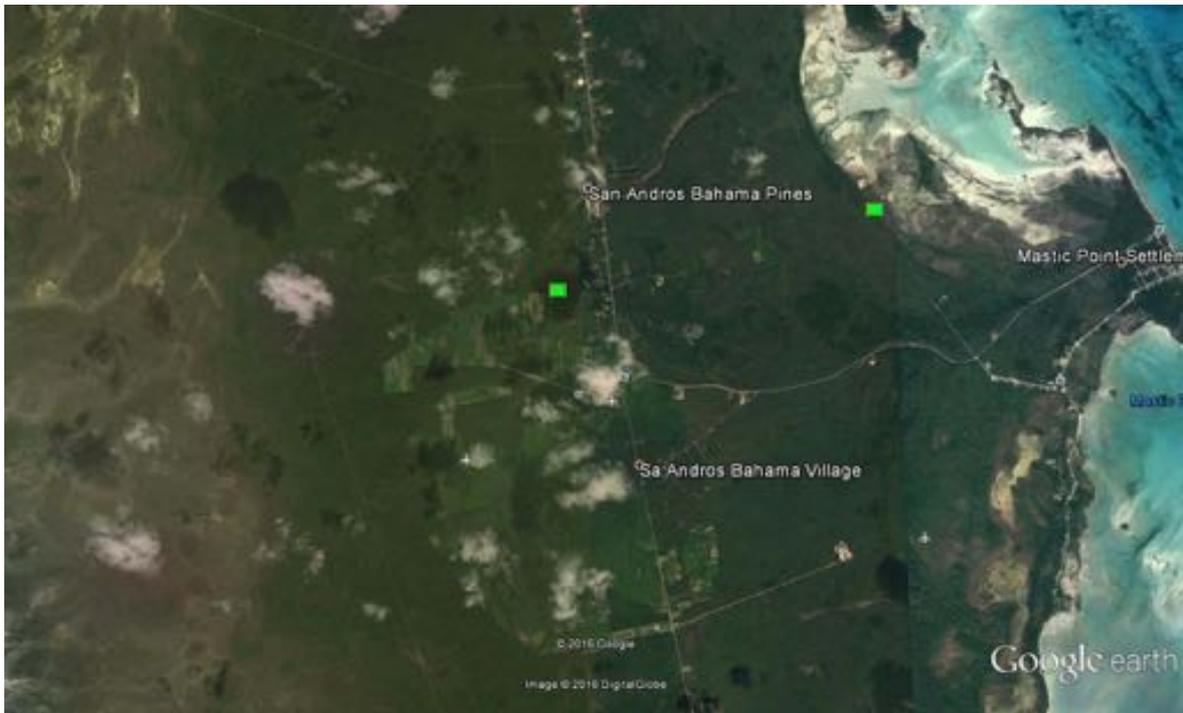
There are four (4) airports in Andros, connecting the island with Nassau and with the United States (Florida) for some, as indicated in the figure below:

- ▶ San Andros Airport in North Andros,
- ▶ Andros Town (Fresh Creek) International Airport in Central Andros,
- ▶ Clarence A. Bain Airport at Mangrove Cay,
- ▶ Congo Town Airport in South Andros.



SAN ANDROS AIRPORT, NORTH ANDROS

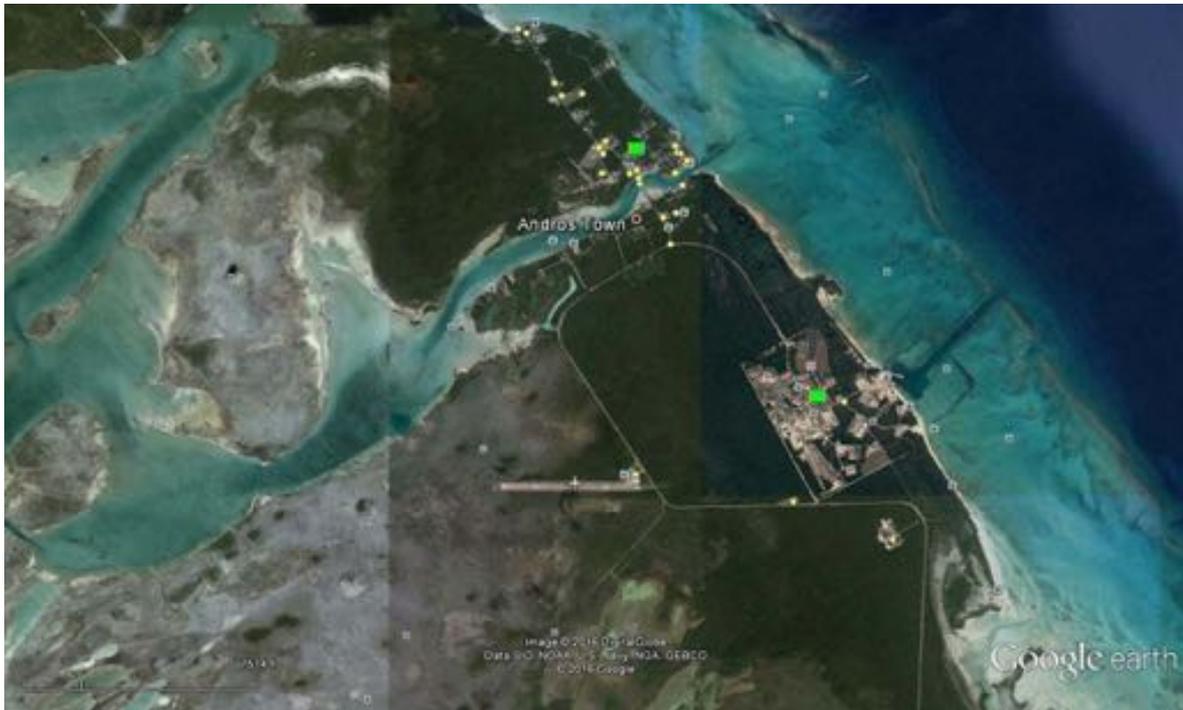
San Andros Airport is located in San Andros, a settlement central to the North Andros District. It is 6.3 miles south of Nicholl's Town, 4.8 miles west of Mastic Point and 34 miles north of Fresh Creek Airport. The airport is close to the main road and surrounded by farmland. Further afield the airport is surrounded to the north and south by pine forest and to the west by a margin of coppice followed by mangrove approximately one mile west of the airport. To the east is pine forest and coppice followed by mangrove and beach approximately three (3) miles from the airport.



San Andros Airport, North Andros

ANDROS TOWN (FRESH CREEK) INTERNATIONAL AIRPORT, CENTRAL ANDROS

Andros Town International Airport is located in the centre of Central Andros at the main settlement for the district as well as the main port for the district. This airport is 34 miles south of the North Andros Airport and is beside the main road. The airport is surrounded mainly by coppice with some mangrove. There are areas of pine forest further afield. To the east is the AUTEK base and there are beaches and the barrier reef.



Andros Town (Fresh Creek) International Airport, Central Andros

CLARENCE A. BAIN AIRPORT, MANGROVE CAY

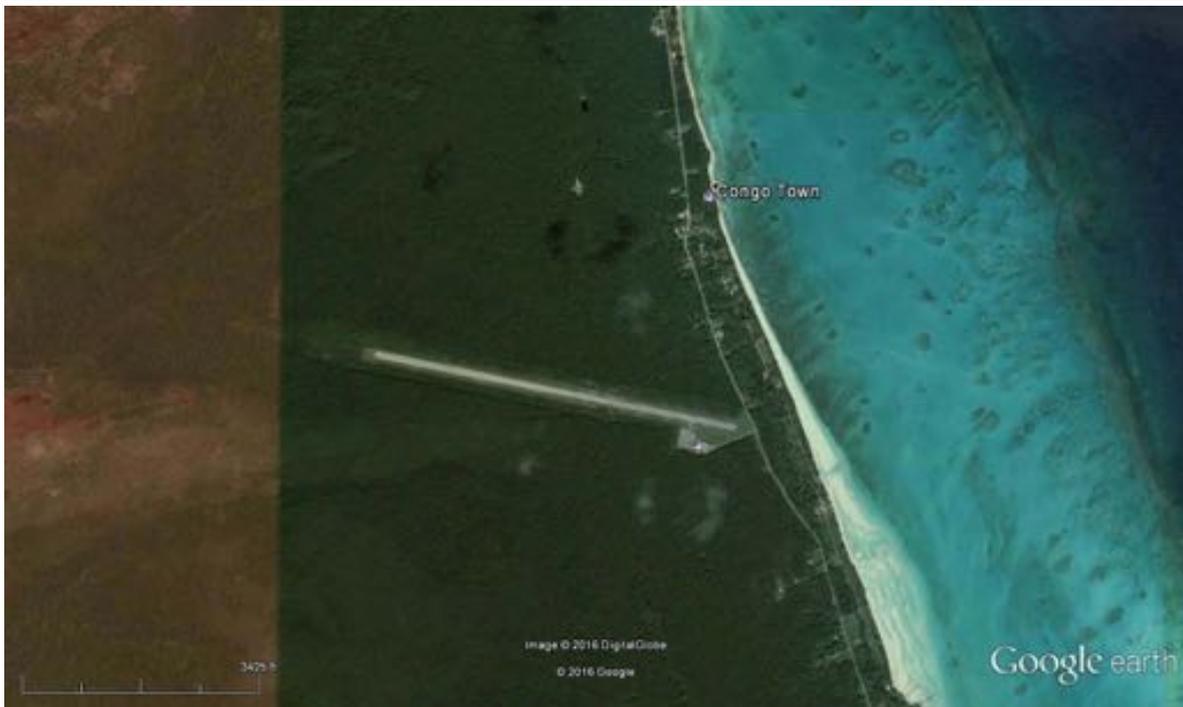
Mangrove Cay Airport is located at the north east of Mangrove Cay. It is half a mile from the north coast and 1,000 feet from the east coast. It is surrounded by coppice and pine forests. The closest mangroves are approximately 5.5 miles to the west of the airport. The airport is also beside the settlement of Moxey Town which is the largest residential area in mangrove Cay. The airport is seven miles north of Lisbon Creek where a free ferry service is currently provided to South Andros.



Clarence A. Bain Airport, Mangrove Cay

CONGO TOWN AIRPORT, SOUTH ANDROS

Congo Town Airport is 4 miles south of Driggs Hill, the northern most end of South Andros and the main port for South Andros and the location for the ferry service to Mangrove Cay. It is 21 miles north of the southern most settlement in South Andros, Mars Bay. The airport is surrounded by coppice forest. There is pine forest 2 miles to the west of the airport whilst there are no known mangrove areas in the area. The airport is 900 feet from the east shoreline where the barrier reef is a further 6,000 feet from the shore.



Congo Town Airport, South Andros

3. ACTION PROGRAMME

3.1 KEY ISSUES AND OPPORTUNITIES

Andros Island is served by multiple scheduled daily flights from Nassau by Western Air, Flamingo Air and LeAir. The flight to any of the four airports from Nassau is 15–25 minutes. Chartered flights provide direct service to Andros Town from Miami and Fort Lauderdale, Florida.

To ensure that the country, as a member of the Chicago Convention on International Civil Aviation and the International Civil Aviation Organization (ICAO), continues to meet its international obligations, the government introduced a civil aviation reform package in 2015, which includes several bills. In particular, the Civil Aviation Bill 2015 establishes the Civil Aviation Authority thereby separating the industry's operational oversight from its regulatory functions. Recent studies undertaken on airport operating conditions in the Family Island airports show that Family Island airport infrastructure is in need of improvement to ensure that these airports offer efficient, safe services. Estimates for these improvements are just over \$100 million.

The Bahamas Ministry of Transport and Aviation (MOTA) and Civil Aviation Department (CAD) retained Stantec Consulting International Ltd. to provide consulting services in support of the air transport reform of the institutional framework for the 28 Bahamas Family Islands Airports. In 2013, 97% of the visitor arrivals to Andros were by air and 3% by sea.

Overall, the Bahamas has seen a decrease in air traffic. Most of the cutbacks have been on the international routes compared to an expansion of the domestic markets (+1.6% p.a.). The Bahamas is expected to attract 138,000 by 2024, an increase of 3.5% p.a. This growth will not incur without investment in the product, which includes the Family Islands Airports. At present, the volume of activity at Andros is small. Of all of the Andros Airports, Andros Town Airport sees the most passengers with approximately 50,000 passengers in 2013 being rating 10th for the Family Island Airports for number of passengers. San Andros is 12th with approximately 10,000 passengers, South Andros/Congo Town 19th and Mangrove Cay 24th out of a total of 28 airports. It should be noted that practically all of these passengers were International passengers.

The main issues at the Andros Airports are as follows:

- ▶ Lack of Port of Entry Status at Mangrove Cay,
- ▶ Strip clearing for vegetation, trees and debris,
- ▶ Airfield lighting issues,
- ▶ Operational practices for on sites staff,
- ▶ Pavement condition and painting,
- ▶ Non-compliant ARFF equipment,
- ▶ General maintenance management systems and training,
- ▶ Security standards.

San Andros Airport

San Andros Airport serves North Andros and is classified as a Port of Entry (POE) or Airport of Entry (AOE) Airport. There is no fueling capability at the airport and only a single runway (5,002' x 100'). The lights can be activated remotely but only by the police and for emergencies.

There are Western Air flights twice a day daily, Watermakers three (3) times a day on Monday, Thursday, Saturday and Sunday. There are also other charters. Western Air have a relatively new large building with arrival and departure lounges. Western Air houses their maintenance facilities at the airport and flies Saab 340 aircraft. Western Air uses its own terminal building and not the government terminal. The Western Air passengers are not security screened at the airport. The government terminal consists of multiple module trailers and buildings with canopies between them, as well as an outdoor covered seating area. There are two retail spaces on site, one is a restaurant and the other is a liquor store. There are Immigration and Customs offices as well as a police office on site. There is no baggage or passenger screening equipment for outgoing passengers. The trailers and buildings are in poor condition with significant roof issues, mold growing in the walls and it is very poorly laid out. There are serious health concerns in the Immigration office due to the mold growth in the walls.

San Andros Airport is the airport in the Family Islands with the most non-commercial movements; in 2013, it is estimated that the airport handled 5,087 movements, representing 14 daily movements on average.

It is necessary to conduct further studies to better determine the feasibility of privatizing San Andros Airport to a degree to limit the demands of the airport on the National Budget. The state of the government terminal is very poor. This is a prime time to make arrangements for a level of privatization given the state of the public and private facilities. The public facilities are non-existent or in very poor condition and the private facilities are new and more than adequate for the airport.

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|---|---|
|  |  |
| <p><i>San Andros Western Air Facility from Airside</i></p> | <p><i>San Andros Airport from Landside (Public facility to left, Western Air Facility on right)</i></p> |
|  |  |
| <p><i>San Andros Airport from Landside (Western Air Facility)</i></p> | <p><i>San Andros Airport from Landside (Public facility)</i></p> |

Andros Town Airport

Andros Town (Fresh Creek) Airport is considered the International Airport for Andros. LeAir has two daily flights between Nassau and Watermakers two daily flights from the United States. Pineapple Air also has flights between Nassau. On a slow day the airstrip sees 26 flights and during Crab Festival (its busiest time) it sees more than 100 flights. The pavement is in particularly poor condition at the load and off-load area where it is necessary to improve drainage. Solar lights were recently installed.

The airstrip is 4362 feet long and 100 wide. The airstrip is in need of repairs to the pavement and operational improvements including general maintenance and upkeep of the airfield and a dedicated operations person with the training, ability, and resources to maintain the airport. The pavement on the airport is in an 'action required' status. Much of the pavement is breaking apart creating foreign object debris (FOD), the runway has no crown, and rutting and water is standing creating the potential for an aircraft to hydroplane. The taxiway is in similarly poor condition and has damage due to standing water over time. The apron is breaking apart very badly and the potential for tire damage or engine ingestion is high. It was reported that a number of tires are damaged each week at present.

Apparently, AUTEK is looking at bringing in a Hercules aircraft. This type of aircraft could create substantial damage to the already deteriorating pavement. As such, a MOU or agreement should be sought after with the U.S. Military to supply the manpower, resources, and capabilities to operate and maintain the airport as their aircraft will be a continuing factor in pavement deterioration. There could be the possibility to create a joint use airport agreement with the military.

The airport terminal consists of two buildings with a covered walkway between them. The overall function of the terminal is acceptable for this location. The building was in good condition. The parking lot next to the airport is free parking with no revenue collected for parked cars. There are no retail or food and beverage outlets at the airport. There is a bar across the street for the airport that also sells food but it is not associated with the airport through its land or any concession agreement.

Andros Town offers a mix of scheduled domestic and international operations. International operations, after reaching a peak of 9,754 passengers in 2011, have since declined to 6,064 by 2013. International scheduled service focuses on Fort Lauderdale and the decrease can be attributed to Continental which, following its merger with United, has reduced capacity to The Bahamas, including cessation of service to Andros Town Airport in 2012. Today, the airport relies on charter and private flights. Domestically, its operations rely on LeAir, which offers twice-daily service to Nassau.

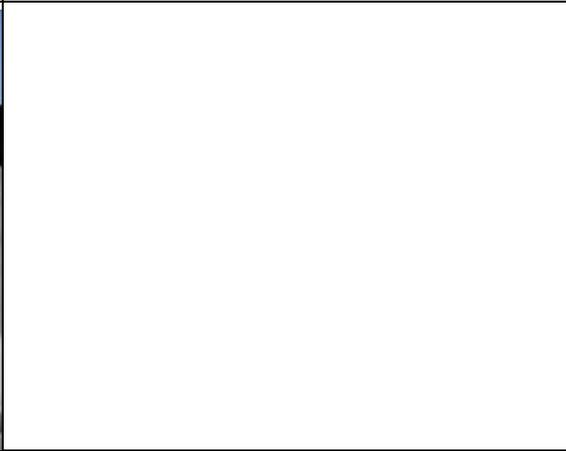
Andros Town Airport is the second busiest Family Island airport for non-commercial movements: in 2013, it is estimated that the airport handled 4,582 movements, representing 13 daily movements on average. Andros Town and San Andros together handled 50% of all noncommercial movements to the Family Islands in 2013.

Over the next 20 years, it is projected that demand is to increase annually by 1.5% to reach 22,507 passengers, where most of the demand will be linked to the projected eco-tourism development. By 2033, the airport is expected to handle 6,294 non-commercial movements representing 17 daily movements on average.

Congo Town Airport, which is situated in the southern portion of Andros Island, is one of the airports recommended by the Stantec reports for removal of its POE status. Should this occur, decreased international passengers and movements at Congo Town Airport will increase activity at San Andros Airport and Fresh Creek/Andros Town Airport. Under these circumstances, by 2033 Andros Town Airport would handle 24,078 total passengers and 8,071 total aircraft movements.

The closure of Congo Town Airport rather than Mangrove Cay Airport is considered questionable. South Andros has a far greater land mass than Mangrove Cay, with greater elevation than mangrove Cay. South Andros also has more development and is therefore considered to have more potential than Mangrove Cay in the long term. It is necessary to conduct further studies to better determine the feasibility of closing Congo Town Airport or alternatively Mangrove Cay Airport.

Studies should also be conducted to determine the feasibility of privatizing San Andros Airport to a degree to limit the demands of the airport on the National Budget, recognizing the impact this would have on the other airports in Andros including Andros Town Airport.

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| <p><i>Andros Town Airport Turnaround and Airside Entrance/Exit</i></p> | <p><i>Andros Town Airport Pavement</i></p> |
|  |  |
| <p><i>Andros Town Airport Pavement</i></p> |  |

Mangrove Cay/Clarence A. Bain Airport

Clarence A. Bain Airport (MYAB) in Mangrove Cay is the only airport on Mangrove Cay and is small with limited commercial service. In 2013, it is estimated that non-commercial movements reached 1,390, representing about four movements per day. There is a single runway (5,000' x 75'). The pavement is in poor condition and is without a crown with evidence of ponding.

There are two airlines that serve this airport, LeAir Charter and Flamingo Air. LeAir has scheduled flights twice a day, five days per week; while Flamingo Air has two flights a day, seven days per week. There are no scheduled international flights to/from the airport and only charter and private flights.

Without major economic or tourism growth planned for Mangrove Cay an aircraft movement growth is projected to be limited to 1% per annum, reaching 2,591 annual movements by 2033. Given the above scenario, the airport is expected to continue to receive some scheduled domestic service and domestic passenger service is projected to reach 2,127 by 2033, increasing at 1.3% per annum.

The Airport is not a Port Of Entry, which frustrates the local sponge and stone crab industry (economic wheel of Mangrove Cay) for exportation. There is a need to upgrade the airport to a POE and international status, which will include the presence of Customs and Immigration, a fire engine and an ambulance service. A taxi-way is also needed so that when one plane is at the terminal another can land.

Presently, visitors have to pre-clear in South Andros, Fresh Creek, or Nassau. The parking for passengers is free. There is a small concession shop in the terminal that sells hot food.

There is no fueling but there are lights that can only be activated by the police and for emergencies. There is one large fire extinguisher that expired and a town fire truck located at the town administration office that is not in a serviceable condition. Any expansion would be achievable with little difficulty, as the surrounding area is not restricted by surface variations or barriers to expansion of any part of the airport. There is no immigration or customs services offered at the airport nor screening for baggage.

As discussed earlier in consideration of the above airports the Government has recognized a need to reduce the number of airports in the country due to the high cost of running and maintaining the airports. The closure of either Congo Town Airport or Mangrove Cay Airport is considered one of the more likely airports to be feasible to close in particular given the volume of traffic and that there is a free ferry service between the two which is not far and often does not take very long. South Andros has a far greater land mass than Mangrove Cay, with greater elevation than Mangrove Cay. South Andros also has more development and is therefore considered to have more potential than Mangrove Cay in the long term. It is necessary to conduct further studies to better determine the feasibility of closing Congo Town Airport or alternatively Mangrove Cay Airport.



Congo Town Airport

Congo Town Airport serves South Andros and is classified as a Port of Entry (POE) or Airport of Entry (AOE) Airport. The international flights are charter or private flights from the US with no regular scheduled flight services. Western Air flies to/from Nassau however, service is unreliable as flights are sometimes canceled due to insufficient demand/bookings.

Congo Town Airport, which is situated in the southern portion of Andros Island, is one of the airports recommended for removal of its POE status. Should this occur, decreased international passengers and movements at Congo Town Airport will increase activity at San Andros Airport and Fresh Creek/Andros Town Airport. If this activity is transferred, by 2033 San Andros would handle 26,474 total passengers and 9,020 total movements.

There is no fueling capability at the airport and it is a single runway (5,300 x 100'). There are no operational vehicles or personnel present and the only firefighting capabilities available were two fire extinguishers with no inspection tags. The airport seems to meet the needs of the airport users at present, as there was no reported apron congestion or heavy amounts of traffic. There is none of the following at the airport :

- ▶ Screening equipment for baggage or passengers,
- ▶ Separate check-in, arrival and departure sections,
- ▶ An enclosed baggage waiting area to avoid getting wet from the rain,
- ▶ Fencing for the entire airport boundary,
- ▶ A fire engine (There is no fire engine on the island and one is especially needed at the airport. When there are fires on the island, homes are lost),
- ▶ A restaurant for people to sit down and have breakfast,
- ▶ Adequate airport security to secure the property of the visitors (private planes) and the grounds at the airport.

Many of the facilities that are present at the airport are not functional including the airport emergency water system and the emergency back-up generator, which also often lacks fuel. The fire extinguishers at the airport are considered unlikely to have been inspected regularly. The emergency lighting on the runway is controlled by the police who have the keys and can be difficult to find. It is also understood that the expansion of the Congo Town airport could be problematic as there are holes on the property.

Refer to the above section regarding Mangrove Cay Airport for further details on the possible closure of either Mangrove Cay or Congo Town Airport.



3.2 DEVELOPMENT STRATEGY - GENERALLY

The strategy for the airports in Andros needs to ensure that the island is well positioned to benefit from the improved tourism market conditions expected over the next 20 years, as well as the labor market. In order for Andros to capture a strong market presence in a very competitive Caribbean environment, it is crucial that the airports offer a high level of safety and services. This is particularly true not only for passengers and tourists but for retaining and attracting air carriers serving the market as well. An air carrier will pull out of a market at a moment's notice if it feels that it no longer makes economic sense to fly to and from as a destination. To achieve this, the first step must be to bring each of the key Airports into compliance with the relevant safety standards and international best practices.

AIRSIDE

Although each airport is unique in terms of its physical environment, activity level, user demographic and available services, the airports had similar issues and compliance gaps:

- ▶ Obstacles Infringing the Aeronautical Zoning – the aerodromes had some degree of obstacles within the airport boundaries infringing on the aeronautical zoning or established obstacle limitation surfaces. For the most part, the obstacles were trees, but also included buildings and towers. Many of the airport personnel consulted were not aware of the extent of the obstacle infringements or the zoning criteria specific to their airport. It is evident from aerial photographs that at one time extensive tree clearing had been done at most of the aerodromes in compliance with the zoning. However, a regular program of tree cutting and removal was not maintained.
- ▶ Miss-Match of Operational Demand with Runway Capability – There are Airports whose runway infrastructure either exceeds or is inadequate to meet the required operational demand.
- ▶ Aircraft Parking Aprons Within the Runway Strip – The aircraft parking aprons were found to be situated within the runway strip or close enough that aircraft tails would be infringing the runway transition surface.
- ▶ Lack of Physical Infrastructure Maintenance – It is evident at most of the Airports that there is a lack of regular and preventative maintenance. This has resulted in airport physical infrastructure and equipment prematurely deteriorating. For example, at many of the aerodromes, the shoulder gravel along the runway edge has not been maintained which has resulted in not only a significant vertical drop along the edge but also a premature breakup of the asphalt pavement. With respect to the airfield lighting, all of the assessed airports had some degree of damaged, missing or noncompliant lighting fixtures (i.e., incorrect lens color, incorrect location or alignment).
- ▶ There are multiple reasons for the lack of maintenance: little or no maintenance training, inadequate or unserviceable maintenance equipment, no structured maintenance program, delays in receiving parts and equipment, lack of a dedicated maintenance budget for each airport, etc.
- ▶ Inadequate Runway Visual Aids – The Airports have no runway pavement markings and the use of lighting equipment is strictly controlled. It is understood that the government is concerned about airport use by smugglers (contraband and persons) and thus limits the availability of runway visual aids. However, the safety of aircraft and passengers should always be paramount. The control of smuggling activity at the airports therefore should be handled by other means, such as increased law enforcement inspection and vigilance, after-hours detection of aircraft (i.e., use of motion-sensors at the apron entrance which triggers an alert to law enforcement officers).
- ▶ Security and Wildlife Control – The Airports are situated in remote or sparsely populated areas which expose the aerodromes to wildlife interaction that can be a serious hazard to aviation. Many of the airport representatives consulted reported runway crossing by wild boars, hog, dog, crabs and other wildlife. Serious incidents have occurred in the past and BCAD has reacted to those by erecting perimeter fencing. However, typical chain link security fencing can be costly. 3-strand wildlife control fencing is considered more effective.

Consultations have suggested that some airports continue to have issues with the public wandering onto airside areas or driving along or across the runway (such, as at San Andros). At these locations, standard perimeter security fencing will be required in order to deter public entry.

The investment by the government in Andros' Airports is a delicate issue, requires a careful, and well laid out plan that is consistent, transparent and based on criteria that support the safe operation of the airports while ensuring the capacity is in step with the economic potential and anticipated growth for the next 20 years. The Ministry of Transport and Aviation and Department of Civil Aviation Comprehensive Strategy for Optimization of the Family Islands Airports Report ranked and prioritized the proposed capital development requirements in order to develop a realistic implementation strategy which recognizes the resource and funding limitations. These results have been taken into consideration in determining the strategy for Andros.

Detailed airport development plans were prepared as part of the 2014 report to address the specific compliance gaps, as well as address traffic and operational demands from users. The development plans are included, along with a plan of the existing airport layout and operational conditions.

It is recommended that the aerodrome development works be implemented in stages over a five-year development period. The following should be the priority ranking for the works:

- ▶ Obstacle clearance within the runway strip and other major hazards to aviation,
- ▶ Obstacle clearance beyond the runway strip, visual aids (lighting, markings, PAPIs) and security and wildlife control,
- ▶ Pavements and other physical infrastructure within the airside areas, as well as infrastructure related to the provision of emergency response,
- ▶ Infrastructure situated external to the airside areas (landside), as well as any other works, which are not critical to maintain operational safety and security.

LANDSIDE

San Andros

At present, the Government facilities are in a state of disrepair and a new facility is required (based on 3110 sq. ft.).

Western Air has two large, new buildings that although private, apparently houses Custom in one of them. There are also two restaurants/bars located within the Western Air buildings. The Western Air facility seems to be under-utilized, and there is a major need for the airport facilities for other airlines to be improved. The cost of a new facility to meet the needs of this location is estimated at over \$1.2 million. This cost seems to be an unnecessary expense at this time, especially if an agreement can be met with Western Air to house and maintain all airport facilities.

Western Air and Watermakers are the two main carriers that utilize this airport for which running costs are high for the relatively small number of persons benefiting from alternate facilities. There is no national carrier service to Andros at present, and the major international airport for Andros is at Andros Town, 30 miles south of San Andros Airport. Therefore, San Andros Airport seems to lend itself to a lease agreement and private management. Improvements should be incorporated either prior to or as part of the lease agreement as best negotiated.

Andros Town

The airport terminal consists of two buildings with a covered walkway between them. One building is the departures and domestic arrivals building while the other building is used for the international arrivals where the Immigration/Customs are located. The overall function of the terminal is acceptable for this location.

There is no screening equipment for departing passengers at this airport. The building was in good condition. Some minor repair and painting are required to the interior and exterior walls. The roof needs minor repairs and the soffits need to be repaired and repainted. In the washrooms, the cabinets need to be repaired or replaced and the partitions need to be repainted. The plumbing fixtures in this location are in good shape. The parking lot next to the airport is free parking with no revenue collected for parked cars. There are no retail or food and beverage outlets at the airport. There is a bar across the street from the airport that also sells food, but it is not associated with the airport through its land or any concession agreement. Therefore, Andros Town Airport is in need of Domestic / International terminal upgrades/repairs including plumbing upgrades and expansion with a new terminal to adequately facilitate the volumes of traffic at the airport.

Clarence A Bain (Mangrove Cay)

The airport does not have immigration or customs services however this airport, for its intended use, is in acceptable condition. The parking for passengers at the airport is free. There is a small concession shop in the terminal that sells hot food but we are not aware if they pay rent for the space they occupy. There is no other concession facility on the airport grounds. There is no equipment at the airport for screening of baggage or passengers. Screening is only done by visual checks. The light fixtures inside the terminal should be replaced with more efficient fixtures and, at a minimum, the lenses should be reinstalled or replaced. Washrooms should be upgraded with low flush-elongated water closets with new open front seats. The fencing around the terminal building requires fixing. Therefore the Mangrove Cay Airport is in need of domestic upgrades to the lighting, washroom and repairs to the fencing in the area around the building estimated at \$6,800.00.

Congo Town

There is a concession booth in the terminal that provides hot food. There is a gift shop in the parking lot but we are unsure if the gift shop is on airport land and if they are paying any rent for the location. The parking lot does not collect any revenue for the vehicles parked there. There is no screening equipment for baggage or passengers, visual checks only.

The airport terminal is in poor condition. There are a number of cracks showing up in the exterior walls. The floors in the washroom along the walls are cracked. Water stains on the ceiling indicate that the roof is leaking. The washrooms are in poor condition and not easily accessible. The water supply to the building is an issue as water is trucked to the site. The storage tank must be checked constantly to ensure sufficient water is available for the washroom. The light fixtures throughout the terminal are in poor condition and should be replaced with more efficient light fixtures. The building itself is not passenger or staff friendly and could do with a major renovation or replacement. Congo Town Airport is presently oversized for its use however, it is in need of domestic upgrades estimated at \$92,800.00.

Airport Mobile Equipment

The following mobile equipment is required at the airports:

San Andros

- ▶ Small wheel foam tank – trailer mounted capable of meeting the intent of ICAD RFF Category 2,
- ▶ Four wheel drive pick-up truck (1 Ton capacity),
- ▶ Airfield lighting spares fixtures,

Andros Town

- ▶ Small wheel foam tank – trailer mounted capable of meeting the intent of ICAD RFF Category 2 – Fresh Creek Airport should establish a MOU agreement with others for use in emergencies,
- ▶ Rolling fire extinguisher,
- ▶ Four wheel drive pick-up (1 Ton capacity),
- ▶ Airfield lighting spares fixtures.

Clarence A Bain (Mangrove Cay)

- ▶ Small wheel foam tank – trailer mounted,
- ▶ Six wheel all terrain utility vehicle,
- ▶ Airfield lighting spares fixture.

Congo Town

- ▶ Rolling fire extinguisher,
- ▶ Six wheel all terrain utility vehicle,
- ▶ Airfield lighting spares fixtures.

3.3 DEVELOPMENT STRATEGY – BY STEP

Airports have historically played and will continue to play an important role in the development of mankind. Air transportation has been described as the fastest and safest means of transportation, which implies that it is the fastest means of transporting business between different locations, either locally or internationally.

At the international level, a country's economic growth is determined by the frequency level and nature of its relationship with other economies. This means that airports are an important element in this growth. At the local level, airports also play a major role in economic growth by facilitating the movement of goods and people, including service providers between different locations in the shortest possible time. As a result, airports have contributed greatly to the wealth of their related areas.

The overall strategy is to develop the airports of Andros as the sustainable ports of entry for commercial and recreational flights with the main airport for Andros being the Andros Town Airport. The strategy is to be developed in three different steps, corresponding to three different stages in time:

- ▶ At short term: existing infrastructure is repaired, basic services are added, some land and airside facilities are improved, safety and security is improved, additional employees are utilized, training provided and a maintenance program initiated,
- ▶ At medium term: landside facilities are further improved for income generation and investors for long term development are sought,
- ▶ At long term: the airports are further developed as profit centers.

By developing infrastructure and services at Andros' airports, as well as developing of the eco-tourism attractions and access, more flights should be attracted on a daily and monthly basis. The establishment of facility fees/taxes could make the airports profitable.

A preliminary list of activities and investments to be undertaken are presented below:

Short term – up to 5 years (2020)

- ▶ Studies to determine the feasibility of privatizing San Andros Airport to a degree and the potential closure of Mangrove Cay airport or other airport to limit the demands of the airport on the National Budget, recognizing the impact this would have on the other airports in Andros,
- ▶ Implement revenue generation strategies (airport improvement fees, leases, concession agreements, airline charges, etc.),
- ▶ Implement systems to formalize responsibilities, including budgeting, from a centralized to airport site-level operating model,
- ▶ Proper monitoring and maintenance of fire protection equipment,
- ▶ Studies to determine likely impacts of climate change and relevant mitigation measures,
- ▶ Proper zoning guidelines to limit construction in close proximity to the airports to reduce future noise concerns and allow for airport expansion,
- ▶ Provide ARFF support at the required level for the aircraft activity,
- ▶ Airfield strip maintenance including tree clearing for proper strip set-backs,
- ▶ Address airfield lighting deficiencies with replacement of lights and corrective action on lenses as well as sustainable power,
- ▶ Consider security fencing for airside areas,
- ▶ Runway resurfacing with proper crowning and slopes for drainage,
- ▶ Provide apron and runway markings once the repaving has been completed,
- ▶ Consider removal of the government terminal facilities at San Andros and either redevelop a new international facility or integrate into the Western Air facility and lease space,
- ▶ Discussions with US Military on Possible ARFF coverage at Andros Town Airport.

Medium term – up to 10 years (2030)

- ▶ Continued maintenance,
- ▶ Continued improvements to landside infrastructure with particular attention paid to climate change study's findings,
- ▶ Consider upgrading Andros Town Airport to enable night time operations,
- ▶ Consideration given to leasing Congo Town Airport once impacts of extended water supply to South Andros, new ferry service between South Andros and Central Andros and other Master Plan projects are realized.

Long term – up to 25 years (2040)

- ▶ Review adequacy of facilities for actual and projected growth into the future.

3.4 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effects regarding the different key pillars related to the Sustainable Prosperity Scenario of development:

| | |
|---------------------------|--|
| Major positive impact | |
| Contribution | |
| No effect | |
| Potential negative impact | |

| Action | |
|---|--|
| Food and water security | |
| Connectivity and accessibility | |
| Education and capacity building | |
| Climate change and coastal resilience | |
| Livelihoods and income equality | |
| Land tenure security, land use planning and enforcement | |
| Health and wellbeing | |
| Strengthening local government | |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| | Sub activities | Institution responsible | Source of funding |
|-------------------|---|---|-------------------|
| Short term | Description | | |
| | General | | |
| | Studies to determine the feasibility of privatizing San Andros Airport to a degree and the potential closure of Mangrove Cay airport or other airport to limit the demands of the airport on the National Budget, recognizing the impact this would have on the other airports in Andros. | MTA – Bahamas Civil Aviation | Public |
| | Implement revenue generation strategies (airport improvement fees, leases, concession agreements, airline charges, etc.) | MTA – Bahamas Civil Aviation | Public |
| | Implement systems to formalize responsibilities, including budgeting, from a centralized to airport site-level operating model. | MTA – Bahamas Civil Aviation | Public |
| | Proper monitoring and maintenance of fire protection equipment | MTA – Bahamas Civil Aviation | Public |
| | Studies to determine likely impacts of climate change and relevant mitigation measures. | MTA – Bahamas Civil Aviation / BEST | Public |
| | Zoning about the airports in Andros to limit construction in close proximity to the airports to reduce future noise concerns and allow for airport expansion. | MTA – Bahamas Civil Aviation | Public |
| | San Andros Airport | | |
| | Provide ARFF support at the required level for the aircraft activity | MTA – Bahamas Civil Aviation is to establish the equipment gaps and provide the support for the airport | Public |

| | | | |
|----------------------------|--|--|--------|
| | Airfield strip maintenance including tree clearing for proper strip setbacks. | MTA – Bahamas Civil Aviation to contract on a one time basis for the Andros Airports strip clearing and review | Public |
| | Address the airfield lighting deficiencies with replacement of lights and corrective action on lenses as well as sustainable power. | MTA – Bahamas Civil Aviation to contract for the repair of airfield lighting and ensure it is compliant. | Public |
| | Consider security fencing for airside areas | MTA – Bahamas Civil Aviation to plan, design and install airfield fencing. | Public |
| | Plan for a runway resurfacing with proper crowning and slopes for drainage | MTA – Bahamas Civil Aviation to contract for a resurfacing of the runway and apron (in phases) | Public |
| | Provide apron and runway markings once the repaving has been completed | MTA – Bahamas Civil Aviation to contract for painting the proper site markings for the runway and apron with airport paint. | Public |
| | Consider removal of the government terminal facilities and either redevelop a new international facility or integrate into the Western Air facility and lease space. | MTA – Bahamas Civil Aviation to consider the requirements for passenger processing and improve the screening and customs/immigration facilities | Public |
| Andros Town Airport | | | |
| | Pavement repair | MTA – Bahamas Civil Aviation – Contract the pavement work. This should be put out to tender but also done to follow on from the road reconstruction project to eliminate the need for remobilization of equipment. This should also be discussed with the US military regarding possible cost sharing for pavement upgrades. | Public |
| | Airfield lighting | MTA – Bahamas Civil Aviation to establish an airfield lighting program to ensure the lighting is operational, with correct lenses and cost effective lights. | Public |

| | | | |
|-----------------------------|---|---|--------|
| | Runway and apron markings | MTA – Bahamas Civil Aviation to contract on a one-time basis for the pavement line and markings painting (with proper aviation paint). Review to ensure work has been completed satisfactorily. | Public |
| | Discussions with US Military on Possible ARFF coverage | MTA – Bahamas Civil Aviation – senior administration to negotiate MOU/MOA – Ministry of Foreign Affairs – Ministry of Transportation and Aviation | Public |
| | Airfield strip maintenance including tree clearing | MTA – Bahamas Civil Aviation to contract for strip obstruction maintenance and review the compliance and quality of work. | Public |
| | Consider airfield fencing to minimize the incursions | MTA – Bahamas Civil Aviation to identify the area to be fenced and contract for fencing | Public |
| | Building repairs are required for the roof, replacement of exterior wood doors, soffit repair, replacement of light fixtures, washroom tiles and general painting for the building. | MTA – Bahamas Civil Aviation to contract the building repairs and painting to freshen up the facility. | Public |
| Mangrove Cay Airport | | | |
| | Airfield strip maintenance including tree clearing | MTA – Bahamas Civil Aviation to contract for the clearing and review the compliance and quality of work. | Public |
| | The runway requires resurfacing with proper crowning | MTA – Bahamas Civil Aviation to plan for a paving of the runway | Public |
| | Ensure the fire extinguisher is refilled and working | MTA – Bahamas Civil Aviation to address the proper monitoring of fire protection equipment. | Public |
| | The terminal facility requires upgrades to the lighting, washroom and repairs to the fencing in the area around the building. | MTA – Bahamas Civil Aviation to address the terminal | Public |

| | | | |
|--------------------|--|---|--------|
| | Congo Town | | |
| | Clear the runway strip of noted objects (including checking the approach obstructions). | MTA – Bahamas Civil Aviation to arrange for the clearing of the strip and the paved surfaces of debris and objects, | Public |
| | Line markings on runway and apron to direct aircraft | MTA – Bahamas Civil Aviation to arrange for line painting and markings to be applied to the paved areas | Public |
| | Airfield strip maintenance including tree clearing | MTA – Bahamas Civil Aviation to contract for the clearing and review the compliance and quality of work. | Public |
| | Clear the vegetation around the runway and taxiway edge lighting and fix the broken lights as well as replace missing lens with the correct colours. | MTA – Bahamas Civil Aviation to address the airfield lighting deficiencies and implement a proper maintenance program | Public |
| | Ensure the fire extinguishers are operational and add inspection tags | MTA – Bahamas Civil Aviation to ensure the fire protection at airports is inspected regularly and equipment is in good condition. | Public |
| | Major renovations to the terminal building including roof, washrooms, water, checking Air Conditioning units, replace lighting and convert the building to an accessible standard. | MTA – Bahamas Civil Aviation to plan for and contract the terminal building work to bring the facility up to standard. | Public |
| Medium term | Description | | |
| | Continued maintenance | MTA – Bahamas Civil Aviation | Public |
| | Continued improvements to landside infrastructure with particular attention paid to climate change studies. | MTA – Bahamas Civil Aviation | Public |
| | Consider upgrading Andros Town Airport to enable night time operations. | MTA – Bahamas Civil Aviation | Public |

| | | | |
|------------------|---|------------------------------|--------|
| | Consideration given to leasing Congo Town or Mangrove Cay Airport once impacts of extended water supply to South Andros, New Ferry service between South Andros and Central Andros and other Master Plan projects are realized. | MTA – Bahamas Civil Aviation | Public |
| Long term | Description | | |
| | Review adequacy of facilities for actual and projected growth into the future. | MTA – Bahamas Civil Aviation | Public |

4.2 COSTS ESTIMATION

| Sub activities | | Estimated costs |
|---|---|--------------------|
| | | Total amount (k\$) |
| Short term | General | |
| | Studies to determine the feasibility of privatizing San Andros Airport to a degree and the potential closure of Mangrove Cay airport or other airport to limit the demands of the airport on the National Budget, recognizing the impact this would have on the other airports in Andros. | To be Determined |
| | Implement revenue generation strategies (airport improvement fees, leases, concession agreements, airline charges, etc.) | - |
| | Implement systems to formalise responsibilities, including budgeting, from a centralized to airport site-level operating model. | - |
| | Arrangements with other departments for shared proper monitoring and maintenance of fire protection equipment. | - |
| | Additional Staff (managers, clerical personnel, fire fighters, maintenance personnel and security. | - |
| | Training provided to new and existing staff. This should include IATA IKO Approved training. Arrangements should be made for IATA IKO Approved training of airport personnel at a National level. | 20 |
| | Studies to determine likely impacts of climate change and relevant mitigation measures. | 70 |
| Zoning about the airports in Andros to limit construction in close proximity to the airports to reduce future noise concerns and allow for airport expansion. | - | |

| San Andros | |
|---|-----------------|
| Airside Improvements | |
| Rehabilitate Runway and Taxi Pavement | 8,054 |
| New Solar Illuminated Wind Direction Indicator | 35 |
| New Aircraft Turn Pad | 290 |
| New Runway Pavement Markings | 23.6 |
| Remove Trees and Vegetation From Runway Strip and Infringing Transition Surface and Approaches and Regrade Runway Strip | 384 |
| In-fill Wetland Area Encroaching Runway Strip | 80 |
| Expand Aircraft Parking Apron | 418 |
| New Solar Runway Edge/Threshold/End Lights and Decommission Existing Lighting System | 113 |
| New PAPI Installation (Each Approach) | 340 |
| New Perimeter Security Fence in Select Areas | 95 |
| New 3-Strand Wildlife Control Fencing Around Airport Perimeter | 182 |
| Sub-total San Andros | 10,014.6 |
| Airport Mobile Equipment | |
| Small wheel foam tank – trailer mounted capable of meeting the intent of ICAD RFF Category 2 | 28 |
| Four wheel drive pick-up (1 Ton capacity) | 38 |
| Airfield lighting spares | 12 |
| Sub-total | 116 |
| Landside Improvements | |
| Consider removal of the government terminal facilities and either redevelop a new international facility or integrate into the Western Air facility and lease space. Integration into the Western Air facility is considered preferable however, for budgeting purposes, the most expensive option of as new facility is included here. | 1,212.9 |
| San Andros Sub-Total | 10,130.6 |

| Andros Town | |
|---|----------------|
| Airside Improvements | |
| Rehabilitate Runway and Taxi Pavement | 5,150 |
| Extend Runway to 4800 feet | 785 |
| New Solar Illuminated Wind Direction Indicator | 35 |
| New Solar Runway Edge/Threshold/End Lights and Decommission Existing Lighting System | 120 |
| Remove distance remaining signs | 5.5 |
| New Aircraft Parking Apron with Taxiway connection | 1,400 |
| Remove Trees and Vegetation From Runway Strip and Infringing Transition Surface and Approaches and Regrade Runway Strip | 352 |
| Aircraft Turn Pad | 110 |
| Displace Rwy 27 Threshold by 300' | 8 |
| Complete Airport Perimeter Security Fence | 140 |
| Remove and Decommission Existing Taxiway | 30 |
| Remove and Decommission Existing Apron | 38 |
| Sub-total | 8,173.5 |
| Airport Mobile Equipment | |
| Rolling fire extinguisher | 3.8 |
| Four wheel drive pick-up (1 Ton capacity) | 38 |
| Airfield lighting spares | 12 |
| Sub-total | 81.8 |
| Landside Improvements | |
| Building repairs are required for the roof, replacement of exterior wood doors, soffit repair, replacement of light fixtures, washroom tiles and general painting for the building. | 395 |
| Sub-total | 395 |
| Andros Town Sub-Total | 8255.3 |

| Clarence A Bain (Mangrove Cay) | |
|---|----------------|
| Airside Improvements | |
| Decommission and Remove a Portion of Existing Aircraft Apron | 30 |
| New Solar Wind Direction Indicator | 33 |
| Full Rehabilitation of Runway Pavement | 7,240 |
| New Runway Pavement Markings | 26 |
| Relocate Public Parking Lot | 225 |
| Remove Trees and Heavy Vegetation From Runway Strip and Infringing Transition Surface | 388 |
| Remove Tall Trees from Under Approach Surfaces | 80 |
| Expand Aircraft Parking Apron | 780 |
| Sub-total | 8,802 |
| Airport Mobile Equipment | |
| Rolling fire extinguisher | 3 |
| Six wheel all terrain utility vehicle | 12 |
| Airfield lighting spares | 4.5 |
| Sub-total | 20.3 |
| Landside Improvements | |
| Building repairs are required for the roof, replacement of exterior wood doors, soffit repair, replacement of light fixtures, washroom tiles and general painting for the building. | 6.8 |
| Sub-total | |
| Clarence A Bain (Mangrove Cay) Sub-total | 8,822.3 |

| Congo Town | |
|--|----------------|
| Airside Improvements | |
| Apron Safety Marking and Aircraft Holding Point Marking and Sign | 4.5 |
| New Solar Illuminated Wind Direction Indicator | 33 |
| Minor Repairs to Apron Pavement | 200 |
| New Runway Pavement Markings | 27 |
| Reduce Runway Length by 112' and Change Rwy 28 Threshold Displacement to 400' | 10 |
| Remove Trees & Vegetation From Runway Strip and Infringing Transition Surface & Approaches | 470 |
| New Aircraft Turn Pad | 200 |
| Expand Aircraft Parking Apron | 960 |
| Relocate Airport Access Road | 220 |
| New PAPI Installation | 175 |
| Sub-total | 2,299.5 |
| Airport Mobile Equipment | |
| Rolling fire extinguisher | 3.8 |
| Six wheel all terrain utility vehicle | 12 |
| Airfield lighting spares | 4.5 |
| Sub-total | 20.3 |
| Landside Improvements | |
| Major renovations to the terminal building including roof, washrooms, water, checking Air Conditioning units, replace lighting and convert the building to an accessible standard. | 94 |
| Sub-total | 94 |
| Congo Town Sub-Total | 2,413.8 |
| Grand TOTAL short term | 29,712 |

The landside costs also have addressed the repairs and maintenance items that would enhance the travelers' experience and the safety and cost effectiveness of the airport facilities. The facility costs of structures for the storage of Aircraft Rescue and Fire Fighting (ARFF) equipment is also included in the landside cost assessment for the airports.

4.3 SOURCES OF FUNDING

- ▶ The World Bank International Financing Company (IFC),
- ▶ Government financing,
- ▶ Private sector.

4.4 MANAGEMENT MODEL

The management model for Andros' airports is part of the overall current thinking, at national level, regarding all family islands' airports.

The proposed model could be a Public-Private Partnership for the following reasons:

- ▶ Private operators are required to raise financing and take construction/renovation risk,
- ▶ Operating/maintenance risks transferred to private sector,
- ▶ Bahamas Airport Authority retain ownership and regulatory control,
- ▶ Leverage private sector expertise to improve operational efficiencies and level of service.

BENEFITS TO THE BAHAMAS AIRPORT AUTHORITY

- ▶ Asset ownership and regulatory control remains with The Bahamas Airport Authority,
- ▶ Private concessionaire responsible for financing, construction/renovation and operation,
- ▶ Operations and maintenance risks transferred to the concessionaire during the concession period,
- ▶ Concession for a finite period with the option to renew,
- ▶ Remuneration for The Bahamas Airport Authority through annual concession fees (as a % of gross revenues),
- ▶ Performance managed through a concession contract that stipulates clearly defined, performance standards and financial penalties for non-compliance.

BENEFITS TO THE PRIVATE SECTOR

- ▶ Potential for future growth in traffic,
- ▶ Foreign exchange risks as airports generate revenues in hard currency,
- ▶ Potential to improve airport amenities and increase commercial revenue,
- ▶ Ability to introduce operational efficiencies and improve financial performance,
- ▶ Opportunities may exist to develop auxiliary activities.

BENEFITS TO THE GOVERNMENT OF THE BAHAMAS

- ▶ Reduction in risks related to airport project development,
- ▶ Potential for new revenue streams,
- ▶ Transfer risks related to operation and maintenance,
- ▶ Access to private sector financing, freeing Government budgets for other priorities,
- ▶ Introduces operational efficiencies,
- ▶ Retains ownership of strategic assets.

4.5 STUDIES NEEDED FOR EXECUTION

- ▶ Studies to determine the feasibility of privatizing San Andros Airport to a degree and the potential closure of Mangrove Cay airport or other airport to limit the demands of the airport on the National Budget, recognizing the impact this would have on the other airports in Andros,
- ▶ Land tenure verification for zoning purposes,
- ▶ Feasibility studies,
- ▶ Environmental impact studies,
- ▶ Climate Change Study - Without information on the elevation of the airports and local topography, it is difficult to comment on the likely impacts of climate change. All of the airports seem to be at elevations that may be affected by flooding during severe rain events as well as extreme surge events for the airports closer to the shores. Further information with regards to topography and storm modelling is necessary in order to be able to determine the likely impacts and thereby any mitigation measures. These studies should be conducted prior to the implementation of the improvements.

4.6 PRIORITY AND RELATION TO OTHER INITIATIVES

- ▶ Aligned with Vision2040: The National Development Plan.

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

Beneficiaries include:

- ▶ Local residents of Andros,
- ▶ The local authorities of Andros,
- ▶ Foreign and domestic visitors arriving by air,
- ▶ Local tourism businesses including hotels, lodges, food and beverage establishments,
- ▶ National or international air transport companies (LeAir, Flamingo Air, Western Air, Watermakers, and Private Charters).

BENEFITS EXPECTED

- ▶ Employment,
- ▶ Labor and skills,
- ▶ Tourism,
- ▶ Inward investment,
- ▶ Competitiveness, regeneration.

DIRECT JOBS CREATION

Relate to those employed on site: airlines, shops, concessions, catering, ground engineering and handling, air traffic, control, car-parking facilities.

INDIRECT JOBS CREATION

Relate to those employed in companies off-site supplying goods and services to the Airports. These jobs may be locally based or remote from the Airports.

INDUCED JOBS CREATION

Relate to jobs generated by the spending of wages and salaries earned by employees in the direct and indirect created jobs.

No estimate of future jobs can be calculated as there is no assessment of the forecast passenger growth and the potential development derived from it.

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|------------------------------|---|--|
| Economic & Social | <ul style="list-style-type: none"> • Economic benefits through increased employment related to airport activities, • Improved environment increasing the touristic appeal, • Improved functional airport facilities and urban space for local residents. • Improved facilities for travelers • Improved fire and rescue equipment • Improved local knowledge in aviation • Improved safety and security • Improved morale of locals | <ul style="list-style-type: none"> • Added demand on country budget • Temporary impacts during construction – limited access to airport, • Temporary impacts during construction – noise, vibration and traffic due to construction vehicles. |
| Environmental | <ul style="list-style-type: none"> • Improved aviation practices and safety, • Reduced impact of fire and other accidents. • Reduced likelihood of loss of wildlife | <ul style="list-style-type: none"> • Temporary construction impacts including noise and vibration pollution during construction. |

6. PRODUCTS & INDICATORS

OUTPUT

- ▶ Design studies for airport repairs, improvements and additions,
- ▶ Aviation infrastructure in good conditions,
- ▶ Climate change studies assessing long-term airport needs,
- ▶ Functional airport facilities (potable water, repaired rooves, fire equipment etc.),
- ▶ Additional and trained personnel,
- ▶ Agreed management of airports with local management.

OUTCOME

- ▶ Long-term requirements of airports determined in terms of climate change,
- ▶ Safer travel for travelers,
- ▶ Increased number of foreign and domestic visitors in Andros,
- ▶ Increased employment related to airport activities.

INDICATOR

- ▶ Number of flights at airports,
- ▶ Number of visitors in Andros,
- ▶ Lack of accidents and issues during emergency situations,
- ▶ Benefits from economic activities in the district,
- ▶ Number of jobs created in the district.

| | | | | | | |
|---|--|---|----|----|----|-------------------------------------|
|  | Infrastructure | 3 - Improvement of port facilities: infrastructure repair and implementation of basic services | | | | |
| | All districts | | | | | |
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1. OBJECTIVE

The overall objective is to improve existing port facilities in the main harbors of Andros.

The sub-objectives include:

- ▶ Upgrade existing port facilities such as docks and ramps,
- ▶ Upgrade existing port services such as potable water, electric power, fueling facilities, port master building, restroom facilities,
- ▶ Implement waste management systems,
- ▶ Improve working conditions for fishermen and fishing guides,
- ▶ Attract more recreational and commercial vessels,
- ▶ Improve connectivity with Nassau and other districts of Andros,
- ▶ Improve tourism,
- ▶ Enhance employment related to port activities.

2. LOCATION

This action sheet concerns the following sites:

- ▶ North Andros: Red Bays, Lowe Sound and Morgan's Bluff,
- ▶ Central Andros: Fresh Creek and Behring Point,
- ▶ Mangrove Cay: Little Harbor and Lisbon Creek,
- ▶ South Andros: Driggs Hill, Little Creek and Mars Bay.

According to the outcomes of the field mission in Andros led by BRLi/Blue in May 2016, these sites are the most visited and utilized by locals (fishermen or fishing guides) or by others vessels (ferry, commercial or recreational boats).

All sites present existing infrastructures in more or less bad condition that need to be repaired.



3. ACTION PROGRAM

3.1 KEY ISSUES AND OPPORTUNITIES

Red Bays (North Andros)

Red Bays Fisherman's Dock is a solid concrete structure with an open pile dock at the deeper end. It is in fair condition with the timber portion in need of repair after having been raised during a hurricane and repaired to a degree by the locals. The ramp is in good condition.

Lots of bonefishermen are coming from all over Andros to use Red Bays dock. There is no potable water, no electric power and no restrooms.

One wreck needs to be removed and the nautical access is not safe: channel buoys and lights are lacking.

Below are some pictures illustrating the current situation at Red Bays dock.



Source: BRLi / Blue – May 2016

Low Sound – Darel Island (North Andros)

Darel Island is a location understood to be the main fishing hub in North Andros, but the timber structure dock is without a deck and the landside edge has been washed away. The dock therefore is in need of replacement, the edge built up and surfaced, and the ramp needs to be resurfaced and extended with minor dredging at the foot of the ramp.

This location is an eye sore frequented by many tourists to launch their fishing boats. There are a number of partially constructed buildings, which are of poor construction, tourists slip on the ramp and there are no restroom facilities other than the nearby restaurant, which is private. There is potable water and electric power facilities, but in need of adaptation and repair. There is no waste management system. The entire site needs cleaning and landscaping.

The nautical access is not safe: channel buoys and lights are lacking.

Below are some pictures illustrating the current situation at Darel Island.



Source: BRLI / Blue – May 2016

Morgan's Bluff (North Andros)

Morgan's Bluff has always been considered as the main commercial and recreational port of Andros; it is Andros' nearest port from New Providence and Florida. Development plans have been proposed occasionally since the 1980s but have never been materialized.

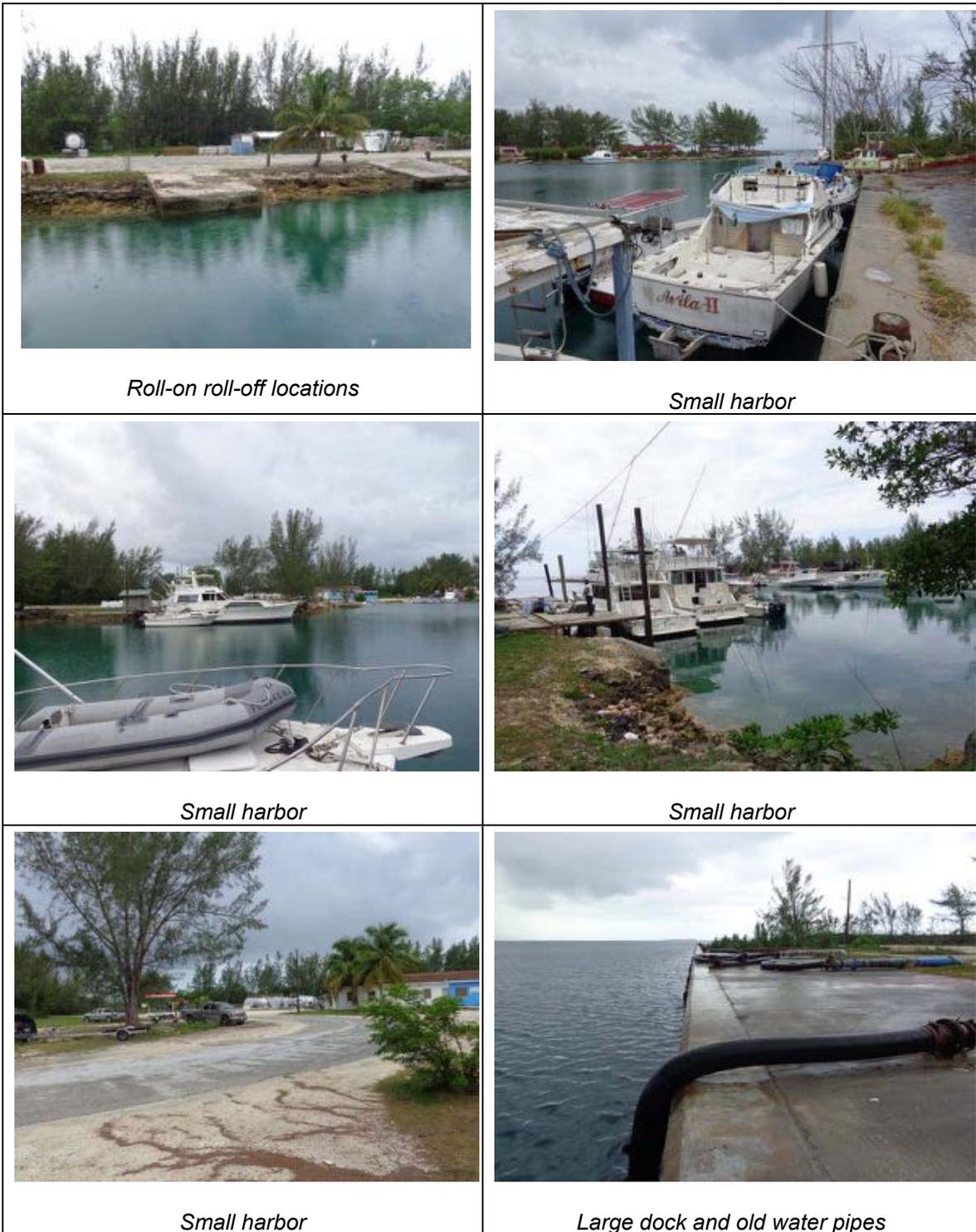
Currently, different types of traffic access Morgan's Bluff:

- ▶ Cargo containers from G&G, Seacor and Bimini Shipping are sitting nearby,
- ▶ Mail boat: the "Lady Rosalind" connects North Andros (Morgan's Bluff) from Nassau once a week,
- ▶ Fuel barge every two months,
- ▶ Local fishermen,
- ▶ Bahamian and American boaters - from January to May 2016, around 100 recreational boats came in at Morgan's Bluff before moving on to Exuma and Abaco islands,
- ▶ Bahamas Fast Ferries used to come into Morgan's Bluff, but it was not profitable enough for them to maintain the route.

These types of traffic are low and could be largely improved if Morgan's Bluff offered better facilities and services:

- ▶ The small harbor offers electric power (installations not up to current standards), fueling facilities, restrooms and the dock master's office,
- ▶ In terms of services: potable water, communication system (VHS radio), customs and immigration, tourist information bureau and stores are lacking, as well as wastewater / solid waste / waste oil management systems,
- ▶ There are two roll-on roll-off (RoRo) locations and a ramp in the small harbor, which need to be repaired and extended,
- ▶ The nautical access is not safe: channel buoys and lights are lacking,
- ▶ Unused water pipes are lying on the quay in the large dock,
- ▶ Several wrecks need to be removed,
- ▶ The entire site needs cleaning and landscaping.

Below are some pictures illustrating the current situation at Morgan's Bluff.



Source: BRL / Blue – May 2016

Fresh Creek (Central Andros)

Fresh Creek is the main commercial and recreational harbor in Central Andros, and is a port of entry. Currently, different types of traffic access Fresh Creek; however, traffic levels are low and could be improved if Fresh Creek offered better facilities and services. At present, there are a number of docks at Fresh Creek as follows:

► Fresh Creek Government Dock #1

It is a concrete bulkhead dock, 200'x30' & 50'x60' stepped. The mail boats (the « Lady D » connects Central Andros from Nassau on Tuesday, return on Sunday, once a week), fueling tankers and Fast Ferry utilize this dock. It is in good condition having been reconstructed in 2012. At present, fenders are required and dredging of the channel needed. The shallow depth prevents ships from coming into the harbor, they have to wait for high tide because the channel is too narrow and there is not enough space to turn around.

There is also a need for fuel to be provided at this dock however, there is insufficient space, being limited by the presence of BEC. The main freighters, G&G and SEACOR, do not use the new dock facilities. They did call at Fresh Creek up to 3 years ago, but have not since the dock's refurbishment. It may be that there is more business in Morgan's Bluff and that being closer to Nassau, Morgan's Bluff is less costly for the operators. It should also be noted that there is no Port Authority and/or Dock Master representative in Fresh Creek.

► Fresh Creek Dock #2 Old St Stephens Dock – Believed to have been destroyed.

► Fresh Creek Dock #3 St Stephens Dock

This dock is constructed of piles in 50 gallon drums. Small crafts / fishing / pleasure boats use it. Its condition is to be confirmed.

► Fresh Creek Dock #4 Ossie Dock

This is a timber Pile in 50 gallon drum dock. The dock is used for small crafts. Its condition is to be confirmed however, it is believed that the abutment is in need of repair.

► Lighthouse Yacht Club & Marina docks

This is an open pile structure. It appears to be in fair condition but its decking is in need of repair. The Bahamas Government (Hotel Corporation) owns it. It offers water and electric power facilities, but the equipment is in need of adaptation and repair. There are no restrooms nor waste management system (wastewater / waste oil / solid waste).

One wreck needs to be removed at the entrance of the harbor, which is not secured: lights and buoys are lacking.

Below are some pictures illustrating the current situation at Fresh Creek.



New government concrete dock



New government concrete dock



Source: BRL / Blue – May 2016

Behring Point (Central Andros)

Behring Point Dock is a newly (2015/2016) built concrete dock measuring 162' x 13' in good condition. It is used by fishing boats.

The harbor was dredged in 2015, but it is understood that it was insufficient and additional dredging needs to take place because the tide gets extremely low and boats are unable to access the dock. Further, it has created a situation whereby a number of boats have to queue up as the area is not wide enough to facilitate more than one boat at a time, and there is no turning basin so boats have to drive in and reverse out in order to stay in the deep-water areas.

There are no facilities to tie boats up and locals have made their own arrangements for keeping their boats at this location. Boats have difficulty getting close to the dock due to the dock arrangement. The channel was dredged 20 feet wide, which is insufficient for larger vessels especially in poor weather conditions. A jetty was not constructed and as a result, the channel is refilling.

There is no potable water and electric power facilities, and the entrance channel is not secured: lights and buoys are lacking.

Below are some pictures illustrating the current situation at Behring Point.



General view of Behring Point harbor

Concrete dock

Source: BRLI / Blue – May 2016

Little Harbor (Mangrove Cay)

Little harbor is situated in Moxey Town. It is a concrete dock in bad condition that needs repairs. Local fishermen use it. Dredging is also needed, as large boats cannot come in at low tide.

There is potable water and electric power facilities, but those systems need adaptation and repair. There is no fueling facilities, no restrooms and no waste management system. The dock is not secured: lights and buoys are lacking.

One wreck needs to be removed.

Below are some pictures illustrating the current situation at Little Harbor.



Concrete dock

Concrete dock

Source: BRLI / Blue – May 2016

Lisbon Creek (Mangrove Cay)

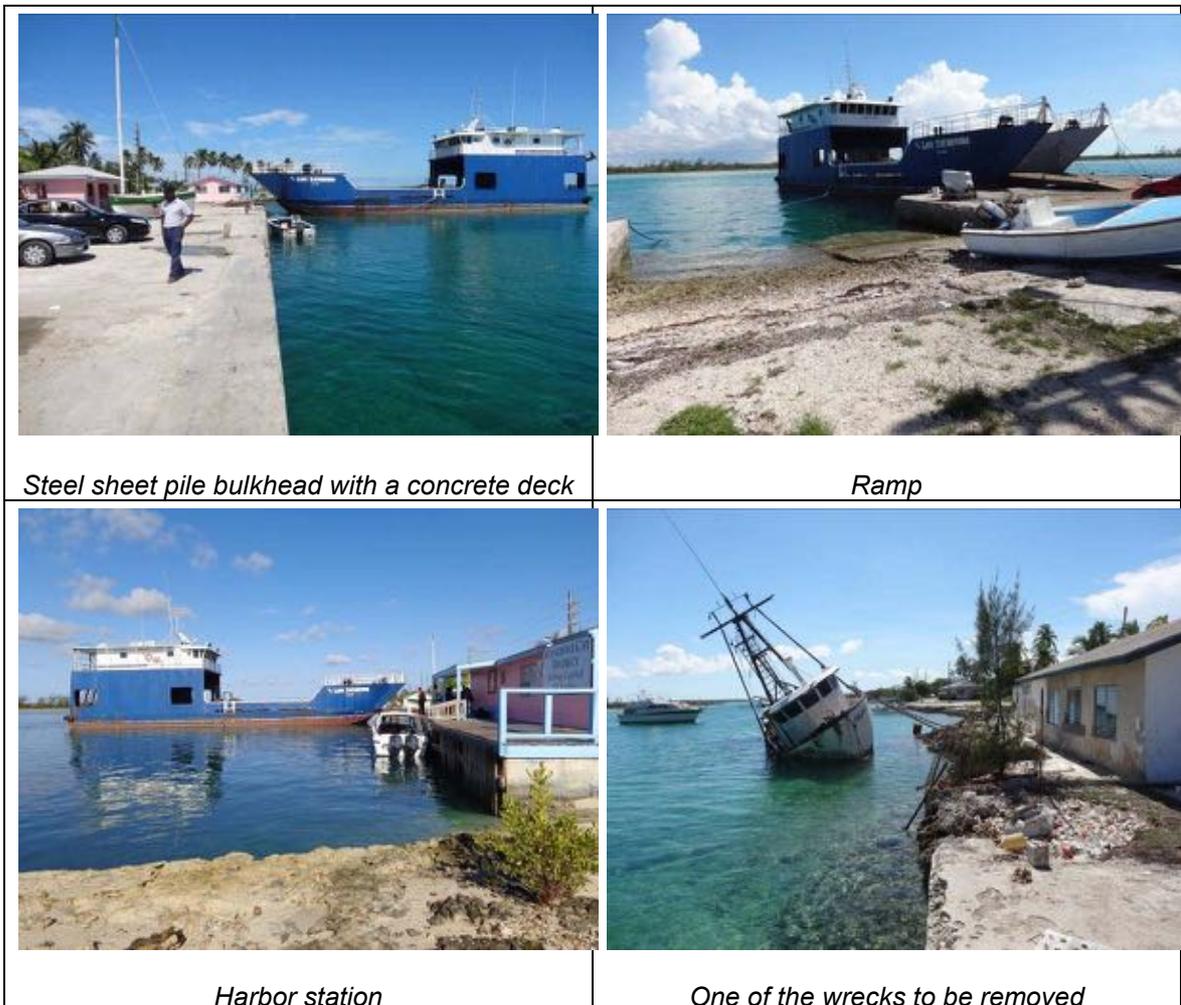
Currently, different types of traffic access Lisbon Creek harbor: local fishermen, ferry from South Andros (there is a harbor station – around 50 persons per day are using this service) and mail boat (the “Lady Katherina” connects Mangrove Cay from Nassau once a week).

It is not a port of entry; there is no dock master nor customs/immigration, which frustrates the local sponge and stone crab industry (economic wheel of Mangrove Cay) for exportation. Improvements are considered necessary at Lisbon Creek to facilitate both fishing and mail boat services to support local industry.

The Government Dock at Lisbon Creek is steel sheet pile bulkhead with a concrete deck measuring 193'6"x56'6". It appears to be in good condition but in need of minor repairs. The existing ramp is in bad condition (currently closed), and needs to be repaired. The harbor also needs to be dredged as vessels can only visit at high tide. There are no potable water and electric power facilities, no fueling facilities, no restrooms and no waste management system.

The channel entrance is not secured: lights and buoys are lacking. Two wrecks need to be removed.

Below are some pictures illustrating the current situation at Lisbon Creek.



Driggs Hill (South Andros)

Driggs Hill is considered as the main commercial and recreational port for South Andros. Currently, different types of traffic access Driggs Hill harbor: local fishermen, recreational boats, ferry from Mangrove Cay (there is a harbor station - around 50 persons per day are using this service) and different commercial vessels, including mail boat (the "Captain Moxey" connects South Andros from Nassau once a week). Around 50 boats per week are visiting Driggs Hill.

There are two docks at Driggs Hill, the main one referred to as Driggs Hill Dock, and the Driggs Hill old Ferry Dock, which used to be utilized by the ferry.

► Driggs Hill Dock

There is a breakwater, which provides protection as a harbor. The dock is a concrete bulkhead on piles, with asphalt storage surface behind, both in good condition and in need of only minor repairs. The dock's dimensions are 887' girth x 48' wide. It is believed it was constructed in 1990. The basin depth is about 10 feet at high tide.

There is a dock master and a dockage fee is requested (5 to 7 \$ per day). The harbor offers potable water, but there are no electric power or fueling facilities. The area is used by the mail boats to carry passengers as well as for managing freight and fuel.

At present, there is inadequate depth at the dock, as the harbor has not been dredged since it was built. The 1000 feet long channel also has inadequate dimensions (not deep and wide enough) as boats have difficulties to enter the harbor during Northeast swells. It is considered likely that 8 feet depth at low tide / 12 feet at high tide would be sufficient for its present use. However, we remain unclear as to why this depth is considered necessary given the use by relatively small vessels.

There are no buoys, channel markers or lights in the channel. Moreover, the harbor is not safe during Northeast surges. The opening of the northwestern portion of the dock channel to make it a safer harbor and the relocation of the dock was a consideration. Another suggestion was made to install a jetty.

► Driggs Hill old ferry dock

The Driggs Hill old ferry dock is an old dock located on the northwest side of Driggs Hill. It is now a decaying and dangerous metal frame destroyed by a hurricane around 1990. The Chief Councilor has indicated that investigations were made regarding the old dock's removal and due to the cost that would have to be incurred at the local level, an overlay of the dock was deemed a more practical approach. He further indicated that if such an approach was taken then the modified structure could facilitate the ferry service between South Andros and Mangrove Cay, and the local fishermen could use this dock for ease of access. However, these solutions do not seem to be technically feasible.

Below are some pictures illustrating the current situation at Driggs Hill.



Captain Moxey at Driggs Hill dock



Driggs Hill dock



Management of freight



Public ferry for Mangrove Cay



Driggs Hill old ferry dock



Decaying and dangerous metal frame

Little Creek (South Andros)

Little Creek is situated 30 km south of Driggs Hill. There is a ramp that needs to be fixed, which is used by local fishermen. No facilities are available.

Below are some pictures illustrating current situation in Little Creek.



Ramp



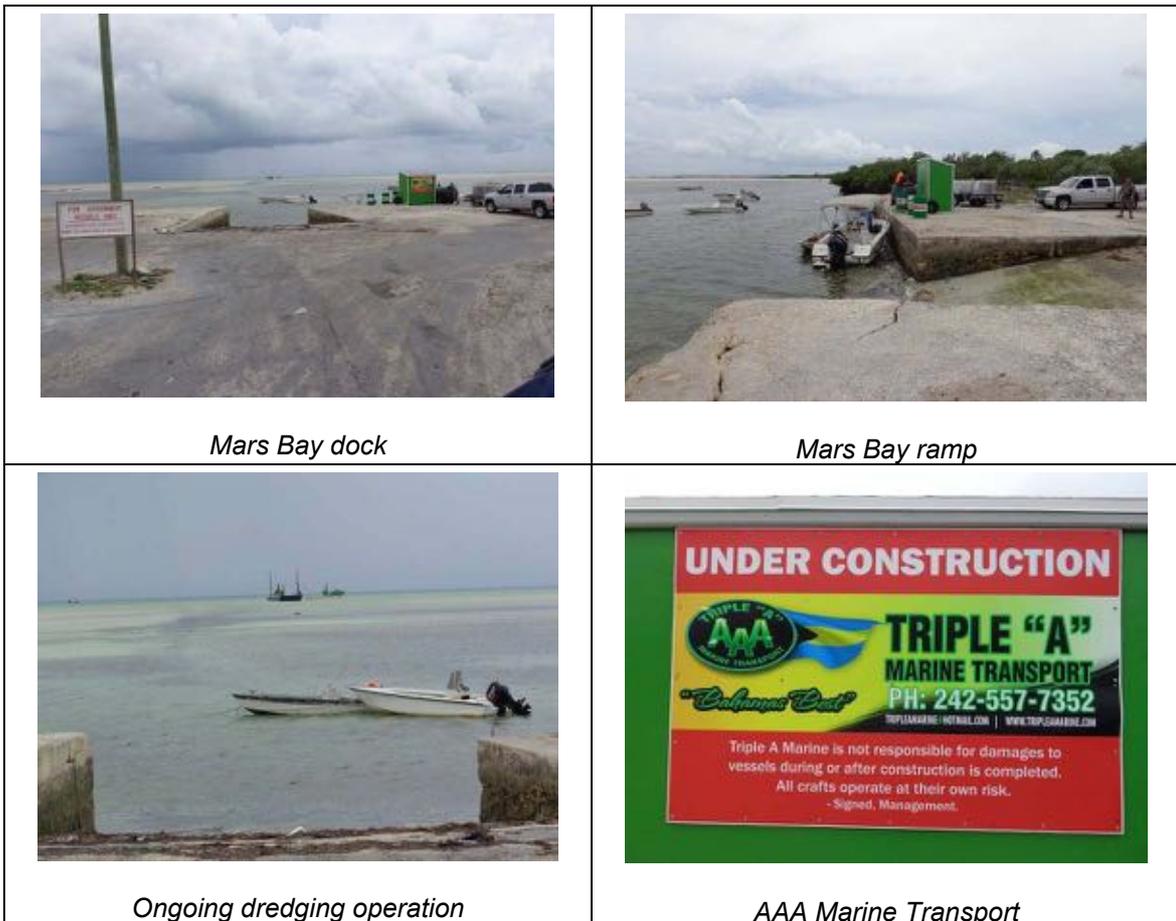
Launching area

Mars Bay (South Andros)

Mars Bay is situated 45 km south of Driggs Hill. It is a concrete dock measuring 200' x 40' and a ramp in poor condition, used by local fishermen and bonefishing guides. There are currently no water, electric power or fueling facilities.

The nautical access is not safe: channel buoys and lights are lacking.

Below are some pictures illustrating current situation in Mars Bay.



3.2 DEVELOPMENT STRATEGY

The overall strategy is to improve existing port facilities in the main harbors of Andros. It is outlined in two different steps, corresponding to two different stages in time:

- ▶ At short term, existing infrastructure is repaired and basic services are added in Red Bays, Lowe Sound, Morgan's Bluff, Fresh Creek, Behring Point, Little Harbor, Lisbon Creek, Driggs Hill, Little Creek and Mars Bay,
- ▶ At medium term, pier is extended in Behring Point.

By updating port infrastructure and services, more recreational and commercial boats should be attracted on a daily as well as monthly basis, connectivity and tourism activities should be enhanced and working conditions for fishermen and fishing guides should be improved.

The issue regarding conditions for maritime access (implementation of lights and buoys, dredging operation and wreck removal) is developed in another action sheet. Specific action sheets are also focusing on Morgan's Bluff and Darel Island development.

A preliminary list of activities and investments to be undertaken are presented below:

Short term – up to 5 years (2020)

- ▶ **Red Bays**
 - Dock repair (wooden end to be replaced),
 - Water and electricity pillar (1) installation.
- ▶ **Lowe Sound**
 - Dock rebuilding,
 - Ramp repair,
 - Water and electricity pillars (3 along dock + 1 at ramp) installation,
 - Restrooms building,
 - Port master office building,
 - Trailer area repavement,
 - Landscaping and conch wastes management.
- ▶ **Morgan's Bluff**
 - Small dock repair,
 - RoRo locations repair,
 - Ramp repair,
 - Rip-rapped bank around small harbor implementation,
 - Water and electricity pillars (10) installation,
 - Restrooms / showers repair,
 - Fueling facilities adaptation,
 - Customs/immigration office building,
 - Landscaping and cleaning of small harbor.
- ▶ **Fresh Creek**
 - Marina wooden dock repair,
 - Water and electricity pillars (10) installation at marina dock,
 - Restroom building,
 - Port master building,
 - Customs/immigration office building,

- *Fueling facilities adaptation at government dock,*
- *Waste management system implementation.*
- ▶ **Behring Point**
 - *Water and electricity pillar (1) installation,*
 - *Restrooms building.*
- ▶ **Little Harbor**
 - *Dock repair,*
 - *Water and electricity pillar (1) installation,*
 - *Fueling facilities adaptation.*
- ▶ **Lisbon Creek**
 - *Dock repair,*
 - *Ramp repair,*
 - *Rip-rapped bank implementation,*
 - *Water and electricity pillars (4) installation,*
 - *Fueling facilities installation,*
 - *Restrooms building,*
 - *Port master building,*
 - *Customs/immigration office building,*
 - *Waste management system implementation.*
- ▶ **Driggs Hill**
 - *Dock minor repair,*
 - *Water and electricity pillars (13) installation,*
 - *Fueling facilities adaptation,*
 - *Restrooms building,*
 - *Customs/immigration office building,*
 - *Waste management system implementation.*
- ▶ **Little Creek**
 - *Ramp repair.*
- ▶ **Mars Bay**
 - *Dock repair,*
 - *Ramp repair,*
 - *Water and electricity pillars (2) installation.*

Medium term – up to 10 years (2030)

- ▶ **Behring Point**
 - *Dock extension (to allow access to a future ferry linking Central Andros and Mangrove Cay).*

3.3 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effects regarding the different key pillars related to the Sustainable Prosperity Scenario of development:

| | |
|---------------------------|--|
| Major positive impact | |
| Contribution | |
| No effect | |
| Potential negative impact | |

| Improvement of port facilities | |
|---|--|
| Food and water security | |
| Connectivity and accessibility | |
| Education and capacity building | |
| Climate change and coastal resilience | |
| Livelihoods and income equality | |
| Land tenure security, land use planning and enforcement | |
| Health and wellbeing | |
| Strengthening local government | |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| | Sub activities | Institution responsible | Source of funding |
|--------------------|--|-------------------------|-------------------|
| Short term | Design studies and works for docks and ramps repairs | MWUD - Port Authorities | Public |
| | Design studies and works for basic public services and landscaping | MWUD - Port Authorities | Public |
| Medium term | Design study and works for Behring Point dock extension | MWUD - Port Authorities | Public |

4.2 COSTS ESTIMATION

It is important to stress that - at this step of the study - the diagnosis and structural state of the existing infrastructure are not known. The proposed works to be undertaken and the costs are given as a first approach only. Technical diagnosis, bathymetric survey, jetting, etc. will be carried out later in order to define further works with more details.

The costs are contingent on data which is currently unavailable:

- ▶ For each type of infrastructures, it would be interesting to collect the original working drawings (to check the level of foundation for example),
- ▶ Inspection by underwater divers will be needed to check the condition of existing structures (corrosion of steel, concrete, etc.),
- ▶ In the case of an island, the works costs depend directly on the availability of materials. For example, are there local quarries to supply aggregates for concrete or large rip-rap for protection dikes at the entrance of channels.

Cost estimates of works are based on recent studies carried out by BRLi for similar infrastructures in the area of Caribbean Sea: French West Indies and Dominican Republic mainly. In particular, BRLi has studied several piers on piles for passenger shuttles and various infrastructures for motor-yachts up to 50 m long. Moreover, local unit prices have been collected by Blue Engineering Ltd.

The following comments are considered for each kind of infrastructures and building:

- ▶ Berth, quay, pier, wharf, dock: The cost depends on the water depth and the maximum size of vessels using the infrastructure. In the case of an industrial quay, the cost also depends on the exploitation on the platform (storage of materials, loads from heavy handling equipment, etc.). In the case of an industrial quay, generally speaking, the upper slab is concrete. In that case, as the area is subject to hurricane risks, some precautions are required. In particular, the upper slabs of the wharfs on piles must be pierced in order to avoid taking the pressure of the impact of the cyclonic swell. Another alternative is to design a fuse slab,
- ▶ Fueling station: The cost depends on the quantity of fuel to be stored, which depends itself on the number and size of boats in the marina. Generally speaking, two types of fuel are considered: diesel and unleaded,
- ▶ Buildings: Data (cost in US\$/ft²) are available on the website bahamaslandproperty.com.

It was considered that the design of new infrastructures will take into account the “Design and operational Guidelines for superyacht facilities” (PIANC Report N°134 – Recreational navigation commission – 2013). The report provides advices for the design of the following items:

- ▶ Basin and channel geometry,
- ▶ Entrance channel,
- ▶ Slip (berth) dimensions,
- ▶ Berthing systems,
- ▶ Mooring,
- ▶ Utilities and hardware:
 - Electrical power,
 - Potable water,
 - Fire protection unit,
 - Fueling facilities,
 - Solid waste collection,
 - Waste oil removal,
 - Restrooms.

| | | | Estimated costs | |
|--------------------------------|--|--|---------------------|--------------------|
| | | | Unit | Total Amount (k\$) |
| Short term | Design studies and works for docks and ramps repairs | Design studies: diagnostic for Red Bays / Lowe Sound / Morgan's Bluff / Fresh Creek / Behring Point / Little harbor / Lisbon Creek / Driggs Hill / Little Creek / Mars Bay | | 395.88 |
| | | Repairs for Red Bays : dock (wooden end rebuilding) | m ² | 24.75 |
| | | Repairs for Lowe Sound : dock rebuilding + ramp repair | m ² | 642.25 |
| | | Repairs for Morgan's Bluff : ramp + 2 roll-on roll-off locations + small harbor dock + rip-rapped bank | m ² | 695.05 |
| | | Repairs for Fresh Creek : wooden dock | m ² | 352.00 |
| | | Repair for Little Harbor : dock | m ² | 676.50 |
| | | Repair for Lisbon Creek : dock + ramp + rip-rapped bank | m ² & lm | 492.69 |
| | | Repair for Driggs Hill : dock (minor repairs) | m ² | 915.20 |
| | | Repair for Little Creek : ramp | m ² | 31.50 |
| | | Repair for Mars Bay : dock + ramp | m ² | 128.89 |
| | Design studies and works for basic public services + landscaping | Design studies: diagnostic for Red Bays / Lowe Sound / Morgan's Bluff / Fresh Creek / Behring Point / Little harbor / Lisbon Creek / Driggs Hill / Little Creek / Mars Bay | | 196.68 |
| | | Morgan's Bluff : add freshwater, repair electric power facilities, adapt fueling facilities, repair restrooms, add customs/immigration office, landscaping and cleaning | | 504.50 |
| | | Red Bays : add fresh water and electric power facilities | | 3.30 |
| | | Lowe Sound : repair freshwater and electric power facilities, add restrooms, add port master building, repave trailers area, landscaping and cleaning | | 488.70 |
| | | Fresh Creek : repair freshwater and electric power facilities, add restrooms, add fueling facilities at GOB dock, add waste management system, add port master and customs/immigration offices | | 305.00 |
| | | Behring Point : add freshwater and electric power facilities, add restrooms | | 25.30 |
| | | Little Harbor : repair freshwater and electric power facilities, adapt fueling facilities | | 17.30 |
| | | Lisbon Creek : add freshwater and electric power facilities, add fueling facilities, add restrooms, add port master and customs/immigration offices, add waste management system | | 367.20 |
| | | Driggs Hill : repair water, add electric power facilities, adapt fueling facilities, add restrooms, add waste management system, add customs/immigration office | | 248.90 |
| | | Mars Bay : add freshwater and electric power facilities | | 6.60 |
| Grand TOTAL Short term | | | | 6 518.19 |
| Medium term | Behring Point Dock | Pier extension | m ² | 220.00 |
| Grand TOTAL Medium term | | | | 220.00 |
| Grand TOTAL | | | | 6 738.19 |

4.3 STUDIES NEEDED FOR EXECUTION

- ▶ Design studies for dock & ramp repairs,
- ▶ Design studies for port basic public services,
- ▶ Land tenure verification,
- ▶ Environmental impact studies.

4.4 PRIORITY AND RELATION TO OTHER INITIATIVES

- ▶ Aligned with Vision2040: The National Development Plan.

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

Beneficiaries include:

- ▶ Local residents and communities around harbors,
- ▶ Local fishermen and bonefishing guides,
- ▶ Foreign and domestic visitors arriving by sea,
- ▶ National or international maritime transport companies (G&G, Seacore, and Bimini Shipping),
- ▶ Local authorities,
- ▶ Local tourist businesses including hotels, lodges, food and beverage establishments.

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|------------------------------|---|---|
| Economic & Social | <ul style="list-style-type: none"> • Direct economic benefits to ports and local communities through increased boat traffic, • Economic benefits to communities, sites and attractions in each district of Andros through increased visitation and length of stay, • Economic benefits through increased employment related to port / economic / nature-based activities, • Improved environment increasing the touristic appeal, • Improved functional harbor facilities and urban space for local residents. | <ul style="list-style-type: none"> • Temporary impacts during works – limited access to harbors, • Temporary impacts during construction – noise, vibration and traffic due to construction vehicles. |
| Environmental | <ul style="list-style-type: none"> • Improved nautical practices and safety, • Improved harbor waste management and sanitation, • Improved site aesthetics through landscape enhancement. | <ul style="list-style-type: none"> • Water quality risk through increased suspended sediments / sedimentation during construction, • Noise and vibration pollution during construction. |

6. PRODUCTS & INDICATORS

OUTPUT

- ▶ Design studies for dock & ramp repairs,
- ▶ Port infrastructure in good conditions,
- ▶ Design studies for port basic public services,
- ▶ Functional harbor facilities (potable water, electric power, fueling, sanitary facilities),
- ▶ Functional harbor administration in Morgan's Bluff, Fresh Creek, Lisbon Creek and Driggs Hill (port master and customs/immigration offices).

OUTCOME

- ▶ Increased recreational and fishermen boat traffic,
- ▶ Increased commercial boat traffic,
- ▶ Increased number of foreign and domestic visitors arriving by sea,
- ▶ Increased benefits from economic and/or nature-based activities,
- ▶ Increased employment related to port / economic / nature-based activities.

INDICATOR

- ▶ Number of boats stopping and docking in the main harbors (Morgan's Bluff, Fresh Creek, Lisbon Creek and Driggs Hill),
- ▶ Number of fishermen using local ramps and docks (Red Bays, Lowe Sound, Behring Point, Little Harbor, Little Creek and Mars Bay),
- ▶ Number of visitors in Andros,
- ▶ Benefits from economic and/or nature-based activities in each district,
- ▶ Number of jobs created related to port / economic / nature-based activities.

| | | | | | | |
|---|---|---|-----------|-----------|-----------|---|
|  | Infrastructure Development | <h2>4 - Morgan's Bluff Development</h2> | | | | |
| | North Andros | | | | | |
| | <table border="0"> <tr> <td>ST</td> <td>MT</td> <td>LT</td> </tr> <tr> <td style="text-align: center;">☒</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☒</td> </tr> </table> | | ST | MT | LT | ☒ |
| ST | MT | LT | | | | |
| ☒ | ☒ | ☒ | | | | |

1. OBJECTIVE

The overall objective is to develop Morgan's Bluff as the main sustainable port of entry for commercial and recreational boats in North Andros.

The sub-objectives include:

- ▶ Upgrade existing port facilities and services,
- ▶ Improve nautical access to North Andros,
- ▶ Attract more recreational and commercial vessels through the development of a marina and a commercial hub,
- ▶ Improve connectivity with Nassau and other districts of Andros,
- ▶ Improve tourism in North Andros,
- ▶ Enhance employment in North Andros related to port and tourism activities,
- ▶ Leverage healthy coastal ecosystems for beautification purposes to draw tourists, to provide nursery habitat for fisheries, and reduce the risk of coastal hazards by implementing improved coastal infrastructure.

2. LOCATION

Morgan's Bluff is the northernmost port of Andros, situated in the district of North Andros.

The port is located 10 km from Nicholl's Town, the main community of North Andros. Nassau is located approximately 70 km, or 35 nautical miles from the port of interest. Maritime routes that connect Morgan's Bluff to Nassau intersect the coral reef, which is situated within 5 km from the port.

The main current terrestrial, coastal and marine habitats present around Morgan's Bluff are pines, mangrove, wetland, beach, coral reef, land crab / lobster / conch habitats.

Morgan's Bluff site can be divided into three areas:

- ▶ The small harbor,
- ▶ The large dock,
- ▶ The western beach.



3. ACTION PROGRAM

3.1 KEY ISSUES AND OPPORTUNITIES

Morgan's Bluff has always been considered as the main commercial and recreational port of Andros; it is Andros' nearest port from New Providence and Florida. Development plans have been proposed occasionally since the 1980s, but have never been materialized.

Types of traffic that frequent Morgan's Bluff:

- ▶ Cargo containers from G&G, Seacor and Bimini Shipping are sitting nearby,
- ▶ Mail boat: the "Lady Rosalind" connects North Andros (Morgan's Bluff) from Nassau once a week,
- ▶ Fuel barge every two months,
- ▶ Local fishermen,
- ▶ Bahamian and American boaters - from January to May 2016, roughly 100 recreational boats came in at Morgan's Bluff before moving on to Exuma and Abaco islands,
- ▶ Bahamas Fast Ferries route into Morgan's Bluff was terminated because it proved unprofitable.

Activity is below potential activity, and could be largely improved if Morgan's Bluff offered better facilities and services:

- ▶ The small harbor offers electric power (installations not up to current industry standards), fueling facilities, restrooms and the dock master's office,
- ▶ Services include: potable water, communication system (VHS radio), Customs and Immigration, tourist information bureau and stores are lacking, as well as wastewater / solid waste / waste oil management systems,
- ▶ There are two roll-on roll-off (RoRo) locations and a ramp in the small harbor, which need to be repaired and extended,
- ▶ The nautical access is not safe: channel buoys and lights are insufficient and below industry standards,
- ▶ Unused water pipes are lying on the quay in the large dock,
- ▶ Several wrecks need to be removed,
- ▶ The entire site needs cleaning and landscaping.

Below are some pictures illustrating the current situation at Morgan's Bluff.



Roll-on roll-off locations



Small harbor



Small harbor



Small harbor



Small harbor



Large dock and old water pipes

Source: BRL / Blue – May 2016

3.2 DEVELOPMENT STRATEGY

Ports have historically played and will continue to play an important role in the development of mankind. Centuries ago, maritime transport was the most common way of connecting major trading hubs, developing remote regions, establishing, and expanding trade relations. Throughout history, whether seaports or river ports, major cities and conurbations have risen around ports as a result of the business and wealth, which ports have created.

Port and city development have always been very closely related. In most cases, the growth of coastal cities has been driven by port business. This has been due to the creation of local companies related directly or indirectly to the ports operations, which has translated into the creation of employment opportunities for neighboring settlements and tax revenue. As a result, ports have contributed greatly to the wealth of related settlements.

In a declaration made for the 2014 ECOSOC (United Nations Economic and Social Council) by the Bahamas Representative, only the development and expansion of Fresh Creek shipping dock, also located in Andros, was planned like an Infrastructural investment. Nonetheless, the Government of The Bahamas is committed to the yachting industry development and expansion because the sector has been identified for development, which is widely regarded as having significant economic potential.

A Marina infrastructure and ancillary services are part of the Tourism Industry. It is a niche market that seeks development in Andros. In that sense, the revamping of Morgan's Bluff is an additional strategy for the island to gain Sustainable Prosperity. It will attract more cruising and fishing stopover arrivals and act as a pull factor supporting yachting.

The overall strategy is to develop Morgan's Bluff as the main sustainable port of entry for commercial and recreational boats in North Andros. It is outlined in three different steps, corresponding to three different stages in time:

- ▶ At short term, existing infrastructure is repaired, basic services are added, nautical access is secured and surveys are launched,
- ▶ At medium term, nautical access is improved and investors for long term development are sought,
- ▶ At long term, the small harbor is developed as a yachting marina and the large dock is focused on commercial use.

By developing infrastructure and services at Morgan's Bluff, more recreational and commercial boats should be attracted on a daily as well as monthly basis. The establishment of port taxes could make Morgan's Bluff harbor profitable.

A preliminary list of activities and investments to be undertaken at Morgan's Bluff are presented below:

Short term – up to 5 years (2020)

- ▶ *All docks, roll-on roll-off locations and ramp are repaired*
As port infrastructure is improved, access and utilization by local fishermen and bonefishing guides using trailers, as well as the number of foreign and domestic sailing boats and commercial vessels will increase.
- ▶ *Basic public services such as electric power, potable water, fueling facilities, restrooms/showers, customs/immigration and communication systems are improved or added in the small harbor*
The implementation of these services will encourage people to use the harbor and will provide a better welcome to all visitors.

- ▶ *Nautical access is secured: lights and buoys are added along the channel of entrance*

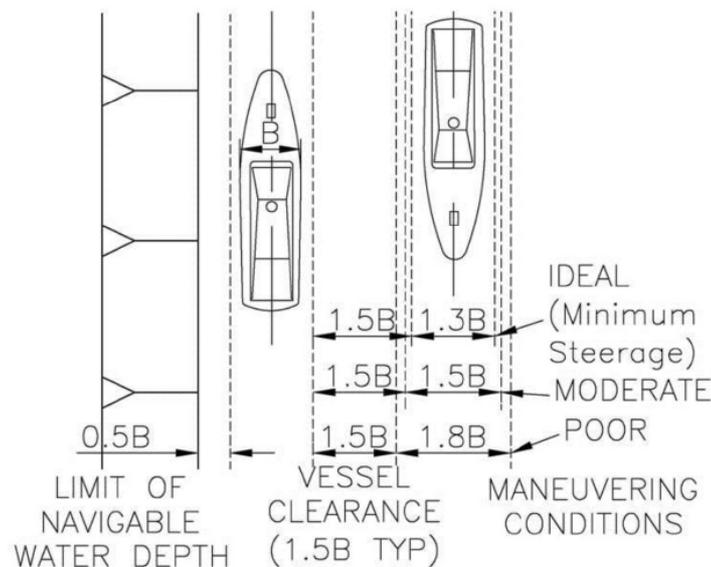
Several floating beacon buoys will be installed along the entrance channel. The implementation of such equipment will secure the harbor entrance and encourage boaters to stop in Morgan's Bluff.

- ▶ *A bathymetric survey is undertaken to assess the dredging needs to allow access for bigger commercial and recreational vessels*

The layout of the basin and the entrance channel are crucial to the safety and efficiency of maneuvering large vessels within a confined water area. The width and depth requirements for safe maneuvers and navigation depend on vessel characteristics and steering requirements in the various wind, wave and current conditions.

If the weather and sea state in the channel and/or the configuration of the channel dictate ideal moderate or poor conditions for steering, then the minimum navigable channel width for two-way traffic is greater than $6B$, where B is the widest beam of the vessel expected to use the channel, otherwise it is the length of the largest vessel. This is illustrated below.

The minimum navigable channel width designed for one-way traffic should be $3B$ under similar steering conditions. These channel widths should be increased, ranging from $8B$ to $9B$ for two-way traffic, if the entrance channel is expected to be used during storm conditions or if there are prevailing winds or currents. It may also be necessary to widen the channel where the channel changes direction.



Entrance channel width requirements for ideal, moderate and poor conditions [ASCE, 2012]

- ▶ *Current traffic is maintained or improved, especially for recreational boats due to the enhancement of port facilities,*
- ▶ *A market study is undertaken to assess commercial opportunities to be developed at long term.*

Medium term – up to 10 years (2030)

- ▶ *Nautical access is improved by dredging operations and wreck removal,*
According to the dredging needs defined by the bathymetric survey, dredging operations will adjust channel and basin size to attract larger vessels.
- ▶ *Mooring buoys are added in the bay for recreational boats,*
Several dozen mooring buoys will be installed in the bay to allow recreational boats to stop near the harbor. This particular action is aimed at increasing the capacity of the harbor.
- ▶ *Investors are sought for long term development.*

Long term – up to 25 years (2040)

- ▶ *Yachting marina is developed in the small harbor including new floating pontoons, tourist information bureau, shops, restaurant, boutique hotel...*

A marina is defined as a group of pontoons, jetties, piers, or similar structures designed or adapted to provide berthing for pleasure craft, and may include ancillary works such as slipways, facilities for the repair and maintenance of boats and the provision of fuel, supplies and accessories.

The usual onshore services and facilities to be considered for inclusion at a marina are as follows:

- Water, electric power and fuel supplies,
- Marina administration and tourist information offices,
- Sanitary facilities: full restroom facilities for customers / visitors / marina employees,
- Mini-market and liquor store,
- Restaurants and cafés,
- Boutique hotel,
- Laundromat,
- Power/sailboat hire and charter office and support facilities,
- Commercial office space,
- Boat valet service office and support facilities,
- Sail making/canopy repair office and work area,
- Site sewerage and treatment system,
- Solid waste collection and disposal facilities,
- Oil spill containment equipment,
- Firefighting services and equipment,
- Storm water drainage system,
- Communications facilities (telephone / radio),
- Dry docking facilities for boats including dinghy storage,
- Hardstand areas for boat repair and maintenance,
- Hardstand drainage and pollution control system,
- Workshops and secure storage for tools, equipment and materials,
- Access for pedestrian and vehicular traffic, vehicle parking,
- Landscaping,
- Security systems and lifebuoys.

A marina represents a land / sea interface, a gathering place where both recreational and technical activities take place, generating significant economic potential.

Examples of recreational marina



Source: BRLi - 2016

- ▶ *Large dock facilities are improved: electric power, potable water, fueling facilities, restrooms/showers are added,*

While developing the small harbor into a recreational marina, the commercial traffic will be moved and concentrated on the large dock, where the facilities will be improved. A commercial hub will be developed to welcome all commercial traffic from Nassau and Florida.

- ▶ *Wastewater / solid waste / waste oil management systems are installed on both sites.*

The protection of the marine environment can be enhanced by eliminating the discharge of ship-generated waste and cargo residues into the sea. This can be achieved by improving the availability and use of reception facilities for:

- Solid waste: trash receptacles, dumpsters and recycling bins,
- Waste oil:

An on-site temporary storage facility for waste oil and sludge provides an added support service value and environmental awareness at marinas. Waste oil consists of lubrication oil removed after service use in onboard machinery such as main engines, generators, auxiliary equipment, tenders and gearboxes. Sludge is a combination of waste oil, grease, contaminated fuel, or related matter. Once the waste oil and sludge is discharged into the onsite storage facility, a local bunker fuel vendor is used to empty the storage tanks.

- Wastewater, consisting of grey and black waters: sanitary pump out service system.

3.3 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effects regarding the different key pillars related to the Sustainable Prosperity Scenario of development:

| | |
|---------------------------|--|
| Major positive impact | |
| Contribution | |
| No effect | |
| Potential negative impact | |

| Morgan's Bluff development | |
|---|--|
| Food and water security | |
| Connectivity and accessibility | |
| Education and capacity building | |
| Climate change and coastal resilience | |
| Livelihoods and income equality | |
| Land tenure security, land use planning and enforcement | |
| Health and wellbeing | |
| Strengthening local government | |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| | Sub activities | Institution responsible | Source of funding |
|--------------------|---|-------------------------|-------------------|
| Short term | <i>Infrastructure repaired, basic services added, nautical access secured and surveys launched</i> | | |
| | Design studies and works for docks & ramps repairs | MWUD - Port Authorities | Public |
| | Bathymetric survey | MWUD - Port Authorities | Public |
| | Design studies and works regarding basic services, landscaping and nautical access | MWUD - Port Authorities | Public |
| Medium term | <i>Nautical access improved and investors sought</i> | | |
| | Dredging operations – wreck removal | MWUD - Port Authorities | Public |
| | Design studies and works regarding mooring buoys | MWUD - Port Authorities | Public |
| Long term | <i>Yachting marina developed and large dock facilities improved for commercial use</i> | | |
| | Design studies and works regarding yachting marina + large dock facilities | MWUD - Port Authorities | Private |

4.2 COSTS ESTIMATION

It is important to stress that - at this step of the study - the diagnosis and structural state of the existing infrastructure are not known. The proposed works to be undertaken and the costs are given as a first approach only. Technical diagnosis, bathymetric survey, jetting, etc. will be carried out later in order to define further works with more details.

The costs are contingent on data which is currently unavailable:

- ▶ For each type of infrastructures, it would be interesting to collect the original working drawings (to check the level of foundation for example),
- ▶ Inspection by underwater divers will be needed to check the condition of existing structures (corrosion of steel, concrete, etc.),
- ▶ In the case of an island, the works costs depend directly on the availability of materials. For example, are there local quarries to supply aggregates for concrete or large rip-rap for protection dikes at the entrance of channels?

- ▶ For dredging and rock excavation of access channels, what heavy equipment could be found on site or nearby islands? What are the possibilities of disposal and storage cuttings?

Cost estimates of works are based on recent studies carried out by BRLi for similar infrastructures in the area of Caribbean Sea: the French West Indies and Dominican Republic mainly. In particular, BRLi has studied several piers on piles for passenger shuttles and various infrastructures for motor-yachts up-to 50 m long. Moreover, local unit prices have been collected by Blue Engineering Ltd.

The following comments are considered for each kind of infrastructures and building:

- ▶ Protection dykes: The cost depends on the water depth, the height of waves during hurricane season, the availability or not of large rip-rap. In case rock is limited (quality and size), for large breakwaters, concrete tetrahedrons could be used.
- ▶ Entrance channel: The cost depends on the size (water depth, width) and on the quality of soil or rock to be excavated. It depends too on the availability or not of the dredging equipment in rocky soils.
- ▶ Berth, quay, pier, wharf, dock: The cost depends on the water depth and the maximum size of vessels using the infrastructure. In the case of an industrial quay, the cost depends too on the exploitation on the platform (storage of materials, loads from heavy handling equipment, etc.). In the case of an industrial quay, generally speaking, the upper slab is in concrete. In that case, as the area is subject to hurricane risks, some precautions are required. In particular, the upper slabs of the wharfs on piles must be pierced in order to avoid taking the pressure of the impact of the cyclonic swell. Another alternative is to design a fuse slab.
- ▶ Fueling station: The cost depends on the quantity of fuel to be stored, which depends itself on the number and size of boats in the marina. Generally speaking, two types of fuel are considered: diesel and unleaded
- ▶ Buildings: Data (cost in US\$/ft²) are available on the website bahamaslandproperty.com

It was considered that the design of new infrastructures would take into account the “Design and operational Guidelines for superyacht facilities” (PIANC Report N°134 – Recreational navigation commission – 2013). This report provides advices for the design of the following items:

- ▶ Basin and channel geometry,
- ▶ Entrance channel,
- ▶ Slip (berth) dimensions,
- ▶ Berthing systems,
- ▶ Mooring,
- ▶ Utilities and hardware:
 - Electrical power,
 - Potable water,
 - Fire protection unit,
 - Fueling facilities,
 - Solid waste collection,
 - Waste oil removal,
 - Restrooms, showers, laundry and dry cleaning.

| Sub-activities | | | Estimated costs | |
|--|--|--|--------------------|--------------------|
| | | | Unit | Total Amount (k\$) |
| Short term | Design studies and works for docks and ramps repairs | Design studies (diagnostic) | * | 109.11 |
| | | Small dock repair | m ² | 448.80 |
| | | Roll-on roll-off locations repair | Lump-sum | 220.00 |
| | | Ramp repair | m ² | 26.25 |
| | | Rip-rapped bank around little harbor | linear meter | 396.00 |
| | Topo-bathymetric survey | | Lump-sum | 30.00 |
| | Design studies and works regarding basic services, landscaping and nautical access | Design studies | * | 58.45 |
| | | Potable water + electric power | U | 33.00 |
| | | Restrooms / showers repair | m ² | 27.50 |
| | | Fueling facilities | U | 28.00 |
| | | Customs/immigration | m ² | 66.00 |
| | | Lights & buoys for the channel | Lump-sum | 80.00 |
| | | Landscaping (beautification + parking) | m ² | 350.00 |
| | Market study about commercial opportunities | | Lump-sum | 15.00 |
| Grand TOTAL Short term | | | | 1 888.11 |
| Medium term | Design studies | | * | 77.60 |
| | Improvement of nautical access | Dredging operations | m ³ | 1 000.00 |
| | | Wreck removal | U | 400.00 |
| | | Dyke repair | m ³ /lm | 176.00 |
| | Implementation of mooring buoys in the bay | Buoys installation works | U | 200.00 |
| Research of investors for the long term | | Lump-sum | 15.00 | |
| Grand TOTAL Medium term | | | | 1 868.60 |
| Long term | Development of yachting marina | Pontoons | Boat | 1 650.00 |
| | | Services | Boat | 375.00 |
| | Improvement of large dock facilities | Design studies | * | 351.00 |
| | | Potable water + electric power | U | 100.00 |
| | | Restrooms / showers | m ² | 110.00 |
| | | Large dock repair | m ² | 3 300.00 |
| | Installation of Wastewater / solid waste / waste oil management systems | Solid waste system | Lump sum | 100.00 |
| | | Waste oil system | | |
| | | Wastewater, grey and black waters system | | |
| Grand TOTAL Long term | | | | 5 986.00 |
| Grand TOTAL | | | | 9 742.71 |
| Real Estate (luxury buildings, shops & villas) | | | | 150 000.00 |

4.3 POTENTIAL SOURCES OF FUNDING

- ▶ The Ministry of Tourism,
- ▶ The Bahamas Port Authority,
- ▶ The Royal Bahamas Defense Force,
- ▶ The Department of Fisheries,
- ▶ The Bahamas Game Fishing Association,
- ▶ The Nature Conservancy,
- ▶ Yachting establishments,
- ▶ Equity investment,
- ▶ Joint ventures program (LLc.) possible with IDCS (state owned Investment & Development),
- ▶ Corporation and domestic private sector who are open for foreign investors or partners.

4.4 MANAGEMENT MODEL

Morgan's Bluff harbor facilities and services will be managed by the dock office. Regarding leisure services such as restaurants, shops and boutique hotels, the options for management will be assessed during the feasibility studies.

4.5 STUDIES NEEDED FOR EXECUTION

- ▶ Land tenure verification,
- ▶ Feasibility studies,
- ▶ Environmental impact studies (environmental compliance).

4.6 PRIORITY AND RELATION TO OTHER INITIATIVES

- ▶ Aligned with Vision2040: The National Development Plan.

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

After revamping, the Morgan's Bluff Marina could have the definite characteristics, with the ambition to mix Green and Blue economy.

Beneficiaries include:

- ▶ Local residents such as Morgan's Bluff and Nicholls Town communities,
- ▶ The local authorities of North Andros,
- ▶ Foreign and domestic visitors arriving by sea,
- ▶ Local tourism businesses including hotels, lodges, food and beverage establishments,
- ▶ Indirect beneficiaries include other communities promoted within North Andros (Red Bays, Lowe Sound) and through opportunities provided to participate in economic and/or cultural activity in the district,
- ▶ National or international maritime transport companies (G&G, Seacore, and Bimini Shipping).

The project is designed for 100 rings and 10 dry storages. According to current tariffs for boats (rings and dry storage) and berth/dockage fees, the following revenue can be assessed:

- ▶ Dry boat storage annual revenue : BSD 18,521,
- ▶ Boat ring annual revenue : BSD 287,618,

The Morgan's Bluff Marina project is expected to positively impact first Andros, and by extension, The Bahamas economy, as economic and social effects are closely related to economic investment either directly or indirectly.

Indirect effects come from building houses, either for commercial or residential use, while direct effects come from the jobs created in:

- ▶ The Works and Construction sectors,
- ▶ Activity located in the Marina inclusive of boats fueling, repairing and maintenance,
- ▶ New jobs opportunities in the yachting area,
- ▶ Effects on the domestic labor market as local land planners/developers, advertising agencies architects and public agencies are involved in the project.

Social effects also come with economic investment. They relate to training opportunities for youth employment in the yachting sector, likewise the touristic promotion of the island. With a new attractive waterfront, these cumulative effects serve as an engine of growth as all sectors are impacted (transportation, hotels & restaurants, fishing guides, food and beverages).

Direct employment can be defined as jobs created and sustained due to the yachting industry at Morgan's Bluff Marina. They have been estimated at a five maxima:

- ▶ 1 Marina Manager/Dock Master,
- ▶ 1 administrative agent,
- ▶ Three dock agents.

The yachting sector also indirectly creates jobs, for example, through support services which were not created as a result of yachting but the yachting sector creates a demand for services or products. Essential to assessing indirect employment generated by the yachting industry is recognizing that a visiting yachtsperson requires and uses all the products and services that a visitor arriving by air would use.

Indirect employment generated a Morgan's Bluff consists of:

- ▶ Security,
- ▶ Tour Guide Services,
- ▶ Fuel Operations.

In addition to the businesses that provide services directly to the yachting sector (such as marinas, ports, etc.), further businesses supply the yachting industry with consequent downstream effects on other economic sectors. Employment is therefore created in all business activities that service the yachting sector indirectly. In addition, expenditure on households' income due to expenditure from visiting yachts generates further induced employment throughout the Androsian economy.

The annual wages served to the direct created jobs could be estimated to BSD 80,600

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|------------------------------|--|---|
| Economic & Social | <ul style="list-style-type: none"> • Direct economic benefits to Morgan's Bluff port and community through increased boat traffic, • Economic benefits to communities, sites and attractions in North Andros through increased visitation and length of stay, • Economic benefits through increased employment related to port / economic / cultural activities, • Improved environment increasing the touristic appeal, • Improved functional harbor facilities and urban space for local residents. | <ul style="list-style-type: none"> • Temporary impacts during construction – limited access to harbor, • Temporary impacts during construction – noise, vibration and traffic due to construction vehicles. |
| Environmental | <ul style="list-style-type: none"> • Improved nautical practices and safety, • Improved harbor waste management and sanitation, • Improved site aesthetics through landscape enhancement. | <ul style="list-style-type: none"> • Water quality risk through increased suspended sediments / sedimentation during dredging and construction, • Noise and vibration pollution during construction. |

6. PRODUCTS & INDICATORS

OUTPUT

- ▶ Design studies for docks & ramps repairs,
- ▶ Port infrastructure in good condition,
- ▶ Bathymetric survey assessing dredging needs,
- ▶ Feasibility studies for the short and medium term development in the small harbor (basic public services + nautical access + beautification + mooring buoys),
- ▶ Functional harbor facilities (potable water, electric power, fueling, sanitary facilities),
- ▶ Entrance channel secured,
- ▶ Mooring buoys in the bay,
- ▶ Dredging operations and wreck removal,
- ▶ Feasibility studies for the long term development (yachting marina + large dock facilities),
- ▶ Yachting marina in small harbor,
- ▶ Commercial hub at the large dock.

OUTCOME

- ▶ Increased recreational boat traffic,
- ▶ Increased commercial boat traffic,
- ▶ Increased number of foreign and domestic visitors in North Andros,
- ▶ Increased benefits from economic and/or cultural activities in the district,
- ▶ Increased employment related to port / economic / cultural activities.

INDICATOR

- ▶ Number of boats stopping and docking in Morgan's Bluff,
- ▶ Number of visitors in North Andros,
- ▶ Benefits from economic and/or cultural activities in the district,
- ▶ Number of jobs created in the district.

| | | | | | | |
|---|--|--|-----------|-----------|-----------|-------------------------------------|
|  | Infrastructure Fishing activities | 5 - Development of an artisanal fishing center in Darel Island – Lowe Sound | | | | |
| | North Andros | | | | | |
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1. OBJECTIVE

The overall objective is to develop Darel Island as the main sustainable artisanal fishing ground for North Andros.

The sub-objectives include:

- ▶ Upgrade existing port facilities and services,
- ▶ Improve nautical access,
- ▶ Attract more fishing boats,
- ▶ Ensure food security for the local people,
- ▶ Improve fishing sector incomes,
- ▶ Enhance employment in North Andros related to fishing activities,
- ▶ Develop fishermen's management skills for sustained commercial fishing,
- ▶ Mainstream Andros' fishing sector into the regional and sub-regional cooperation and management framework, as stated by the CARICOM Regional Fishery Mechanism (CRFM).

2. LOCATION

Darel Island is situated in Lowe Sound, North Andros.

It is located roughly 10 km from Nicholl's Town, the main community of North Andros. Nassau is located approximately 80 km, or 45 nautical miles away. Maritime routes connect it to Morgan's Bluff (5 miles) and Joulter Cays (10 miles).



3. ACTION PROGRAM

3.1 KEY ISSUES AND OPPORTUNITIES

Darel Island is a location understood to be the main fishing hub in North Andros. This location is far from picturesque. Many tourists to launch their fishing boats use it. Currently, 15 to 20 boats come in daily.

The land belongs to the community of Lowe Sound. There are a number of partially constructed private buildings, which are poorly constructed.

There is a dock without a deck, made of timber pile and timber, the landside edge of which has been washed away. The dock is therefore in need of replacement; the edge needs to be built up and surfaced. The ramp is in poor condition and needs to be resurfaced and extended with minor dredging at the foot of the ramp. Freshwater and electric power are available on site, but there are no restroom facilities other than in the nearby restaurant, which is private.

Below are some pictures illustrating the current situation at Darel Island.



General view of Darel Island



Wooden dock



General view of the wooden dock



Ramp



Fishermen



Conch waste disposal

3.2 DEVELOPMENT STRATEGY

The overall objective is to develop Darel Island as the main sustainable artisanal fishing ground for North Andros. This should be done in two different steps, corresponding to two different stages in time:

- ▶ At short term, existing infrastructure is repaired, basic services are added or repaired, and nautical access is secured,
- ▶ At medium term, nautical access is improved, a fish-processing unit is built and a waste management system is installed.

By developing infrastructure and services at Darel Island, more fishing boats (recreational or professional) should be attracted on a daily as well as monthly basis. The fish-processing unit should also encourage the developments of new links with the hotels/restaurants while proposing new products such as smoked fish or fillets of fish. These additional transformations brought to the fresh fish should generate value added to a final product that should positively affect incomes.

The corresponding list of activities and investments to be undertaken in Darel Island are presented below:

Short term – up to 5 years (2020)

- ▶ *Dock and ramp are repaired*
As port infrastructure is improved, access and utilization by local fishermen and bonefishing guides using trailers will increase.
- ▶ *Basic public services such as electric power, potable water, restrooms/showers, port master building and trailer parking areas are improved or added*
The implementation of these services will encourage people to use the harbor and will provide a better welcome to all fishermen.
- ▶ *Cleaning, landscaping and conch waste management is planned for the entire area*
- ▶ *Nautical access is secured: lights and buoys are added along the channel of entrance*
Marked channel buoys will be implemented on site, with red and green lights (solar panels). The implementation of such equipment will secure the harbor entrance and encourage fishermen to come to Lowe Sound.

Medium term – up to 10 years (2030)

- ▶ *Nautical access is improved by dredging operations*
Minor dredging is needed at the bottom of the ramp to improve nautical access.
- ▶ *Fish processing unit is created*
See description below.
- ▶ *Waste management system is installed*
A solid waste collection and waste oil removal system will be implemented to collect and manage all waste from the processing unit, from the fishermen and from their boats.

Overview of the future artisanal fishing center

Source: Jean-Marc BEYNET – BRLi - 2016

THE FISH PROCESSING UNIT

Sustainable fishing is one of the means recommended by all the Funding Programs and/or projects for poverty alleviation and sustainable development, with specific fishery management objectives comprising sustainable development of the commercial, regional and sub-regional cooperation in management, as stated by the CARICOM Regional Fishery Mechanism (CRFM).

Dedicated to the fishermen's community, this fish processing unit aims at ensuring food security for the local population and improving incomes in the fishing sector. The implementation of such a unit should help professionals to engage in good practices relevant to fish and crawfish, such as handling, temperature maintenance, packaging and freezing before distribution either on the domestic market or on the export one.

The aim of the processing unit is to contribute to the improvement of food security by reducing poverty. The objectives are to increase sea fishing production as well as fishermen's income and, by doing so, participate in improving the nutritional health of the population.

The prioritized objectives are the following:

- ▶ Build infrastructure dedicated to sea fishing product processing,
- ▶ Improve the fishermen's capacity to achieve sustainable prosperity.

In that frame, the following activities are planned; build a small unit, make it available to the fishermen gathered in a professional association, and then train them to conduct basic administrative management and use best practices for cleaning, bagging, freezing and handling to avoid potential dangers related to fresh fish and mollusk.

This unit should also encourage the development of new links with the hotels/restaurants while proposing new products such as smoked fish or fillet of fish. The additional processing of the fresh fish should generate value added for end products that should positively affect income.

The expected impacts are an increase in the value added of sea fishing products for local consumption and for export.

At the sectorial level, the project aims to help improve food security by increasing employment and income, and to maintain sustainable exploitation of sea fishing resources. More specifically, it aims at increasing sea fish production and fishermen's income and the nutritional health of the population.

This project is compliant with the GEF/SGP as it is in line with the International Waters Focal Area. It is also well compatible with two main lines of The Bahamas Country Program Strategy: "Private Sector Development for Labor Market and Productivity" that aims at improving skills to reduce unemployment and "Other Areas for Future Dialogue 2013-2017" concerning food security by increasing the production and consumption of local food.

The project can be implemented in three components:

- ▶ Component A: Build the unit for fisheries product processing,
- ▶ Component B: Buy and install several sets of equipment,
- ▶ Component C: Train the fishermen to use basic best practices for handling and processing.

Technical description

Technically, the processing unit will be dedicated to the following:

- ▶ Offloading and storing unprocessed fish,
- ▶ Processing that means,
 - Cutting,
 - Smoking,
 - Blast freezing or chilling,
 - Packaging.
- ▶ Cold storage,
- ▶ Storing other products not kept in cold storage,
- ▶ Storing packaging and supplies,
- ▶ Quality testing.

The unit will be fitted with:

- ▶ Lavatory,
- ▶ Laundry, and facilities such as utility equipment (heat, hot water, well water, electricity),
- ▶ Office.

The unit will be organized into four distinct areas that are:

- ▶ Fish sales,
- ▶ Salting and smoking zone,
- ▶ End product preparation area,
- ▶ Administrative zone (the office).

The unit will employ four persons and recruitment will respect gender equality.

Environmental impact risks and mitigation

Future operations will be of very small scale. According to the key environmental issues, the following recommendations to mitigate impacts are:

- ▶ Focus operations on dry clean-up of fish waste and give attention to floor drains to minimize any solids entering the sewers,
- ▶ If none exists, create a sewage connection for waste water discharge,
- ▶ Store solid fish waste in a cool room,
- ▶ Maintain careful attention to very good housekeeping for odor management.

Risk to successful implementation

- ▶ Risk 1: Lack of investment by private stakeholders.
This risk is considered low as the need has been expressed by the fishing industry professionals. Risk may be mitigated by a close collaboration between the GoB and stakeholders to gain effective support.
- ▶ Risk 2: Lack of Political support.
This risk is considered as low as the Government is currently reviewing its National Development Plan with a Long Term perspective (2040). Food security, unemployment reduction, poverty alleviation and boosting local food production and consumption are among the targets to be reached.

3.3 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effects regarding the different key pillars related to the Sustainable Prosperity Scenario for development:

| | |
|---------------------------|--|
| Major positive impact | |
| Contribution | |
| No effect | |
| Potential negative impact | |

| Development of an artisanal fishing center in Darel Island – Lowe Sound | |
|---|--|
| Food and water security | |
| Connectivity and accessibility | |
| Education and capacity building | |
| Climate change and coastal resilience | |
| Livelihoods and income equality | |
| Land tenure security, land use planning and enforcement | |
| Health and wellbeing | |
| Strengthening local government | |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| | Sub activities | Institution responsible | Source of funding |
|--------------------|--|-------------------------|-------------------|
| Short term | <i>Infrastructure repaired, basic services added, and nautical access secured</i> | | |
| | Design studies and works for dock & ramp repairs | MWUD - Port Authorities | Public |
| | Design studies and works regarding basic services, landscaping and nautical access | MWUD - Port Authorities | Public |
| Medium term | <i>Nautical access improved and fish processing unit created</i> | | |
| | Improvement of nautical access (dredging operation) | MWUD - Port Authorities | Public |
| | Fish processing unit | PPP | PPP |
| | Installation of waste management systems | MWUD - Port Authorities | Public |

4.2 COST ESTIMATION

Port facilities and services - Dredging

It is important to stress that - at this stage of the study - the diagnosis and structural state of the existing infrastructure are not known. The proposed works to be undertaken and the costs are given as a first approach only. Technical diagnosis, bathymetric survey, jetting, etc. will be carried out later in order to define the necessary works in more detail.

The cost of the works depends on the collected data, which are not available at the beginning of the present study:

- ▶ For each type of infrastructure, it would be interesting to collect the original working drawings (to assess the level of foundation for example),
- ▶ Inspection by underwater divers will be needed to check the condition of existing structures (corrosion of steel, concrete, etc.),
- ▶ In the case of an island, the works costs depend directly on the availability of materials. For example, are there local quarries to supply aggregates for concrete or large rip-rap for protection dikes at the entrance of channels?
- ▶ For dredging and rock excavation in access channels, what heavy equipment could be found on site or nearby islands? What are the possibilities of disposal and storage of spoil materials?

Cost estimates for works are based on recent studies carried out by BRLi for similar infrastructure in the Caribbean Sea area: the French West Indies and Dominican Republic mainly. In particular, BRLi has studied several piers on piles for passenger shuttles and various infrastructure for motor-yachts up to 50 m long. Moreover, Blue Engineering Ltd. has collected local unit prices.

In the case of Darel Island, the following comments are considered for each kind of infrastructure and building:

- ▶ Dock and ramp: The cost depends on the water depth and the maximum size of vessels using the infrastructure,
- ▶ Dredging operation: The cost depends on the size (water depth, width) and on the quality of the soil or rock to be excavated. It also depends on the availability or not of the dredging equipment in rocky soils,
- ▶ Buildings: Data (cost in US\$/ft²) are available on the website.

It was considered that the design of new infrastructure would take into account the “Design and operational Guidelines for superyacht facilities” (PIANC Report N°134 – Recreational navigation commission – 2013):

The report provides advice for the design of the following items:

- ▶ Basin and channel geometry,
- ▶ Entrance channel,
- ▶ Slip (berth) dimensions,
- ▶ Berthing systems,
- ▶ Mooring,
- ▶ Utilities and hardware:
 - Electrical power,
 - Potable water,
 - Solid waste collection,
 - Waste oil removal,
 - Restrooms, showers.

Fish processing unit

The estimated cost of the unit is of k\$ USD 1,470.

This cost is an average one based upon comparison between two small fish processing units designed for the fishery industry in Martinique where the sector is very similar to the Androsian one. Calculations have been made according to fish weight assumptions. A low capacity processing one of 100/150 Tons per year and a higher one of 500 Tons per year.

This average cost includes:

- Cost of the unit building,
- Cost of the cooling equipment,
- Cost of the other kinds of equipment and the production material.

| Sub-activities | | | Estimated costs | |
|--|--|--|-----------------|--------------------|
| | | | Unit | Total Amount (k\$) |
| Short term | Design studies and works for docks and ramps repairs | Design studies | * | 64.23 |
| | | Pier rebuilding | m ² | 616.00 |
| | | Ramp repair | m ² | 26.25 |
| | Design studies and works regarding basic services, landscaping and nautical access | Design studies | * | 53.87 |
| | | Potable water + electric power | U | 13.20 |
| | | Restrooms / showers repair | m ² | 110.00 |
| | | Port master building | m ² | 66.00 |
| | | Trailers area (parking) - 450 m ² | m ² | 49.50 |
| | | Marking access channel (Lights & buoys) | Lump-sum | 50.00 |
| | | Landscaping + conch waste management | m ² | 250.00 |
| Grand TOTAL Short term | | | | 1 299.05 |
| Medium term | Improvement of nautical access | Dredging operations (30cubic yards) | Lump sum | 2.40 |
| | Fish processing unit | Building + equipment | Lump sum | 1 470.00 |
| | Installation of Wastewater / solid waste / waste oil management systems | Solid waste system | Lump sum | 60.00 |
| | | Waste oil system | | |
| Wastewater, grey and black waters system | | | | |
| Grand TOTAL Medium term | | | | 1 532.40 |
| Grand TOTAL | | | | 2 831.45 |

4.3 SOURCES OF FUNDING

The funding sources liable to be used are the following, for investment and functioning.

Investment

The fish-processing unit could be funded through an agreement between the GEF/SGP, the stakeholders through the UN Polled Financing Facility that gathers Donors (ODA), Banks and institutional Investors, Local Governments, Local NGOs and/or Private Companies.

Other potential investors could be:

- ▶ Equity investment,
- ▶ Investment Fund for project implementation and training fishermen on basic management principles,
- ▶ The World Bank small and medium enterprise financing,
- ▶ The GEF,
- ▶ The Small Grant Fund,
- ▶ The IDB for the unit implementation,
- ▶ The CARICOM Regional Fishery Mechanism (CRFM) Unit for technical and/or financial assistance.

Functioning

- ▶ The Government of The Bahamas through direct payments to the sector,
- ▶ Tax waivers and deferrals that refer to fuel tax exemptions for fishing vessel fuel, sales tax exemptions, special income tax deductions for fishermen and deferred tax programs,
- ▶ A monthly rent paid by the cooperative to the GoB for using the fish-processing unit.

4.4 MANAGEMENT MODEL

Artisanal and small-scale coastal fishery must be understood as fishing where vessels are beach landed and traditional gear used. Consequently, the investment level is low.

On that basis, the co-management model is the one recommended here for actively involving user-groups in regulatory decision-making. The point is to develop a dynamic partnership using the capacities and interests of both the Government and the resource-users. It is a Public-Private Partnership Model.

The stakeholders could be the following:

- ▶ Fishermen through a cooperative, or a community-based representation,
- ▶ The Ministry of Agriculture and Marine Resources,
- ▶ The Department of Marine Resources (DMR),
- ▶ The Marine Resources Network/The Marine National Parks representatives,
- ▶ The Bahamas National Trust (BNT),
- ▶ The Bahamas Agriculture and Marine Sciences Institute (BAMSI).

Expected impacts of community-based management initiatives include: improved quality of fishery management decisions and their implementation; enhanced flexibility of resource users to adapt to the changing international fisheries regime due to information exchange; empowerment and enhanced capability of communities to manage fishery resources for sustainability; increased contribution of the fisheries sector to economic development both directly and through linkages; and increased cost-effectiveness of fishery management.

4.5 STUDIES NEEDED FOR EXECUTION

- ▶ Design studies for dock & ramp repairs,
- ▶ Design studies for fish processing unit,
- ▶ Land tenure verification,
- ▶ Environmental impact assessment.

4.6 PRIORITY AND RELATION TO OTHER INITIATIVES

The fishing sector is critical for food sustainability in all SIDS. As a matter of fact, the UN and its Agency FAO have given priority and importance to the development of small-scale fisheries. Thus, the project is yet consistent with the Economic Pillar of Vision 2040, The Bahamas National Development Plan that encompasses measures for Poverty alleviation and Food Security as expressed in the Millennium Development Goals (MDGs).

At the National level, the project is also consistent with works recently conducted for revamping under the Fisheries Act (AGRER, Final Technical Report, 2013). At the Regional level, the project is in line with both the 1994, Barbados Plan of Action (BPoA) defined for SIDS and the CARICOM mechanism, the Caribbean Regional Fisheries Mechanism (CRFM), which aims to support the sustainability of the fishing sector in the Caribbean.

More widely, the project is still in line with the Objective of the Mauritius Strategy (UN Conference, 1995), the Apia (Samoa, 2014) Conference that defined the SIDS development strategy with regard, among others, to the impacts of climate change on coastal areas, and GLISPA, the SIDS trademark, one of the goals of which is to help and assist fisheries sustainability among SIDS.

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

The beneficiaries are the fishermen first of all, but also the tourism sector, as hotels and restaurants will be able to propose new products such as smoked fish and fillets of fish at medium term. At long term, the last target is the export-market. The project is expected to reduce poverty by cutting unemployment.

Beneficiaries include:

- ▶ Local residents such as Lowe Sound, Morgan's Bluff and Nicholls Town communities,
- ▶ Local fishermen and bonefishing guides,
- ▶ Domestic activity in general (increase in energy consumption, ice producers, fishing gear vendors....),
- ▶ Local tourist businesses including hotels, lodges, food and beverage establishments,
- ▶ Local authorities of North Andros.

The most important impact index is the contribution of the fish sector in GDP that according to data from 2008 accounted for 2-3 %. The experience may serve as a pilot for replication in other places either in Andros or elsewhere in the Family Islands and develop cooperation between other islands in the Caribbean.

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|------------------------------|---|--|
| Economic & Social | <ul style="list-style-type: none"> • Direct economic and social benefits to Lowe Sound community through increased fishermen's boat traffic and fish products sold, • Direct economic and social benefits to fishermen and bonefishing guides through increased income, • Direct economic and social benefits through increased employment related to fishing activities, • Improved environment increasing the touristic appeal, • Improved functional harbor facilities and urban space for local residents. | <ul style="list-style-type: none"> • Temporary impacts during works – limited access to Darel Island, • Temporary impacts during construction – noise, vibration and traffic due to construction vehicles. |
| Environmental | <ul style="list-style-type: none"> • Improved nautical practices and safety, • Improved fishing waste management and sanitation, • Improved site aesthetics through landscape enhancement. | <ul style="list-style-type: none"> • Water quality risk through increased suspended sediments / sedimentation during dredging and construction, • Noise and vibration pollution during construction. |

6. PRODUCTS & INDICATORS

OUTPUT

- ▶ Design studies for dock & ramp repairs,
- ▶ Port infrastructure in good condition,
- ▶ Functional harbor facilities (potable water, electric power, sanitary facilities),
- ▶ Entrance channel secured,
- ▶ Dredging operations,
- ▶ Design studies for fish processing unit,
- ▶ Fishing center with the fish processing unit operational and used by the fishermen's community,
- ▶ Processed fishing products sold on domestic and export markets,
- ▶ Fishermen are better organized and their skills are improved: they are directly involved in the management of the structure.

OUTCOME

- ▶ Increased fishermen's boat traffic,
- ▶ Improved fish products quality,
- ▶ Increased fishermen's and bonefishing guides' income,
- ▶ Increased benefits from the fisheries sector,
- ▶ Increased employment related to fishing activities,
- ▶ Increased processed fish products sold on domestic and export markets.

INDICATORS

The indicators of success are the increase in the quantities sold on both the domestic market at first and on the export market in the future. The evolution of the number of hotels/restaurants interested in the newly launched products is also an index. This project is justified by the need to improve fishermen's income, food security in terms of healthy processing/handling and environmental protection by introducing good practices for waste management.

Other indicators are:

- ▶ Number of fishermen's boats using Darel Island port facilities,
- ▶ Rate of increase in fishermen's income,
- ▶ Number of jobs created,
- ▶ Benefits from the fisheries sector,
- ▶ Quantity of sea products and by-products on the markets,
- ▶ Number of hotels/restaurants interested in the newly launched product.



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APPENDIX B.

RECOMMENDATIONS
FOR DREDGING AND MINING

DREDGING AND MINING

1. STRATEGY AND RECOMMENDATIONS

The recommendations regarding the dredging and mining sector are the following:

► **Launch study to determine the most sustainable locations for quarrying and offshore mining in Andros**

Extractive activities such as quarry and offshore mining aggravate coastal and marine degradation and must be carefully managed. The study aims at determining the most environmentally sustainable locations for quarrying and offshore mining. The study should determine what resource is worth developing and where, and how to effectively extract the reserves in an environmentally sustainable way that makes financial and economic sense, taking into account the needs for Andros.

This type of study includes technical, environmental, economic and legal insight, and is developed in the action sheet 0 – Physical studies.

► **Implement policies to limit ad-hoc dredging and mining - Better regulate locations and depth of mining**

According to the results of the study above-mentioned, it should be possible to define a specific zoning indicating where extractive activities are allowed or not on Andros.

Policies limiting and regulating these activities should be implemented specifying the best practices to adopt for reducing their environmental impact. These practices include measures such as reducing water and energy consumption, minimizing disturbance and waste production, preventing soil, water and air pollution.

Regarding dredging operations, dredging needs should be accurately assessed through bathymetric surveys.

► **Launch topo-bathymetric surveys in the main ports**

No recent bathymetric surveys have been performed in the main harbors of Andros since their construction. Currently, many channels are not deep enough to allow boats to enter irrespective of the tide, entrance channels are not secured, wrecks are left in the waters and port infrastructure is in need of repair.

The surveys aim at assessing dredging needs in the main harbors of Andros prior to dredging operations, and are developed in the action sheet 0 – Physical studies.

2. ACTION PROGRAM

No specific action sheet has been developed for this sector. Refer to 0 – Physical studies.



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APPENDIX C.

RECOMMENDATIONS AND ACTION SHEETS
FOR TRANSPORTATION BY WATER

TRANSPORTATION BY WATER

1. STRATEGY AND RECOMMENDATIONS

The recommendation regarding transportation by water is the following:

► **Move boat traffic to avoid travel on coral reefs**

Andros has some of the most intact coastal and marine ecosystems in The Bahamas, including the third largest barrier reef in the world.

Coral reefs are marine ridges or mounds, formed from the deposition of calcium carbonate by living organisms, predominantly corals, but also by other organisms, such as coralline algae and shellfish. On one scale, they are large, robust, long-lived geological structures that have withstood the forces of storms, climatic change, sea level rise and predators. However, the living elements that build these structures are just a very thin veneer of delicate living tissue, highly sensitive to its surrounding environment.

Depending on the species and the environmental conditions, corals develop a variety of distinct growth forms. The different forms have different characteristics and affect where the corals are found, how they react to different stresses, and how fast they grow.

It has been demonstrated that a healthy coral reef provides a rich array of services to the human community, including providing food (especially protein), protecting shorelines, supporting the livelihoods of communities, supporting nature-based tourism activities and sustaining cultural traditions. In contrast, unhealthy or degraded coral reef systems can be linked to human diseases, decline in natural resources upon which local people are dependent (fishing activities for example), and increased vulnerability of the coastal area (east coast of Andros).

Main settlements on Andros are concentrated on the east coast, facing the barrier reef. The four main harbors (Morgan's Bluff, Fresh Creek, Lisbon Creek and Driggs Hill) are also located on the east coast. Thus, the different types of maritime traffic that access the harbors travel on the coral reef. Moreover, the port improvements planned at short term will increase this traffic, also increasing the stresses to the reef.

The barrier reef should be preserved through the following measures:

- The prohibition of travelling/sailing on the reef,
- The implementation of markers along the reef,
- The implementation of crossing channels where the reef is either interrupted, the least wide or at its deepest,
- The implementation of mooring buoys in specific sites to allow access for snorkeling or scuba diving.

2. ACTION PROGRAM

The action sheets developed regarding transportation by water are the following:

- **6 - Improvement of conditions for maritime access: implementation of lights and buoys, dredging operations and wreck removal,**
- **7 - Development of a new ferry service between Central Andros, Mangrove Cay and South Andros.**

| | | |
|---|---|--|
|  | Transportation by water | <p style="text-align: center;">6 - Improvement of conditions for maritime access: implementation of lights and buoys, dredging operations and wreck removal</p> |
| | All districts | |
| | <p style="text-align: center;">ST MT LT</p> <p style="text-align: center;"><input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p> | |

1. OBJECTIVE

The overall objective is to improve conditions for maritime access in the main harbors of Andros.

The sub-objectives include:

- ▶ Upgrade security conditions for maritime access,
- ▶ Upgrade existing entrance channels and harbor basins,
- ▶ Improve working conditions for fishermen and fishing guides,
- ▶ Attract more recreational and commercial vessels,
- ▶ Improve connectivity with Nassau and other districts of Andros,
- ▶ Improve tourism,
- ▶ Enhance employment related to port activities.

2. LOCATION

This action sheet concerns the following sites:

- ▶ North Andros: Red Bays, Lowe Sound and Morgan's Bluff,
- ▶ Central Andros: Fresh Creek and Behring Point,
- ▶ Mangrove Cay: Little Harbor and Lisbon Creek,
- ▶ South Andros: Driggs Hill and Mars Bay.

According to the outcomes of the field mission in Andros led by BRLi/Blue in May 2016, these sites are the most visited and utilized by locals (fishermen or fishing guides) or by others vessels (ferry, commercial or recreational boats).



6 - Improvement of conditions for maritime access: implementation of lights and buoys, dredging operations and removal

3. ACTION PROGRAM

3.1 KEY ISSUES AND OPPORTUNITIES

Red Bays (North Andros)

Red Bays Fisherman's Dock is a solid concrete structure with an open pile dock at the deeper end. It is in fair condition with the timber portion in need of repair after having been raised during a hurricane and repaired to a degree by the locals. The ramp is in good condition.

One wreck needs to be removed and the nautical access is not safe: channel buoys and lights are lacking.

Below are some pictures illustrating the current situation at Red Bays dock.



Source: BRLi / Blue – May 2016

Low Sound – Darel Island (North Andros)

Darel Island is a location understood to be the main fishing hub in North Andros, but the timber structure dock is without a deck and the landside edge has been washed away. The dock therefore is in need of replacement, the edge built up and surfaced, and the ramp needs to be resurfaced and extended with minor dredging at the foot of the ramp.

This location is an eye sore frequented by many tourists to launch their fishing boats.

The nautical access is not safe: channel buoys and lights are lacking.

Below are some pictures illustrating the current situation at Darel Island.



General view of Darel Island

Wooden destroyed dock

General view of the wooden dock

Ramp

Fishermen

Conch waste disposal

Source: BRLI / Blue – May 2016

Morgan's Bluff (North Andros)

Morgan's Bluff has always been considered as the main commercial and recreational port of Andros; it is Andros' nearest port from New Providence and Florida. Development plans have been proposed occasionally since the 1980s, but have never been materialized.

Currently, different types of traffic access Morgan's Bluff:

- ▶ Cargo containers from G&G, Seacor and Bimini Shipping are sitting nearby,
- ▶ Mail boat: the "Lady Rosalind" connects North Andros (Morgan's Bluff) from Nassau once a week,
- ▶ Fuel barge every two months,
- ▶ Local fishermen,
- ▶ Bahamian and American boaters - from January to May 2016, around 100 recreational boats came in at Morgan's Bluff before moving on to Exuma and Abaco islands,
- ▶ Bahamas Fast Ferries used to come into Morgan's Bluff, but it was not profitable enough for them to maintain the route.

These types of traffic are low and could be improved if Morgan's Bluff offered better conditions for maritime access:

- ▶ The nautical access is not safe: channel buoys and lights are lacking,
- ▶ Unused water pipes are lying on the quay in the large dock,
- ▶ Several wrecks need to be removed,
- ▶ A bathymetric survey has to be undertaken to define dredging needs in the channel and in the harbor basin.

Below are some pictures illustrating the current situation at Morgan's Bluff.



Roll-on roll-off locations



Small harbor



Small harbor



Small harbor



Small harbor



Large dock and old water pipes

Source: BRL / Blue – May 2016

Fresh Creek (Central Andros)

Fresh Creek is the main commercial and recreational harbor in Central Andros, and is a port of entry. Currently, different types of traffic access Fresh Creek; however, traffic levels are low and could be improved if Fresh Creek offered better facilities and services.

Among the different docks at Fresh Creek, the new Government dock is utilized by mail boats, fueling tankers and by the fast ferry (the « Lady D » connects Central Andros from Nassau once a week) ; and the Lighthouse Yacht Club & Marina wooden docks are used by recreational boats.

At present, a bathymetric survey has to be undertaken to define dredging needs in the channel and in the harbor's basin. The shallow depth prevents ships from coming into the harbor, they have to wait for high tide because the channel is too narrow and there is not enough space to turn around. One wreck needs to be removed at the entrance of the harbor, which is not secured: lights and buoys are insufficient and below industry standards.

Below are some pictures illustrating the current situation at Fresh Creek.





Wreck to be removed

Mail boat "Lady D"

Source: BRLI / Blue – May 2016

Behring Point (Central Andros)

Behring Point Dock is a newly (2015/2016) built concrete dock in good condition. It is used by fishing boats.

The harbor was dredged in 2015, but it is understood that it was insufficient and additional dredging needs to take place because the tide gets extremely low and boats are unable to access the dock. Further, it has created a situation whereby a number of boats have to queue up as the area is not wide enough to facilitate more than one boat at a time, and there is no turning basin so boats have to drive in and reverse out in order to stay in the deep-water areas. A bathymetric survey has to be undertaken to define dredging needs.

There are no facilities to tie boats up and locals have made their own arrangements for keeping their boats at this location. Boats have difficulty getting close to the dock due to the dock arrangement. The channel was dredged 20 feet wide, which is insufficient for larger vessels especially in poor weather conditions. A jetty was not constructed and as a result, the channel is refilling.

The entrance channel is not secured: lights and buoys are lacking.

Below are some pictures illustrating the current situation at Behring Point.



General view of Behring Point harbor

Concrete dock

Source: BRLI / Blue – May 2016

Little Harbor (Mangrove Cay)

Little harbor is situated in Moxey Town. It is a concrete dock in bad condition that needs repairs. Local fishermen use it. Dredging is also needed, as large boats cannot come in at low tide.

One wreck needs to be removed and the dock is not secured: lights and buoys are lacking.

Below are some pictures illustrating the current situation at Little Harbor.



Source: BRL / Blue – May 2016

Lisbon Creek (Mangrove Cay)

Currently, different types of traffic access Lisbon Creek harbor: local fishermen, ferry from South Andros (there is a harbor station – around 50 persons per day are using this service) and mail boat (the “Lady Katherina” connects Mangrove Cay from Nassau once a week).

It is not a port of entry; there is no dock master nor customs/immigration, which frustrates the local sponge and stone crab industry (economic wheel of Mangrove Cay) for exportation. Improvements are considered necessary at Lisbon Creek to facilitate both fishing and mail boat services to support local industry.

The Government Dock at Lisbon Creek is steel sheet pile bulkhead with a concrete deck measuring 193'6"x56'6". It appears to be in good condition but in need of minor repairs. The existing ramp is in bad condition (currently closed), and needs to be repaired. The harbor also needs to be dredged as vessels can only visit at high tide.

Two wrecks need to be removed and the channel entrance is not secured: lights and buoys are lacking.

Below are some pictures illustrating the current situation at Lisbon Creek.



Driggs Hill (South Andros)

Driggs Hill is considered as the main commercial and recreational port for South Andros. Currently, different types of traffic access Driggs Hill harbor: local fishermen, recreational boats, ferry from Mangrove Cay (there is a harbor station - around 50 persons per day are using this service) and different commercial vessels, including mail boat (the “Captain Moxey” connects South Andros from Nassau once a week). Around 50 boats per week are visiting Driggs Hill.

There are two docks at Driggs Hill, the main one referred as Driggs Hill Dock, and the Driggs Hill old Ferry Dock, which used to be utilized by the ferry.

► Driggs Hill Dock

There is a breakwater, which provides protection as a harbor. The dock is a concrete bulkhead on piles, with asphalt storage surface behind, both in good condition and in need of only minor repairs. The dock’s dimensions are 887’ girth x 48’ wide. It is believed it was constructed in 1990. The basin depth is about 10 feet at high tide.

There is a dock master and a dockage fee is requested (5 to 7 \$ per day). The area is used by the mail boats to carry passengers as well as for managing freight and fuel.

At present, there is inadequate depth at the dock, as the harbor has not been dredged since it was built. The 1000 feet long channel also has inadequate dimensions (not deep and wide enough) as boats have difficulties to enter the harbor during Northeast swells. It is considered likely that 8 feet depth at low tide / 12 feet at high tide would be sufficient for its present use. However, we remain unclear as to why this depth is considered necessary given the use by relatively small vessels.

A bathymetric survey has to be undertaken to define dredging needs in the channel and in the harbor basin.

There are no buoys, channel markers or lights in the channel. Moreover, the harbor is not safe during Northeast surges. The opening of the northwestern portion of the dock channel to make it a safer harbor and the relocation of the dock was a consideration. Another suggestion was made to install a jetty.

► Driggs Hill old Ferry Dock

The Driggs Hill old ferry dock is an old dock located on the northwest side of Driggs Hill. It is now a decaying and dangerous metal frame destroyed by a hurricane around 1990. The Chief Councilor has indicated that investigations were made regarding the old dock's removal and due to the cost that would have to be incurred at the local level, an overlay of the dock was deemed a more practical approach. He further indicated that if such an approach was taken then the modified structure could facilitate the ferry service between South Andros and Mangrove Cay, and the local fishermen could use this dock for ease of access. However, these solutions do not seem to be technically feasible.

Below are some pictures illustrating the current situation at Driggs Hill.



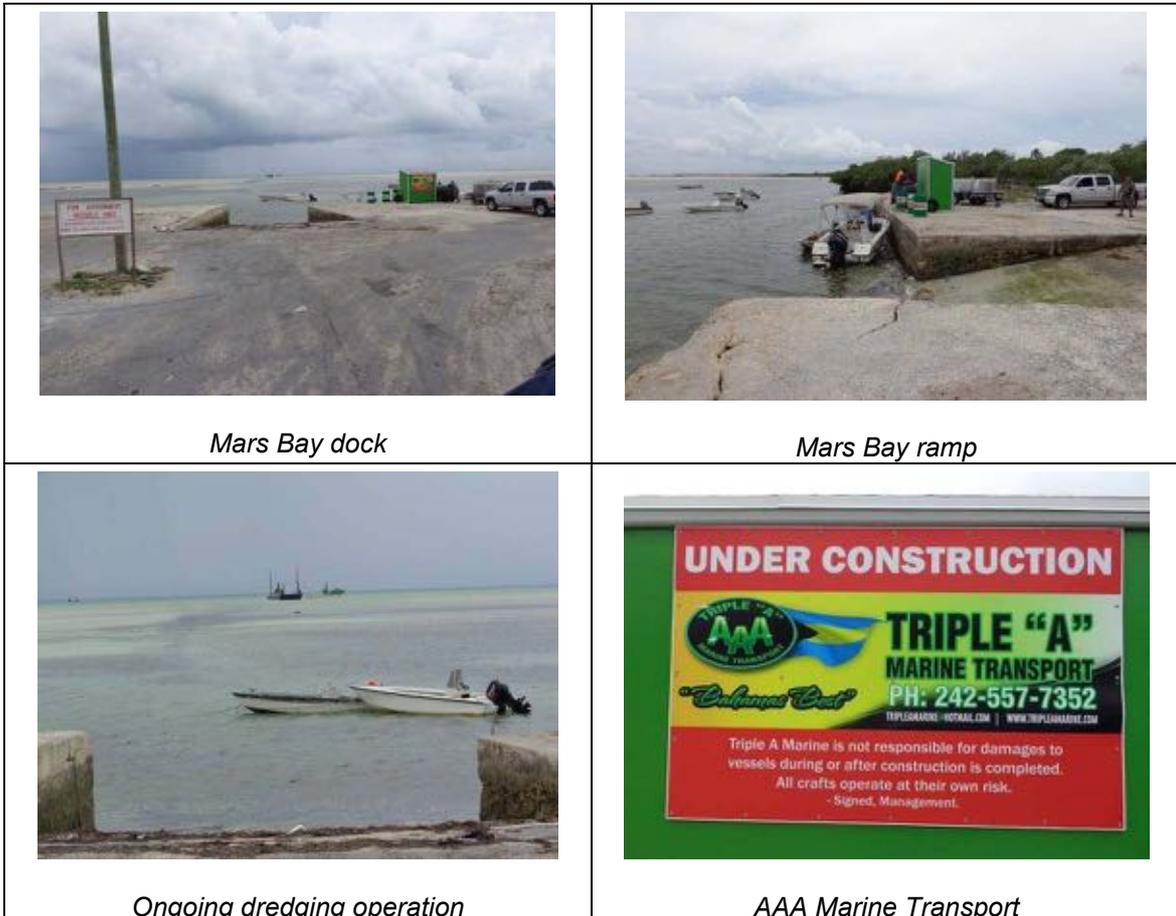
| | |
|---|--|
| <p><i>Captain Moxey at Driggs Hill dock</i></p> | <p><i>Driggs Hill dock</i></p> |
|  <p><i>Management of freight</i></p> |  <p><i>Public ferry for Mangrove Cay</i></p> |
|  <p><i>Driggs Hill old ferry dock</i></p> |  <p><i>Decaying and dangerous metal frame</i></p> |

Mars Bay (South Andros)

Mars Bay is situated 45 km south of Driggs Hill. It is a concrete dock and a ramp in poor condition, used by local fishermen and bonefishing guides.

The nautical access is not safe: channel buoys and lights are lacking.

Below are some pictures illustrating current situation in Mars Bay.



3.2 DEVELOPMENT STRATEGY

The overall strategy is to improve security conditions for maritime access in main harbors of Andros. It is declined in two different steps, corresponding to two different stages in time:

- ▶ At short term:
 - Channel markers, lights and buoys are added in Red Bays, Lowe Sound, Morgan's Bluff, Fresh Creek, Behring Point, Little Harbor, Lisbon Creek, Driggs Hill and Mars Bay,
 - Bathymetric surveys are undertaken in Morgan's Bluff, Fresh Creek, Behring Point, Little Harbor, Lisbon Creek and Driggs Hill to define dredging needs in the channels and harbor basins.
- ▶ At medium term, dredging operations are carried out and wrecks are removed.

By improving ports accesses and security, more recreational and commercial boats should be attracted on a daily as well as monthly basis, connectivity, tourism activities should be enhanced and working conditions for fishermen, and fishing guides should be improved.

A preliminary list of activities and investments to be undertaken are presented below:

Short term – up to 5 years (2020)

- ▶ **Red Bays**
 - *Channel markers added (lights and buoys),*
- ▶ **Low Sound**
 - *Channel markers added (lights and buoys),*
- ▶ **Morgan's Bluff**
 - *Channel markers added (lights and buoys),*
 - *Bathymetric survey.*
- ▶ **Fresh Creek**
 - *Channel markers added (lights and buoys),*
 - *Bathymetric survey.*
- ▶ **Behring Point**
 - *Channel markers added (lights and buoys),*
 - *Bathymetric survey.*
- ▶ **Little Harbor**
 - *Channel markers added (lights and buoys),*
 - *Bathymetric survey.*
- ▶ **Lisbon Creek**
 - *Channel markers added (lights and buoys),*
 - *Bathymetric survey.*
- ▶ **Driggs Hill**
 - *Channel markers added (lights and buoys),*
 - *Bathymetric survey.*
- ▶ **Mars Bay**
 - *Channel markers added (lights and buoys).*

Medium term – up to 10 years (2030)

- ▶ **Red Bays**
 - *One wreck removal.*
- ▶ **Low Sound**
 - *Minor dredging operation at the bottom of Darel Island ramp.*
- ▶ **Morgan's Bluff**
 - *Five wrecks removal,*
 - *Dredging operation.*
- ▶ **Fresh Creek**
 - *One wreck removal,*
 - *Dredging operation.*
- ▶ **Behring Point**
 - *Dredging operation (dock extension to allow access to a future ferry linking Central Andros and Mangrove Cay).*

- ▶ **Little Harbor**
 - One wreck removal,
 - Dredging operation.
- ▶ **Lisbon Creek**
 - Two wrecks removal,
 - Dredging operation.
- ▶ **Driggs Hill**
 - Old ferry dock removal,
 - Dredging operation.

3.3 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effect regarding the different key pillars related to the Sustainable Prosperity Scenario of development:

| | |
|---------------------------|--|
| Major positive impact | |
| Contribution | |
| No effect | |
| Potential negative impact | |

| Improvement of conditions for maritime access | |
|---|--|
| Food and water security | |
| Connectivity and accessibility | |
| Education and capacity building | |
| Climate change and coastal resilience | |
| Livelihoods and income equality | |
| Land tenure security, land use planning and enforcement | |
| Health and wellbeing | |
| Strengthening local government | |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| | Sub activities | Institution responsible | Source of funding |
|--------------------|--|-------------------------|-------------------|
| Short term | Channel markers added (lights & buoys) | MWUD - Port Authorities | Public |
| | Bathymetric surveys | MWUD - Port Authorities | Public |
| Medium term | Dredging operations | MWUD - Port Authorities | Public |
| | Wreck removal | MWUD - Port Authorities | Public |

4.2 COSTS ESTIMATION

It is important to stress that - at this step of the study - the diagnosis and structural state of the existing infrastructure are not known. The proposed works to be undertaken and the costs are given as a first approach only. Technical diagnosis, bathymetric survey, jetting, etc. will be carried out later in order to define further works with more details.

The costs are contingent on data which is currently unavailable:

- ▶ For each type of infrastructures, it would be interesting to collect the original working drawings (to check the level of foundation for example),
- ▶ Inspection by underwater divers will be needed to check the condition of existing structures (corrosion of steel, concrete, etc.),
- ▶ In the case of an island, the works costs depend directly on the availability of materials. For example, are there local quarries to supply aggregates for concrete or large rip-rap for protection dikes at the entrance of channels?
- ▶ For dredging and rock excavation, what heavy equipment could be found on site or nearby islands? What are the possibilities of disposal and storage cuttings?

Cost estimates of works are based on recent studies carried out by BRLi for similar infrastructures in the area of Caribbean Sea: the French West Indies and Dominican Republic mainly. In particular, BRLi has studied several piers on piles for passenger shuttles and various infrastructures for motor-yachts up-to 50 m long. Moreover, local unit prices have been collected by Blue Engineering Ltd.

Considering entrance channels, the cost depends on the size (water depth, width) and on the quality of soil or rock to be excavated. It depends too on the availability or not of the dredging equipment in rocky soils.

It was considered that the design of new infrastructures would take into account the "Design and operational Guidelines for superyacht facilities" (PIANC Report N°134 – Recreational navigation commission – 2013). The report provides in particular advices for the design of basin and channel geometry.

| Sub activities | | | Estimated costs (k\$) | | |
|--|--|--|---|--------------------|---------------|
| | | | Unit | Total Amount (k\$) | |
| Short term | Design studies and works for channel markers, lights and buoys | Design studies: Red Bays / Lowe Sound / Morgan's Bluff / Fresh Creek / Behring Point / Little harbor / Lisbon Creek / Driggs Hill / Mars Bay | * | 70.00 | |
| | | Channel markers, lights and buoys for Red Bays | Lump sum | 50.00 | |
| | | Channel markers, lights and buoys for Lowe Sound | Lump sum | 50.00 | |
| | | Channel markers, lights and buoys for Morgan's Bluff | Lump sum | 80.00 | |
| | | Channel markers, lights and buoys for Fresh Creek | Lump sum | 80.00 | |
| | | Channel markers, lights and buoys for Behring Point | Lump sum | 50.00 | |
| | | Channel markers, lights and buoys for Little Harbor | Lump sum | 50.00 | |
| | | Channel markers, lights and buoys for Lisbon Creek | Lump sum | 80.00 | |
| | | Channel markers, lights and buoys for Driggs Hill | Lump sum | 80.00 | |
| | | Channel markers, lights and buoys for Mars Bay | Lump sum | 50.00 | |
| | Bathymetric surveys to assess dredging needs | Survey for Morgan's Bluff | Lump sum | 30.00 | |
| | | Survey for Behring Point | Lump sum | 20.00 | |
| | | Survey for Fresh Creek | Lump sum | 30.00 | |
| | | Survey for Little Harbor | Lump sum | 20.00 | |
| | | Survey for Lisbon Creek | Lump sum | 30.00 | |
| | | Survey for Driggs Hill | Lump sum | 30.00 | |
| | Grand TOTAL Short term | | | | 800.00 |
| | Medium term | Dredging operation | Low Sound (minor dredging at the bottom of the ramp - 30 cubic yards) | m3 | 2.40 |
| Morgan's Bluff (Hypothesis = 20000 m3) | | | m3 | 1 000.00 | |
| Fresh Creek (Hypothesis = 20000 m3) | | | m3 | 1 000.00 | |
| Behring Point (Hypothesis = 10000 m3) | | | m3 | 500.00 | |
| Little Harbor (Hypothesis = 10000 m3) | | | m3 | 500.00 | |
| Lisbon Creek (Hypothesis = 20000 m3) | | | m3 | 1 000.00 | |
| Driggs Hill (Hypothesis = 20000 m3) | | | m3 | 1 000.00 | |
| Wreck removal | | Red Bays (1) | U | 80.00 | |
| | | Morgan's Bluff (5) | U | 400.00 | |
| | | Fresh Creek (1) | U | 80.00 | |
| | | Little Harbor (1) | U | 80.00 | |
| | | Lisbon Creek (2) | U | 160.00 | |
| | | Driggs Hill (1 = old steel ferry dock) | U | 150.00 | |
| | | Grand TOTAL Medium term | | | |
| Grand TOTAL | | | | 6 752.40 | |

4.3 STUDIES NEEDED FOR EXECUTION

- ▶ Design studies for channel markers,
- ▶ Bathymetric surveys,
- ▶ Environmental impact studies for dredging operations.

4.4 PRIORITY AND RELATION TO OTHER INITIATIVES

- ▶ Aligned with Vision2040: The National Development Plan.

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

Beneficiaries include:

- ▶ Local residents and communities around harbors,
- ▶ Local fishermen and bonefishing guides,
- ▶ Foreign and domestic visitors arriving by sea,
- ▶ National or international maritime transport companies (G&G, Seacore, and Bimini Shipping),
- ▶ Local authorities,
- ▶ Local tourism businesses including hotels, lodges, food and beverage establishments.

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|------------------------------|--|---|
| Economic & Social | <ul style="list-style-type: none"> • Improved security conditions for maritime access to main and local harbors, for foreigners and for Androsians, • Direct economic benefits to ports and local communities through increased boat traffics, • Economic benefits to communities, sites and attractions in each district of Andros through increased visitation, • Economic benefits through increased employment related to port / economic / nature-based activities. | <ul style="list-style-type: none"> • Temporary impacts during works – limited access to harbors, • Temporary impacts during dredging operations and wreck removals – noise, vibration and traffic due to marine machinery. |
| Environmental | <ul style="list-style-type: none"> • Improved nautical practices and safety. | <ul style="list-style-type: none"> • Water quality risk through increased suspended sediments / sedimentation during dredging operations and wreck removals, • Noise and vibration pollution during dredging operations and wreck removals. |

6. PRODUCTS & INDICATORS

OUTPUT

- ▶ Design studies for channel markers,
- ▶ Bathymetric surveys,
- ▶ Secured nautical accesses to main harbors,
- ▶ Functional lights and buoys,
- ▶ Functional channels and turn-around (larger boats can enter into main harbors whatever the tides),
- ▶ No wrecks left in main harbors.

OUTCOME

- ▶ Increased recreational and fishermen boat traffic,
- ▶ Increased commercial boat traffic,
- ▶ Increased number of foreign and domestic visitors arriving by sea,
- ▶ Increased benefits from economic and/or nature-based activities,
- ▶ Increased employment related to port / economic / nature-based activities.

INDICATOR

- ▶ Volume of materials excavated for channel and harbor basin,
- ▶ Number of wrecks removed,
- ▶ Number of boats stopping and docking in the main harbors (Morgan's Bluff, Fresh Creek, Lisbon Creek and Driggs Hill),
- ▶ Number of fishermen using local harbors (Red Bays, Lowe Sound, Behring Point, Little Harbor, Little Creek and Mars Bay),
- ▶ Number of visitors in Andros arriving by sea,
- ▶ Benefits from economic and/or nature-based activities in each district,
- ▶ Number of jobs created related to port / economic / nature-based activities.

| | | |
|---|---|---|
|  | Transportation by water | 7 - Development of a new ferry service between Central Andros, Mangrove Cay and South Andros |
| | Central Andros, Mangrove Cay, South Andros | |
| | ST MT LT <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> | |

1. OBJECTIVE

The overall objective is to improve inter-island transportation for locals as well as visitors by developing a new ferry service between Central Andros, Mangrove Cay and South Andros.

The sub-objectives include:

- ▶ Upgrade existing port facilities and services,
- ▶ Improve connectivity with other districts of Andros,
- ▶ Improve tourism in Central and South Andros and Mangrove Cay, and potentially Big Wood Cay
- ▶ Reduce cost and travel time for workers that need to travel between districts.

2. LOCATION

The main districts of Andros that are separated by waterways are from north to south; Central Andros, Mangrove Cay and South Andros. At present, there is a ferry service between Mangrove Cay at Lisbon Creek and South Andros at Driggs Hill. Extending the service to Central Andros, which is a longer distance trip, would connect the districts of Andros with a form of transport that does not rely on unreliable flights at a reduced cost.

CARGILL CREEK, CENTRAL ANDROS

Cargill Creek and Behring Point are the two southern most settlements of Central Andros, which is connected to North Andros by road. Cargill Creek is a major Creek, which is of high importance to the surrounding ecological environment. It is 1.2 miles north of Behring Point and there are many mangroves in the Creek area. It provides a natural shelter and is often utilized by vessels during storms. The Creek is however bottlenecked by the presence of a causeway and a small bridge a distance inland of the creek entrance. There is no Government dock at this location and it is not the preferred port location given that it is 1.2 miles further north by ferry than Behring Point. There are however a number of private docks that have been utilized for public use by others. In addition, Cargill Creek is a larger settlement than Behring Point.

BEHRING POINT, CENTRAL ANDROS

Behring Point is located at the southeastern most tip of Central Andros. It is 3.3 miles north of the north end of Big Wood Cay, 12.4 miles north of Moxey Town, Mangrove Cay, 20 miles north of Lisbon Creek, Mangrove Cay and 25 miles north of Driggs Hill, South Andros. The dock here was recently constructed and dredging carried out though this is inadequate at present (note that the improvement of the access to the dock by additional dredging is one of the action foreseen in that Andros Master Plan). There are mangroves about the new dock, some of which were damaged by the recent construction. Recent construction has also left a large volume of dredge material at this location. There is also a small beach at the dock location with stalls which it would seem are used during community events.



Behring Point, Central Andros

MOXEY TOWN/LITTLE HARBOR, MANGROVE CAY

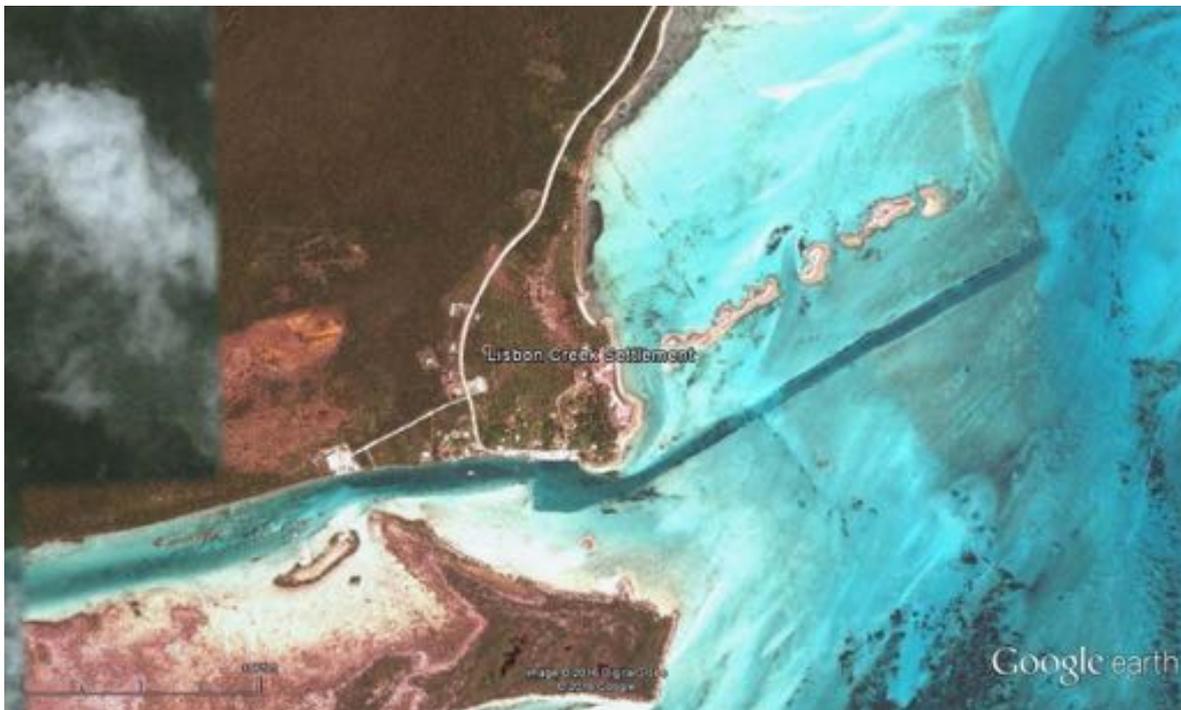
Moxey Town is located at the northeastern tip of Mangrove Cay. There is a Public Dock at this location and this dock is closest to the majority of the population of Mangrove Cay, Government offices and the Airport. It is also closest to the Driggs Hill – Behring Point ferry route as compared to Lisbon Creek as Lisbon Creek is located further west of the route thereby necessitating a lengthier journey to call into. The drive on land between Moxey Town and Lisbon Creek is approximately 7.5 miles. There are a few small cays offshore of Moxey Town dock, which is approximately 1.5 miles west of the barrier reef. There is coppice nearby and pine forest relatively close while mangrove is sparse in the area.



Moxey Town/Little Harbor, Mangrove Cay

LISBON CREEK, MANGROVE CAY

Lisbon Creek is located at the southeastern tip of Mangrove Cay. Access by sea is via a one mile long dredged channel. There is a public dock at Lisbon Creek, which is currently under repair. There is coppice nearby and very limited pine forest and mangrove. There is a ferry that currently serves between Lisbon Creek and Driggs Hill at South Andros. The mail boat, “Lady Katherina” connects Mangrove Cay (Lisbon Creek) from Nassau once a week on Thursdays, returning on Mondays.



Lisbon Creek, Mangrove Cay

DRIGGS HILL, SOUTH ANDROS

Driggs Hill is located at the northeastern tip of South Andros. There are two docks at Driggs Hill, the main one referred as Driggs Hill Dock (to the east), and the Driggs Hill old Ferry Dock, which used to be utilized by the ferry. The mail boat and the Lisbon Creek-Driggs Hill ferry service utilize this dock as well as other vessels. There is some coppice in the area and the barrier reef is approximately 1 mile to the west.



Driggs Hill, South Andros

The following lists the distance in miles between various docks that could be accessed by the ferry service;

- ▶ Cargill Creek and Behring Point; 1.2 miles
- ▶ Cargill Creek and Moxey Town; 15 miles
- ▶ Behring Point and Big Wood Cay (north); 3.3 miles
- ▶ Behring Point and Big Wood Cay (south); 9.6 miles
- ▶ Behring Point and Moxey Town; 12.5 miles
- ▶ Moxey Town and Lisbon Creek; 8 miles
- ▶ Moxey Town and Driggs Hill; 8.2 miles
- ▶ Lisbon Creek and Driggs Hill; 2.2 miles



3. ACTION PROGRAMME

3.1 KEY ISSUES AND OPPORTUNITIES

Improving connectivity within Andros and to Nassau is important to Androsians and will influence which parts of Andros tourists visit. At present, there is a fast ferry, which transports people, vehicles and goods between Fresh Creek and Nassau on Fridays.

There are also a number of mail boats, which transport people and goods to many of the major settlements along the eastern coast from Nassau weekly however, they rarely provide a service between ports in Andros and rely heavily on trips between Nassau and a single port in Andros.

Andros is split up into its districts largely by creeks, three (3) of which it is not feasible to provide access to by bridge. The distance is not too great to provide a ferry service between South Andros and Mangrove Cay however. This service runs twice daily and allows visitors and employees to travel between the two districts free of charge, a journey that takes approximately half an hour one-way.

There is a perceived need for an inter-island ferry service, which would further connect the districts.

Some of the issues that are currently restricting the development of water transportation are as follows:

- ▶ Its viability is economically questionable,
- ▶ Facilities are limited at the various ports/docks (i.e. fuel, electricity, water etc., is not available and dockage with nearby accommodation is limited),
- ▶ Access is limited at the various ports/docks due to inadequate depth and entrance channels are not secured (marking is lacking),
- ▶ There is a lack of safe harbor,
- ▶ Demand is unknown and/or limited.

At present, should persons who wish to travel between North and Central Andros and South Andros have the following limited options;

- ▶ Fly in and out of Nassau. This option is utilized by many of the Government employees however it is very time consuming as flights from Andros districts depart in the morning for Nassau and the flights into Andros are not until the afternoon thereby taking up much of the day to travel between districts.
- ▶ Limited and unreliable availability for flights between Fresh Creek and Mangrove Cay (approximately \$70 one-way). Service may be provided Mangrove Cay to Fresh Creek in the morning and vice versa in the afternoon. Further travel will then be required including a taxi from Moxey Town to Lisbon Creek (7.5 miles) followed by a ferry service to Driggs Hill (service provided twice per day free of charge otherwise a charter at \$90 to \$150 one way).
- ▶ Charter a bonefishing guide. Rates are \$300 between Behring Point and Driggs Hill and \$200 between Behring Point and Mangrove Cay one way. It should be noted that the vessels used for these trips are small and shallow draft and thereby limited in their capacity as well as weather conditions in which it is safe to travel.
- ▶ Charter the ferry that provides the regular Driggs Hill - Lisbon Creek ferry to travel between Driggs Hill and Cargill Creek at \$700 (this is mainly used by sports teams such as basketball teams to attend basketball matches in other districts, assuming 22 persons onboard this equates to \$32 per person).

As indicated above, travel between these districts is difficult as it is costly, can be unreliable and very time consuming, and in the case of the ferry a group of people must wish to travel and special arrangements must be made.

The Government of the Bahamas currently subsidizes the existing ferry service between Driggs Hill and Lisbon Creek. The subsidy is reported to be \$63.57 per round trip however; the operator advises that this is insufficient for the service to continue and that subsidies need to be increased to \$100 per round trip.

It is believed that for many years Androsians have been of the opinion that a cost effective way of joining all of Andros would yield a variety of important benefits for the island community. A bridge connecting the three separate parts of Andros has been suggested however, this is not economically or environmentally viable at this time. The next logical method of connecting all of Andros is to provide a reliable, safe and cost effective ferry service to accomplish this goal. A ferry service would open up opportunities for tourists as well as Bahamians to further explore the island of Andros whilst also opening opportunities for the benefits of BAMSI to be better experienced through Andros.

Providing a ferry service that connects Andros could allow the sustainable growth of Andros by cost effectively connecting the entire island into one social, economic, cultural and educational entity. Most local residents, businesses and visitors would benefit.

Infrastructure at the proposed ports is in varied states and should be considered for improvement as follows;

- **Behring Point Dock** – a newly (2015/2016) built concrete dock measuring 162' x 13' in good condition used by fishing boats. It is understood that the recent dredging was insufficient and additional dredging needs to take place because the tide gets extremely low and boats are unable to access the dock. Further, it has created a situation whereby a number of boats have to queue up as the area is not wide enough to facilitate more than one boat at a time and there is no turning basin so boats have to drive in and reverse out in order to stay in the deep-water areas. There are no facilities to tie boats up and locals have made their own arrangements for keeping their boats at this location. Boats have difficulty getting close to the dock due to the dock arrangement. As a result, an eighty (80) year old guest fell in the water, because the boat could not get to the dock. The channel was dredged 20 feet wide, which is insufficient for larger vessels especially in poor weather conditions. A jetty was not constructed and as a result, the channel is refilling.



Behring Point Dock



Behring Point Dock Access with stalls at nearby beach in background



Dredged material left at Behring Point Dock

- ▶ **Moxey Town – Little Harbor** is situated in Moxey Town. It is a concrete dock, used by local fishermen that is in bad condition, requiring repairs. A bathymetric survey is required to define dredging needs, as large boats cannot come at low tide. The dock lacks lights and buoys and there is a wreck that needs to be removed.
- ▶ **Lisbon Creek** –Currently, different types of traffic access Lisbon Creek harbor: local fishermen, ferry from South Andros (there is a harbor station – around 50 persons per day are using this service) and mail boat (the “Lady Katherina” connects Mangrove Cay once a week from Nassau on Thursdays, returning on Mondays,). The ferry loading and off-loading dock is currently undergoing minor repairs. It is not a port of entry; there is no dock master nor customs/immigration, which causes problem to the local sponge and stone crab industry (economic wheel of Mangrove Cay) for exportation. Improvements are considered necessary at Lisbon Creek to facilitate both fishing and mail boat services to support local industry.

The Government Dock at Lisbon Creek is steel sheet pile bulkhead with a concrete deck. It is believed in good condition, in need of minor repair. The existing ramp is in bad condition (currently closed), in need of repair. A bathymetric survey is needed to define dredging needs as vessels can only visit at high tide. Two wrecks need to be removed and the channel entrance is not secured: lights and buoys are lacking.



Lisbon Creek Dock from South



Lisbon Creek Dock looking east



Lisbon Creek Dock looking west

► Driggs Hill

There are two docks at Driggs Hill, the main one referred as Driggs Hill Dock (to the east), and the Driggs Hill old Ferry Dock, which used to be utilized by the ferry.

- Driggs Hill Dock

There is a breakwater, which provides protection as a harbor. The dock is a concrete bulkhead on piles, with asphalt storage surface behind, both in good condition, though in need of minor repairs. It is believed it was constructed in 1990. The basin depth is about 10 feet at high tide. The area is used by the mail boats to carry passengers as well as for managing freight and fuel. At present, there is inadequate depth at the dock, as the harbor has not been dredged since it was built. The 1000 feet long channel has also inadequate dimensions (not deep and wide enough) as boats have difficulties to enter the harbor during Northeast swell. It is considered likely that 8 feet depth at low tide / 12 feet at high tide would be sufficient for its present use. However, we remain unclear as to why this depth is considered necessary given the use by relatively small vessels. A bathymetric survey has to be undertaken to define dredging needs in the channel and in the harbor basin. There are no buoys, channel markers or lights in the channel. Moreover, the harbor is not safe during Northeast surges. The opening of the northwestern portion of the dock channel to make it a safer harbor and the relocation of the dock was a consideration. Another suggestion was made to install a jetty.

- Driggs Hill old Ferry Dock

The Driggs Hill Ferry Dock is an old dock located on North West Side. It is now a decaying and dangerous metal frame destroyed by a hurricane around 1990. The Chief Councilor has indicated that investigations were made regarding the old dock removal and due to the cost at the local level; an overlay of the dock was deemed a more practical approach. He further indicated that if such an approach was taken then the modified structure could facilitate the ferry service between South Andros and Mangrove cay; and the local fishermen can use this dock for ease of access. However, these solutions do not seem to be technically feasible. This old dock needs to be removed for security reasons.



Driggs Hill Larger Protected Eastern Dock Ferry off-loading beside mail boat



Driggs Hill Larger Protected Eastern Dock looking east



Driggs Hill Larger Protected Eastern Dock



Driggs Hill Smaller Western Dock looking north



Driggs Hill Smaller Western Dock



Rusted Barge Wreck at Driggs Hill Smaller Western Dock looking north

3.2 DEVELOPMENT STRATEGY

Transportation by sea has been and continues to be of high importance in the Bahamas. In particular in the Family Islands where there is heavy reliance on the shipping of basic necessities by mail boat and more recently some reliance on other shipping companies and a weekly fast ferry service from Nassau to Fresh Creek. Ports have historically played and will continue to play an important role in the development of mankind. Centuries ago, maritime transport was the most common way of connecting major trading hubs, developing remote regions, establishing, and expanding trade relations. Unfortunately, maritime transportation of today is more economically inclined and as a result, there is little inter island connectivity in particular in Andros where New Providence is closer than other districts of the same island.

The overall strategy is to expand the existing ferry service between Driggs Hill and Lisbon Creek to provide a service to Central Andros thereby connecting all of Andros by ferry. This project would be initiated in three different steps, corresponding to three different stages in time as follows:

- ▶ At short term, existing infrastructure is repaired, marketing of the service is underway, channel markers provided, studies are launched and the new service is started,
- ▶ At medium term, nautical access is improved with dredging and wreck removal, there is possible extension of the service to include booking offices and/or increase frequency and/or a stop at Big Wood Cay, and investors for long term development are sought,
- ▶ At long term, the service is developed alongside other activities with possible increase in fleet and service, possibly including vehicles for transportation.

By developing the ferry service, more recreational and commercial activities should be attracted on a daily as well as monthly basis. The increase of fees could make the ferry service profitable.

Route considerations

Cargill Creek is 1.2 miles north of Behring Point, which is the southernmost point of Central Andros. Both locations have their pros and cons as ports for the ferry service. Being further south, the Behring Point location would require less distance to be covered by the ferry service. This location was recently dredged and a new dock provided however further dredging is necessary to enable easier access and egress to/from the dock. Parking areas would be necessary at Behring Point whilst Cargill Creek area has more area that could be utilized for parking. Behring Point is also less protected than Cargill Creek however; Cargill Creek does not have a suitable Government Dock. It is understood that there is a protected dock area that AUTECH is currently decommissioning.

Overall, it is considered appropriate for the Behring Point location to be utilized following the necessary dredging for its use and the provision of a small number of car parking spots. Infrastructure works are considered at Behring Point for the new ferry service. See AS Improvement of port facilities. Discussions should be had with AUTECH for the use of the dock at Cargill Creek in particular during bad weather and in the long term.

Whilst Lisbon Creek is the dock used by the existing ferry and should continue to be for the Driggs Hill - Lisbon Creek only service, when the service is between Driggs Hill and Behring Point Lisbon Creek would extend the service and is a less desirable location to stop given that most development on Mangrove Cay is at Moxey Town. Therefore, Moxey Town would be the only stop on the two days that the service is run between Driggs Hill and Behring Point while Lisbon Creek would continue to be the stop for the Driggs Hill Lisbon Creek only service in the short term. The route would be reconsidered in the medium term.

For the purpose of costing, we have determined running costs of the ferry service to be as follows;

- ▶ \$2 per mile – Maintenance
- ▶ \$6 per mile – Fuel
- ▶ \$32 per hour – Salaries

- ▶ \$3.5 per mile – Taxes and Insurance
- ▶ \$1.4 per mile – Administration

At present, the Lisbon Creek to Driggs Hill ferry service is subsidized \$63.57 per round trip or \$127 per day. It is understood that this insufficient to maintain the provision of this service. It is estimated that \$100 per round trip or \$200 per day is more appropriate however; it is difficult to confirm this to be the case.

In order to make the extended ferry service cost effective we propose to have a single operation ferry service that operates a service between Driggs Hill, Little Harbor (Moxey Town) and Behring Point twice a week with the ferry service as current for the remaining days of the week. Providing the service to Moxey Town rather than Lisbon Creek is considered appropriate as Moxey Town is the location where there is most activity (closer to the airport also) as well as to reduce operational costs, travel time and impacts on the environment (for instance collision with reef).

Rather than the ferry service being free for all we propose that all persons are charged to use the current ferry service a fee of \$5 or similar with an option to purchase a book of tickets at reduced rates also with reduced rates for students and Government workers. The current subsidy should be applied to the expanded service (i.e. \$63.57 per round trip). With these assumptions, the ferry service would be able to cover its running costs if there are at least 11 people on the Behring Point service paying \$20 one way. This assumes that the existing ferry will be adequate. Once a new ferry must be purchased (at approximately \$80,000) based on the same number of trips and passengers should be charged an additional \$10 per trip to recoup boat costs within 2.5 years.

The existing ferry service is regularly chartered for trips between Lisbon Creek and Driggs Hill at alternate times to the regular service mainly for employees of the banks, BEC, BTC and other Government Agencies, as well as for trips to Cargill Creek usually for school sports teams etc. These trips provide good income for the ferry operator.

A new vessel considered suitable for the service in the future is a 40-foot long 12.6-foot wide fiberglass vessel with a capacity of 35 to 40 persons. The draft of this vessel would be such to allow passage through shallower waters if water conditions on the open seaside become too rough for comfortable travel. The propulsion would be two (2) gas fueled four stroke outboard engines. The vessel will be equipped with all the required safety equipment and a rest room. The cost of this type of vessel is estimated at \$80,000. A new vessel would only be purchased once the demand is found to confirm the service as cost effective.

Further consideration should be given to requiring reservations/bookings prior to travel to be sure that there is sufficient demand for each trip to warrant the expense.

The longer journey between Behring Point and Driggs Hill is to take place twice per week whilst service between Lisbon Creek and Driggs Hill will be provided as it currently does on all other days. The total distance covered for the journey between Behring Point and Driggs Hill is 25 miles. The total distance covered for the journey between Lisbon Creek and Driggs Hill is approximately 2.2 miles.

A proposed schedule for the two days of the week, which are to receive the Behring Point to Driggs Hill ferry service, is as follows;

| DEPARTURE FROM DRIGGS HILL | ARRIVAL AT LITTLE HARBOUR | DEPARTURE FROM LITTLE HARBOUR | ARRIVAL AT BEHRING POINT | DEPARTURE FROM BEHRING POINT | ARRIVAL AT LITTLE HARBOUR | DEPARTURE FROM LITTLE HARBOUR | ARRIVAL AT DRIGGS HILL |
|----------------------------|---------------------------|-------------------------------|--------------------------|------------------------------|---------------------------|-------------------------------|------------------------|
| 7.15 AM | 7.45 AM | 8.00 AM | 8.40 AM | 8.55 AM | 9.35 AM | 9.50 AM | 10.20 AM |
| 4.00 PM | 4.30 PM | 4.45 PM | 5.25 PM | 5.40 PM | 6.20 PM | 6.35 PM | 7.05 PM |

Further consideration should be given to ferry times during daylight saving periods and otherwise. In the future, there is likely to be a need for improved facilities at the ports where the ferry calls including a restaurant and shelter.

Of extreme importance in determining routes will be the minimization of impacts on the reef. At present, the presence of reef and its depth is not well known, however, the ferry captain would be familiar with the route. Mitigation measures shall be in place to address any potential negative impacts to reef from collision with reef or gasoline spills for instance.

A preliminary list of activities and investments to be undertaken for the ferry service are presented below:

Short term – up to 5 years (2020)

- ▶ Existing port facilities are repaired, and nautical access is improved (extent of dredging requirement determined and lights and buoys to mark channels) in the ports; Behring Point in Central Andros, Little Harbor and Lisbon Creek in Mangrove Cay and Driggs Hill in South Andros. These works will also attract more commercial and recreational boats and could be a source of income. Regarding coastal risks on these locations due to sea level rise, the climate change resilience study planned will assess risks and protection solutions to be proposed.
- ▶ Marketing for tourism improved with detailed information provided on-line with particular emphasis on packages taking advantage of the new ferry service. Including suggested activities by number of days of stay.
- ▶ Study to enhance Driggs Hill harbor protection during Northeast surges (wave propagation modeling, proposal of several coastal systems such as breakwater walls...),
- ▶ Collect fees for all ferry routes to cover running costs.
- ▶ Feasibility studies into providing a stop at Big Wood Cay for the ferry service in the future.
- ▶ Discussions with AUTECH with respect to Government utilizing the dock at Cargill Creek.

Medium term – up to 10 years (2030)

- ▶ Expand ferry service to include trips between Driggs Hill and Behring Point twice a week utilizing existing ferryboat.
- ▶ Connectivity between districts, transport on land and sea, are improved:
 - Consider expansion of ferry service (from Central to Mangrove Cay and to South Andros) to further improve connectivity between districts of Andros by increasing the number of trips and/or providing a stop at Big Wood Cay for the ferry service.
 - Consider providing more facilities at docks (i.e. shelter, parking and restaurants)
 - Traffic flows and accidents on bridges are monitored,
- ▶ Nautical accesses are improved in Behring Point, Little Harbor, Lisbon Creek and Driggs Hill, including dredging operations and wreck removal. Possible nautical access and dock provided at Big Wood Cay (this would be a private investment).

Long term – up to 25 years (2040)

- ▶ Consider expansion of ferry service (from Central to Mangrove Cay and to South Andros) to improve connectivity between districts of Andros by increasing the capacity of the vessels making the trips, including other locations for stops (i.e. Big Wood Cay) and possibly including vehicles. Also, consider expansion of service to Nassau, in connection with the establishment of the University in North Andros.

Example of ferry boat that could be implemented



Source : Jean-Marc BEYNET – BRLi - 2016

3.3 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effect regarding the different key pillars related to the Sustainable Prosperity Scenario of development:

| | |
|---------------------------|--|
| Major positive impact | |
| Contribution | |
| No effect | |
| Potential negative impact | |

| Action | |
|---|--|
| Food and water security | |
| Connectivity and accessibility | |
| Education and capacity building | |
| Climate change and coastal resilience | |
| Livelihoods and income equality | |
| Land tenure security, land use planning and enforcement | |
| Health and wellbeing | |
| Strengthening local government | |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| | Sub activities | Institution responsible | Source of funding |
|--------------------|---|-------------------------|-------------------|
| Short term | Description | | |
| | Repair existing port facilities and improve nautical access (lights and buoys to mark channels) in the ports; Behring Point in Central Andros, Little Harbor and Lisbon Creek in Mangrove Cay and Driggs Hill in South Andros | MOWUD | Public |
| | Climate change resilience study to assess risks and protection solutions to be proposed | MOE/BEST | Public |
| | Marketing for tourism improved with detailed information provided on-line with particular emphasis on packages taking advantage of the new ferry service. Including suggested activities by number of days of stay | MOT | Public |
| | Study to enhance Driggs Hill harbor protection during Northeast surges (wave propagation modeling, proposal of several coastal systems such as breakwater walls...) | BEST/MOWUD | Public |
| | Collect fees for all ferry routes to cover running costs | MOT | Private |
| Medium term | Description | | |
| | Expand ferry service to include trips between Driggs Hill and Behring Point twice a week utilizing existing ferry boat | MOT | Private |
| | Consider expansion of ferry service (from Central to Mangrove Cay and to South Andros) to further improve connectivity between districts of Andros by increasing the number of trips | MOT | Public & Private |
| | Monitoring of traffic flows and accidents on bridges | Police Dept./MOWUD | Public |

| | | | |
|------------------|--|-----------|------------------|
| | Nautical accesses are improved in Behring Point, Little Harbor, Lisbon Creek in Mangrove Cay and Driggs Hill in South Andros, including dredging operations and wreck removal. | MOWUD | Public |
| Long term | Description | | |
| | Consider expansion of ferry service (from Central to Mangrove Cay and to South Andros) to improve connectivity between districts of Andros by increasing the capacity of the vessels making the trips, possibly including vehicles. Also expansion of ferry service to Nassau. | MOT/MOWUD | Public & Private |

4.2 COSTS ESTIMATION

| Sub activities | | Total amount (k\$) |
|--------------------------------|---|--|
| Short term | Repair existing port facilities and improve nautical access (lights and buoys to mark channels) in the ports; Behring Point, Little Harbor, Lisbon Creek and Driggs Hill. | Cf. Action Sheet related to infrastructure |
| | Climate change resilience study to assess risks and protection solutions to be proposed. | Cf. Action Sheet related to studies |
| | Marketing for tourism improved with detailed information provided on-line with particular emphasis on packages taking advantage of the new ferry service. Including suggested activities by number of days of stay. | To be determined |
| | Study to enhance Driggs Hill harbor protection during Northeast surges (wave propagation modeling, proposal of several coastal systems such as breakwater walls...), | Cf. Action Sheet related to studies |
| | Collect fees for all ferry routes to cover running costs. | No additional |
| Grand TOTAL short term | | |
| Medium term | Expand ferry service to include trips between Driggs Hill and Behring Point twice a week utilizing existing ferryboat. Possible expansion of ferry service by increasing the number of trips including a new ferry vessel. | 80 (recovered in 2.5 years) |
| | Monitoring of traffic flows and accidents on bridges | No additional |
| | Nautical accesses are improved in Behring Point, Little Harbor, Lisbon Creek and Driggs Hill, including dredging operations and wreck removal. This will allow ferries to easily come to the different districts in Andros. | To be determined |
| Grand TOTAL medium term | | |
| Long term | Increase capacity of the vessels making the trips, possibly including vehicles. | To be determined |
| | Improve facilities at the ports (i.e. restaurants and shaded areas) utilizing public land by lease. | To be determined |
| | Consider extending the Bahamas Fast Ferry Service or similar to better serve these extended routes. | To be determined |
| Grand TOTAL long term | | |
| Grand TOTAL | | |

4.3 SOURCES OF FUNDING

We anticipate that some of the costs to provide the extended service will be provided by Government subsidies however, these are not to increase more than present subsidies and the intention of this service is to eventually be an income generator.

4.4 MANAGEMENT MODEL

The new ferry service will be managed by the private contractor under the management of the Ministry of Tourism. Regarding leisure services such as restaurants, the management shall be private under Government lease.

4.5 STUDIES NEEDED FOR EXECUTION

- ▶ Feasibility studies,
- ▶ Environmental impact studies for dredging.

4.6 PRIORITY AND RELATION TO OTHER INITIATIVES

4.7 ALIGNED WITH NATIONAL DEVELOPMENT MASTER PLAN.

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

Beneficiaries include:

- ▶ Local residents such as Behring Point, Cargill Creek, Moxey Town and/or Lisbon Creek and Driggs Hill communities,
- ▶ The local authorities of Andros,
- ▶ Foreign and domestic visitors wishing to visit more than one district of Andros,
- ▶ Local tourist businesses including hotels, lodges, food and beverage establishments,
- ▶ BAMSI and the Local Farming communities.
- ▶ Businesses provided with more accessible expanded market.

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|------------------------------|--|---|
| Economic & Social | <ul style="list-style-type: none"> • Direct economic benefits to ferry ports and community through increased interconnectivity • Economic benefits to communities, sites and attractions throughout Andros through increased visitation and length of stay, • Economic benefits through increased employment related to port / economic / cultural activities, • Improved environment increasing the touristic appeal, • Improved functional harbor facilities for local residents. | <ul style="list-style-type: none"> • Temporary impacts during marine works, – limited access to harbor, |
| Environmental | <ul style="list-style-type: none"> • Improved nautical practices and safety, • Improved harbor waste management and sanitation, • Improved site aesthetics through landscape enhancement. | <ul style="list-style-type: none"> • Water quality risk through increased suspended sediments / sedimentation during any dredging, • Noise and vibration pollution during construction. |

6. PRODUCTS & INDICATORS

OUTPUT

- ▶ Bathymetric surveys to assess dredging needs,
- ▶ Design studies for dock repairs and dredging,
- ▶ Dredging operations and wreck removal,
- ▶ Operational ferry service between Driggs Hill and Behring Point.

OUTCOME

- ▶ Increased ferry transportation reliance in Andros,
- ▶ Increased local traffic,
- ▶ Increased number of foreign and domestic visitors in Andros,
- ▶ Increased benefits from economic, educational and/or cultural activities in the districts,
- ▶ Increased employment opportunities.

INDICATOR

- ▶ Number of trips,
- ▶ Number of visitors in Andros,
- ▶ Benefits from economic, educational and/or cultural activities in the district,
- ▶ Number of jobs created in the district.



andros

**SUSTAINABLE DEVELOPMENT
MASTER PLAN**





APPENDIX D.

RECOMMENDATIONS AND ACTION SHEET
FOR FISHING ACTIVITIES

FISHING ACTIVITIES

1. STRATEGY AND RECOMMENDATIONS

Both commercial and recreational fishing are the number drivers of the Andros economy. There has been significant work done to protect the habitats that support these fisheries, but there needs to be a lot more done to enforce existing regulations and educate both the direct and indirect resource users. It is only through a combined effort that these activities be able to see continued growth.

Recommendations include the following:

► **Renew enforcement of existing regulations**

Enforcement of existing regulations should be a priority and should be taken seriously. There should be unbiased enforcement and prosecution of all infractions: ensure that reported incidents are investigated by the authorities and the proper punishments are issued.

► **Improve fisheries policy: catch and size limits, temporal closures, technique-based restrictions**

Collaborative strategies must be developed for improvements in all harvest sectors, and working groups should include fishermen, biological scientists, socio-economists and wholesalers (support for planning and implementation for improvements, capacity building, communication, etc.).

► **Implement community education about sustainable fishing practices**

Public outreach is required on a national and local level. Resource users as well as consumers need to be educated about the commercially and ecologically important species, their importance to the ecosystem and the consequences of exploiting them. Sustainable harvesting techniques should be developed and training provided for main fisheries (lobster, conch, sponge, land crab). Enforcement agencies need specific training on laws and regulations on each fishery in order to take action. Climate change awareness is also essential for Andros, as it is so heavily dependent on its natural resources that are highly vulnerable to its effects. Innovative public outreach campaigns should be designed to effectively educate the community using town meetings, media such as print, radio, television and social media.

► **Data collection, monitoring and marine research programs in collaboration with foreign clusters of excellence for the monitoring and management of natural resources**

A more efficient system should be designed to assess fisheries landings to reduce significant information gaps. This will require collaboration from the Department of Marine Resources, Ministry of Agriculture with educational institutions such as COB, BAMSI and local field stations. A smart phone application should be created for fishermen, spongers and crabbers to report their landing data. There is an immediate need for scientific research on the land crab. There are also no population baselines or monitoring of the fisheries to determine thresholds.

2. ACTION PROGRAM

The action sheet developed regarding fishing activities is the following:

► **8 - Monitor and manage important commercial fish species stocks.**

| | | | | | | |
|---|---|--|----|----|----|---|
|  | Fishing | 8 - Monitoring and management of important commercial fish species stocks | | | | |
| | All districts | | | | | |
| | <table border="0"> <tr> <td style="padding: 0 10px;">ST</td> <td style="padding: 0 10px;">MT</td> <td style="padding: 0 10px;">LT</td> </tr> <tr> <td style="text-align: center;">☒</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☒</td> </tr> </table> | | ST | MT | LT | ☒ |
| ST | MT | LT | | | | |
| ☒ | ☒ | ☒ | | | | |

1. OBJECTIVE

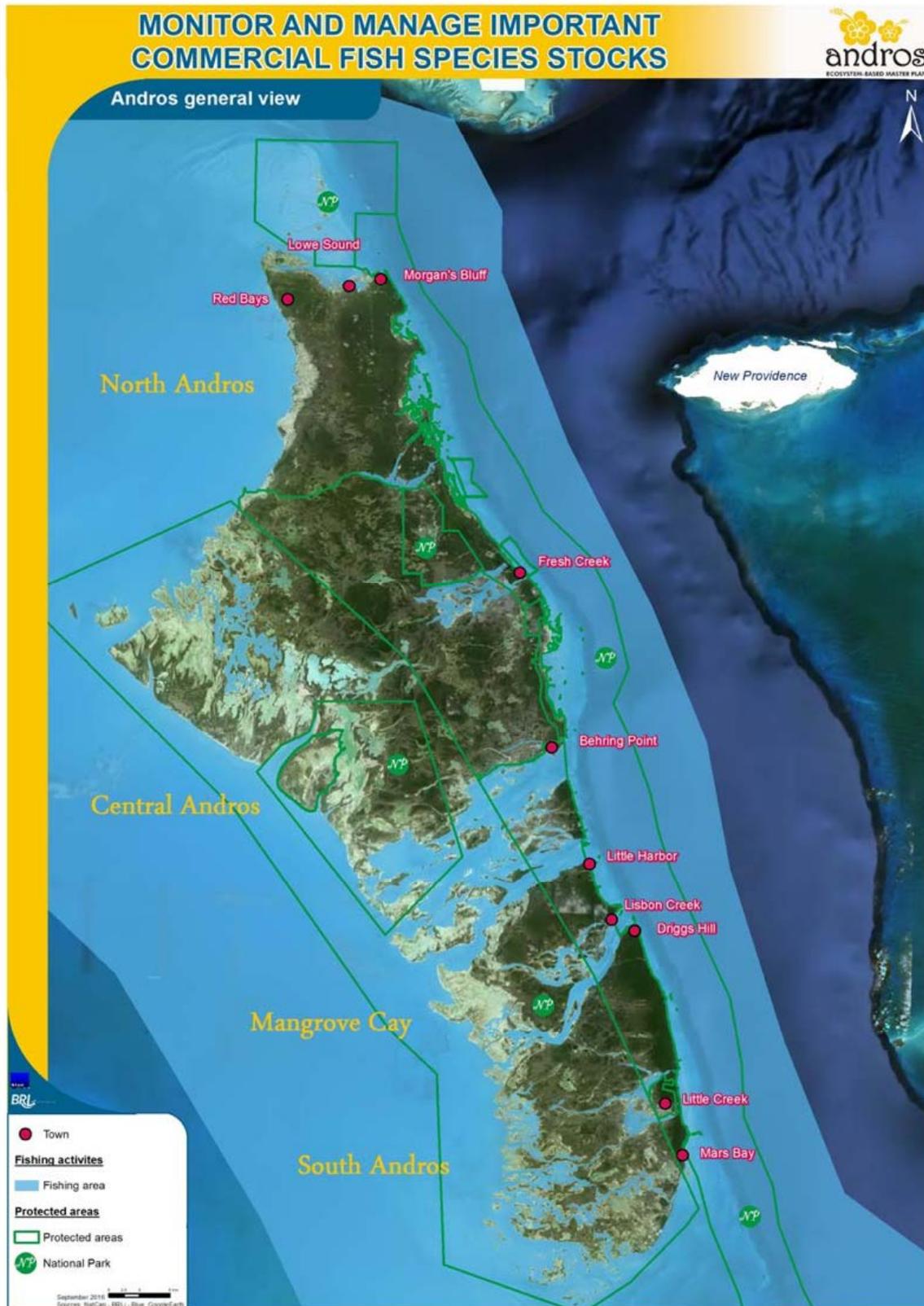
The overall objective is to develop sustainable fishing practices based on co-management and shared information on stocks and fisheries practitioners' situation, with focus on species of commercial interest. These actions will help to develop ecosystem-based fisheries management methods at the national level.

The sub-objectives are:

- ▶ Strengthen infrastructure and build capacity in fisheries management and research. For that purpose formal relationships are to be established between the Department of Marine Resources (DMR), The Bahamas Agriculture and Marine Science Institute (BAMSI) and other fisheries research institutions,
- ▶ Develop and implement biological and bio-economic modeling that will support decision making on stocks management and fisheries regulations,
- ▶ Create a co-management plan that empowers fishermen to take part in efforts and decision making,
- ▶ Improve local fishermen's capacity to support data collection and co-management activities (by creating a training program for fishermen that also includes exchanges of fishermen's experience),
- ▶ Consolidate national system on fisheries monitoring and information system. Methods for data collection are to be improved to reduce gaps and to link local and national systems (for example, a smartphone application could be developed to allow resource users to supply information to the system on a regular basis). Collaborative efforts with research institutes, fisheries managers and local stakeholders will allow the development of a manual to clearly define roles and responsibilities as well as standardize data collection methods,
- ▶ Develop management plans for economically important species involving all key stakeholders such as the queen conch, Nassau grouper, lobster as well as stone and land crab,
- ▶ Develop and implement experimental models of specific management strategies to determine effectiveness.

2. LOCATION

This action sheet concerns all Andros. The map below illustrates the main fishing ports, the fishing area around the island and the protected areas.



3. ACTION PROGRAM

3.1 KEY ISSUES AND OPPORTUNITIES

Healthy marine environment

The commingling of marine and freshwater environments throughout Andros has produced an important patchwork of habitats that vary in environmental conditions and ecological communities.

The estuaries are **important nursery and foraging habitat for commercially valuable species** such as snapper, spiny lobster, tarpon and bonefish. The nursery habitats are thought to significantly contribute to fish stocks throughout the Caribbean region, particularly for highly migratory species such as bull sharks, tarpon and several other species of interest, including endangered sawfish. Thirty-two (32) fish taxa have been observed (19 in mangrove, 13 in hard bottom zones). Fish biomass is extremely high, due to the mangrove creeks on western Andros. The creeks have naturally high rates of productivity coupled with limited human impacts, such as creek fragmentation, fishing and coastal development, which can reduce the amount of fish biomass in mangrove systems. One of the most important spiny lobster fishing grounds in The Bahamas is located in the extensive bank areas to the west and southwest of Andros Island. Andros is also known to be an important mating area for nurse sharks, an important nursery area for lemon sharks and an important area for maintaining populations of bull sharks.

There is a critical link between the development of coastal regions and fisheries benefits. If such regions are developed without protecting critical nursery habitats, the catch and revenue of some important commercial fish species will drop dramatically, affecting both economy and livelihoods.

Commercial fisheries

The fisheries in Andros are important both socially and economically as they employ many locals.

The Bahamas became the first country for lobster (around \$80 million/year) and is often the second for conch production in the Caribbean. The contribution of fisheries to the national economy is estimated as a 3 % share of the GDP.

The priority species mentioned by the Department of Marine Resources are lobster (crawfish), conch, groupers and in particular Nassau grouper and snappers, as well as locally important species such as land and stone crabs.

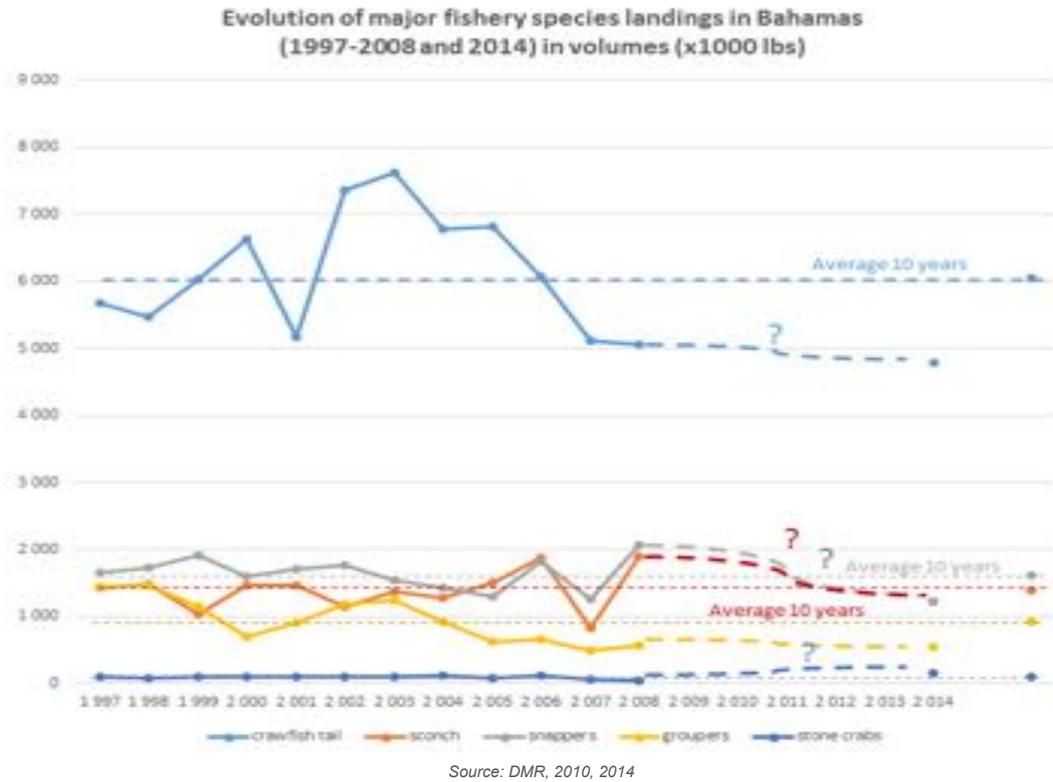
Table 1 : Situation of some key fisheries resources, assessment and management situation

| | Situation of the Resource at national level | Assessments and monitoring situation | Trends of the fisheries and management |
|---------------------------|---|--|--|
| Lobster (crawfish) | Stable according to FAO at national level | No regular data collection in support to science related stock management Modified DeLury depletion model (Dr. Paul Medley & Lester Gittens – 2011) | Fishing effort: estimated stable but lot of poaching and poor capacity of enforcement Management: Size limits, licenses + quotas decided at national level International agreements, joint management plans...) (Plans being formulated under the auspices of WECAFC. |
| Conch | Believed to be stable but variable (areas with evident signs of overfishing, far-flung areas). Decreasing in size, low level of densities of mature individuals | No regular data collection in support to science related stock management Assessments conducted: visual surveys (2009 – 2015) (Community Conch –Dr. Alan Stoner) 1 tuned weight cohort analysis in 1999 (Ehrhardt and Deleveaux 1999). | Fishing effort: estimated stable but lot of poaching and poor capacity of enforcement Management: Size limits, licenses + quotas decided at national level protected species by CITES: international agreements, joint management plans reported by FAO but poor co-management planning at large scale and not based on ecosystem models. |
| Nassau Grouper | Fully to over exploited | No regular data collection in support to science related stock management Visual surveys (Dr. Craig Dahlgren, (2012 -) (, Long Island), fisher interviews (W. Chung, Dr. Yvonne Sadovy, Michael Braynen, and Lester Gittens)-2009. | Fishing effort: estimated stable but lot of poaching and poor capacity of enforcement Management : Closed season established Other national regulations |

Source: FAO-WECAFC, 2016

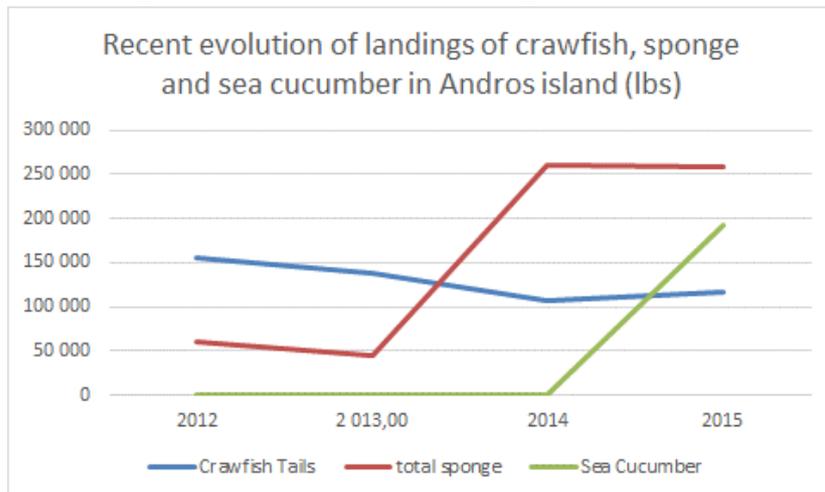
The 1997-2008 fisheries statistics and 2014 landing information from DMR (other years were not available), show a decrease in volume regarding some species compared to the average of the 1990-2000 decade. This is relevant in particular for lobster, conch and groupers according to FAO. For conch, the figures do not allow us to identify whether the trend is related to the development of the fishing effort or to a natural evolution of the status of the stocks.

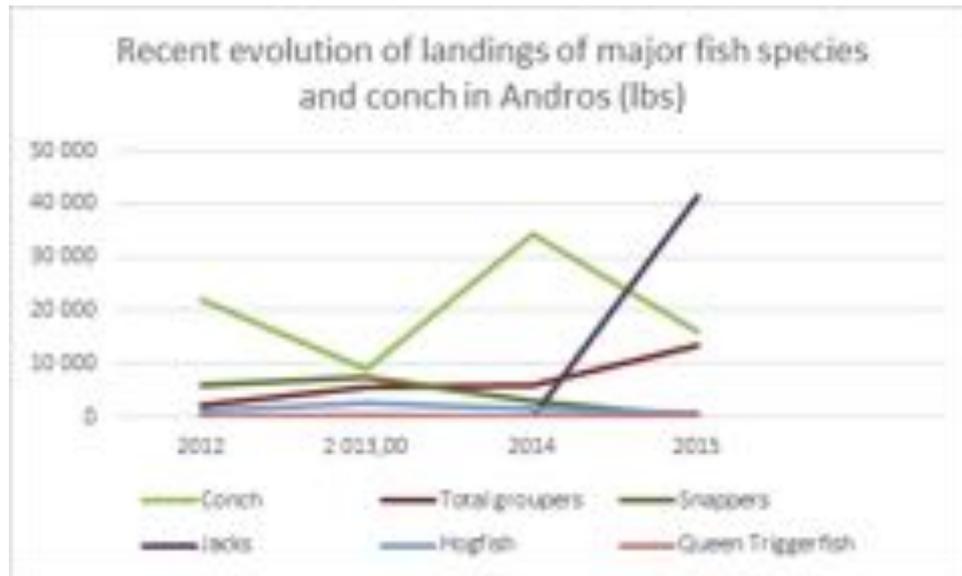
Figure 1 : Evolution of major landings in The Bahamas between 1997-2008 and in 2014 (volumes x 1000 lbs)



Regarding landings statistics for Andros, the situation tends to show the evolution of a pioneering ground where pressures on lobster, conch, groupers and snappers are still increasing as well as for sponge and for new species of interest like sea cucumber. Crabbing shows stabilized volumes of catch.

Figure 2 : Recent evolution of landings in Andros (lbs)





Current national projects that affect Andros

Current national projects that affect Andros fisheries stock management issues include:

- ▶ A national project with the Food and Agriculture Organization (FAO) and supported by the European Union (EU). It aims at facilitating the development of a Fisheries Management Information System (FisMIS) for The Bahamas with a comprehensive fisheries statistical monitoring system (cf. WECAFC, 16th session, 24-25 June 2016):
 - An assessment mission at the Department of Marine Resources (DMR) has been carried out and a very detailed report produced with a proposal for a new Data Collection Framework (DCF). It will strengthen the current statistical reporting which is based on administrative records (provided by exporting companies or processing plants for largely exported species like lobster) partially completed by mothership landing form collection. The proposed upgrade envisages a comprehensive system implementing a logbook for large vessels, and an extension to small scale and recreational fisheries through a sample based survey for selected islands.
 - The FisMIS is now operational with all its components: managing fishermen, companies and vessels registries including permits and certificates, data upload for purchase orders (required for lobster certification schemes), data upload for the logbook landing forms, activity sheets and sample based survey (telephone survey and landing forms), statistics computation and reporting. A pilot phase started in February 2016 in Abaco to allow DMR to validate the new data collection framework and test the system in routine use by staff. Required corrective actions will follow, after which the final version will be available for a complete rollout by DMR to all The Bahamas family islands.
- ▶ The Bahamas National Trust (BNT) is leading the Conservation Campaign that aim to:
 - Consult with researchers, government agencies, private entities and the Bahamian public to share information and provide feedback on best practices for conch fisheries management,
 - Review and amend legislation on conch harvesting as well as collection methods,
 - Improve fisheries management by improving the process of collecting landing data, developing a conch management plan and expanding the MPA system to include critical conch habitats.
- ▶ The Government along with other international and national environmental organizations launched the Bahamas Fishery Improvement Project (FIP) in 2009. This FIP aims to move The Bahamas spiny lobster fishery towards achieving the Marine Stewardship Council (MSC) certification that requires proper management of the species.

- ▶ The WWF is currently supporting management plans on lobster by:
 - Conducting an updated, peer-reviewed stock assessment for 2015 to monitor the health of The Bahamas' lobster stock,
 - Establishing a public forum for stakeholders to participate in the management of the lobster fishery,
 - Collecting reliable fishery data with The Bahamas government that includes fishing effort (amount of gear used) and spatial data (where gear is set),
 - Analyzing the monitoring and control of IUU fishing to ensure that the level of deterrence is appropriate for the fishery's value,
 - Developing a lobster harvest strategy, a fishery management plan, and procedures to review the performance of the lobster fishery management.
- ▶ The Bahamas national report -CFMC/OSPESCA/WECAFC/CRFM working group on queen conch¹ reports in 2012 that "*A number of research or assessment activities have taken place since 2009 by the nonprofit group Community Conch with lead scientist Allan Stoner*". These activities took place with varying amounts of resources supplied year to year chiefly by Community Conch, in addition to The Bahamas Government, the Bahamas National Trust and The Nature Conservancy. Activities included visual surveys of conch fishing grounds in the Berry Islands, Eastern through Southern Andros, a portion of the Exuma Cays Land and Sea Park, Lee Stocking Island and southwestern Abaco. Survey results for the Berry Islands showed that there was a major decline in juvenile densities compared to a 1987 study. Exports then peaked at 51% of landings by 1993 and have settled at 36% in 2010 and 2011. Other aspects of the Community Conch research activities included examination of the relationship between lip thickness, maturity and the presence of a flared lip. Results indicate that the juveniles are not adequately protected in most Caribbean countries (Stoner et al 2012). This explains the production of a Draft Regional Queen Conch Fisheries Management and Conservation Plan to be endorsed by all countries in 2015².
- ▶ The Department of Marine Resources (DMR) strategic plan 2010-2014 pointed out that "*fisheries must be viewed within the context of entire ecosystems, including human population*". It strives to "develop a vibrant fishing sector through ecological sustainable practices, adequate data collection, research, management, and enforcement". Some of the key actions expected to be developed were:
 - Data system complete and fully implemented,
 - Data on spiny lobster fishery will be fully collected and experience gained from spiny lobster fishery will be applied to designing the data system for other fisheries,
 - Conduct fisheries census,
 - The DMR will continue research on the queen conch, spiny lobster and Nassau grouper.

Co-management and MPA-Fisheries: binding issues towards ecosystem based management

Only four of the 51 existing protected areas in The Bahamas have formalized management plans that outline goals, conservation actions and measures toward effective management of natural resources. There are at least a dozen more protected areas that have draft management plans. The Nature Conservancy, The Bahamas National Trust, and The Bahamas Reef Environment Educational Foundation have partnered with Oceans 5 to launch a three-year project, "*Realizing The 2020 Goal: Advancing the Expansion & Effective Management of the Marine Protected Areas System in The Bahamas*".

¹ L.G. GITTENS and M.T. BRAYNEN, Department of Marine Resources,

² DRAFT REGIONAL QUEEN CONCH FISHERIES MANAGEMENT AND CONSERVATION PLAN Authors: Martha C. Prada &, Richard S. Appeldoorn Editors: Sjeff van Eijs & Manuel Pérez M. June, 2015

Several outcomes have been identified under the project to meet the goal of maintaining healthy marine ecosystems and sustaining fisheries by advancing the expansion and effective management of marine protected areas throughout the archipelago:

- ▶ Outcome 1: Design a New Set of Marine Protected Areas that Will Bring The Bahamas to 20 Percent Protection of Marine Habitat,
- ▶ Outcome 2: Increase the Effective Management of Protected Areas within The Bahamas Marine Protected Area Network,
- ▶ Outcome 3: Increase Sustainable Funding Dedicated to Protected Area Management; and
- ▶ Outcome 4: Strengthen Public Awareness and Support for Marine Protected Areas.

Under the project, a consultant was hired in 2016 to develop and implement a co-management framework that is suited to the varying socio-economic, cultural and ecological considerations and contexts found throughout the Bahamas Protected Area System including Andros.

The consultant will complete a review and assessment of the status of MPA management in The Bahamas, to determine progress on the ten-year action plan included in the Master Plan for The Bahamas National Protected Area System. He will also identify the key stakeholders and players involved (government, non-government and private sector), while providing specific recommendations for the development and implementation of a sustainable co-management framework for protected areas in The Bahamas, including financial considerations. In this regard, the consultant will review the literature pertaining to protected areas in The Bahamas, interview important leaders, managers and relevant participants within the network, and visit selected protected area sites to gain first-hand knowledge of the current management practices in the field.

Recent state of the art of co-management in fisheries developed by BRLi3 and CSRP has shown that drawing up a joint management plan or project comprises several stages: consensus on a preliminary assessment, creation of a co-management body, formalizing the organization of the co-management and an action plan, and finally a co-management agreement. Three in-depth thought areas are recommended when developing such plans or projects:

1. the production of a preliminary assessment from the information about the socio-ecosystems concerned,
2. the strengthening of the co-management body by means of representativeness and adequate deployment of the stakeholders,
3. and the consolidation of the organization of co-management.

The sharing of the functions among the main stakeholders requires the actual stakeholders involved in each function to be identified, whether communities, fisher organizations, government agencies, external agents or others.

To implement a fisheries co-management plan or project, the first thing to be done is to build up trust by paying special attention to the circulation of information, transparency, meeting commitments and fulfilling responsibilities by everyone, and to do so in the frame of a process that must be adaptive. Specific attention must also be paid to the enforcement of regulations and punishments, to monitoring and evaluation, to networking and to advocacy. After analyzing the implementation process, a number of ideas can be proposed for more refined thought:

- ▶ Strengthening the transparent, adaptive implementation of co-management and appropriate information at the different scales, optimizing the enforcement of regulations and punishments, and the establishment of a co-management monitoring and evaluation mechanism.

³http://spcsrp.org/medias/csrfp/projets/AmpCogestion/capitalisation/State_of_the_Art_of_Fisheries_Co-management__Synthesis_Report.pdf

- ▶ The enforcement of regulations and punishments in a co-management process must be promoted by and involve the communities or the fishers' associations themselves, which, although a fairly costly process requiring a new distribution of resources, nevertheless helps attenuate conflict.
- ▶ The control and surveillance depend on efficient synergies between government agencies and communities or fishermen's organizations and the redistribution of some of the corresponding resources to the fishers. The direct involvement of the fishers entails a great many risks, including the risk of individual vengeance; it should be strictly limited to warnings associated with confirmed State mechanisms at sea.
- ▶ The monitoring involves all the players in the collection of information, the selection of indicators and the transparency of the monitoring results, which is looked upon as a continual process of examining information.
- ▶ The technical measures that apply in the case of co-management are the introduction of fishing permits, limits on the fishing effort, the seasonal or permanent closing of fishing zones, restrictions on fishing gear, catch quotas and total allowable catch (TAC), catch size limits and individual transferable quotas (ITQs). The latter are difficult to apply in multi-species fisheries in developing countries and they can cause adverse social effects.

In addition, concerns and culture among fisheries communities and marine protected areas are getting closer and closer with the years, and specific attention should be developed by MPA managers and NGOs to fisheries management, culture and fisheries management tools in order to base their inputs on relevant levels of expectations and relevant consideration of national and local knowledge on fisheries. A recent state of the art review on the role of MPAs in fisheries management provides full information on success and conditions for joint efforts regarding ecosystem based management⁴.

Key issues

In line with key issues identified by FAO and regional working groups on fisheries assessments (WECAFC) and some documentary analysis, the main issues are:

- ▶ The dimensions of the country are huge. As a result, fisheries resource management efforts and cost are impacted by difficulties in fighting against illegal fisheries, developing enforcement and control,
- ▶ There is lack of capacity to address various fisheries management issues,
- ▶ Illegal fishing (IUU) has been an escalating issue for many years. Fishermen take part in but are also affected by poaching in various fisheries,
- ▶ The state of application of the 2010-2014 strategic plan reveals a few questions regarding national political will to address long term fisheries management issues,
- ▶ Adaptation of the legislation to the needs regarding management plans, sanctions application, co-management, MPAs and fisheries,
- ▶ Lack of stakeholder involvement in decision-making processes (co-management).

The situation in 2016 calls for the development of coherence between means and objectives, and for support to the core functions related to the fisheries sector on Andros: the structure of fisheries organizations, research and data collection, capacity for local fishermen to understand ways of and different tools for managing fisheries, the status of their stocks and pressures on them, the fishing effort, co-management culture, enforcement and control with new tools, the relationship between enforcement, the legal framework and punishments.

⁴ and other technical reports

3.2 DEVELOPMENT STRATEGY

The aims of the proposed strategy are:

- ▶ To develop coherence in the type of monitoring and data collection with national and regional efforts, both on biological and socio-economic aspects in order to support stock management,
- ▶ To establish formal relationships with DMR, BAMSI and other fisheries research institutions, such as CRFM (CARICOM Regional Fishery Mechanism), in order to build biological and fisheries monitoring capacity,
- ▶ To build on local co-management capacity in order to develop specific management planning and rules at the Andros level. This can be developed in close relation with MPA managers.

A preliminary list of activities and investments to be undertaken are presented below:

Short term – up to 5 years (2020)

- ▶ *Strengthen fisheries research capacity* – Establish memorandums of understanding between DMR, BAMSI and other fisheries research institutions to build biological and socio-economic monitoring and create a data collection manual that defines roles and priorities.
- ▶ *Consolidate Data collection and National System of Information* – Implement the national FisMIS system including specific software and other data collection tools and procedures.
- ▶ *Develop a co-management system* – Create a co-management plan that will address all management needs specifically for Andros.
- ▶ *Improve fishermen's capacity to get involved in the management processes* – Local commercial and sports fishermen form organizations. Develop MOU with local fishermen's organizations and develop training programs on fisheries data reporting and other management tools.
- ▶ *Involve MPAs in Fisheries co-management* - Training on fisheries management tools and first test of the co-management process.
- ▶ *Develop Andros "fisheries resource management plans"* on three resources based on national plans: Lobster, Conch and Nassau Grouper, to ensure habitat protection and sustainable fishing practices.

Medium term – up to 10 years (2030)

- ▶ *Strengthen fisheries research capacity* - Strengthening the teams and strengthening modeling on multi trophic and ecosystem based management information.
- ▶ *Application of improved FisMIS national system and registration of boats and access.*
- ▶ *Improve fishermen's capacity to be involved in the management process* - Training, exchange of experience, proposal of MPAs by fishermen, etc.
- ▶ *Involve MPAs in Fisheries co-management* - Consolidation and improvement on implementing fisheries management plans at MPA levels.
- ▶ *Implementation of Andros "fisheries resource management plans"* on three resources: Lobster, Conch, Nassau Grouper + development of new management plans for crabbing, snappers and other grouper species, to ensure habitat protection and sustainable fishing practices.
- ▶ *Develop and implement a fisheries resource management plan on land crabs*, to ensure habitat protection and sustainable catching practices.

Long term – up to 25 years (2040)

- ▶ *Strengthen fisheries research capacity* - Creation of a Pole of Excellence to set conditions for research, definition and identification. Assuming research capability at BAMSI and partnership with Universities have been a success at medium term, a new satellite of the University of Bahamas is implemented in North Andros in connection with research institutes. Various international exchanges.
- ▶ *Monitoring is developed on sport fishing activity and resource.*
- ▶ *TAC and Quotas and other regulations are established* using complete knowledge based data and when possible data on ecosystems, in other words, full information through an eco-systemic approach. Specific selective techniques are developed.
- ▶ *Data collection is standard and harmonized nationally.* All boats are registered including small boats and all activities licensed. All boats use electronic logbooks and are geo-localized through a national GIS management system developed by fishermen together with the authorities.
- ▶ *Improve fishermen's capacity to be involved* in the management process: training, exchange of experience, proposal of MPAs by fishermen, to ensure Andros experience is replicated.
- ▶ *MPAs have been created by fishermen* and MPAs are fully involved in fisheries management. All MPAs are effectively managed to the principles of ecosystem-based management. Ministries of Environment and DMR develop joint programs and activities.
- ▶ *All resources are managed through regularly revised and adapted management plans on all species of commercial interest.*

Fishermen in Lowe Sound, Little Harbor and Red Bays



Source: BRLi - 2016

3.3 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effects regarding the different key pillars related to the Sustainable Prosperity Scenario for development:

| | |
|---------------------------|--|
| Major positive impact | |
| Contribution | |
| No effect | |
| Potential negative impact | |

| Monitoring and management of important commercial fish species stock | |
|---|--|
| Food and water security | |
| Connectivity and accessibility | |
| Education and capacity building | |
| Climate change and coastal resilience | |
| Livelihoods and income equality | |
| Land tenure security, land use planning and enforcement | |
| Health and wellbeing | |
| Strengthening local government | |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| Sub activities | | Institution responsible | Source of funding |
|---|---|---|-------------------|
| Short term | Description | | |
| | Strengthen fisheries research capacity | DMR | Public |
| | Consolidate Data collection and National System of Information. Complementarity with FisMIS national system | DMR / CRFM / FAO | Public |
| | Improve fishermen's capacity to get involved in the management process | DMR / CRFM / BAMSI | Public |
| | Involve MPAs in fisheries co-management: training on fisheries management tools + first test of co-management process | DMR / GEF / BAMSI | Public / ODA |
| | Develop Andros "fisheries resource management plans" on 3 resources: Lobster, Conch, Nassau Grouper | DMR / FAO / GEF / World Bank | Public / ODA |
| Medium term | Description | | |
| | Strengthen fisheries research capacity: strengthening the teams. Strengthening modeling on multi trophic and ecosystem based management information | DMR / CRFM | Public |
| | Application of improved FisMIS national system and registration of boats and access | DMR | Public |
| | Improve fishermen's capacity to be involved the in management process: training, exchange of experience, proposals of MPAs by fishermen, etc. | World Bank Small Development Programme / DMR / CRFM / FAO / BAMSI | Public / ODA |
| | Involve MPAs in fisheries co-management: consolidation and improvement on implementing management plans on fisheries at MPA levels | CRFM / DMR | Public |
| Implementation of Andros "fisheries resource management plans" on 3 resources: Lobster, Conch, Nassau Grouper + development of new management plans for crabbing, snappers and other groupers species | DMR / FAO / CRFM | Public | |

| Description | | | |
|--------------------|---|--|------------------|
| Long term | Strengthen fisheries research capacity: creation of a pole of excellency. Assuming research capability at BAMSI and partnership with Universities have been a success in the middle term, a new satellite of the University of Bahamas is implemented in North Andros in connection with research institutes. Various international exchange. | DMR / BREEF / Academics | Public |
| | Monitoring is developed on sport fishing activity and resource | DMR / Private fishing and diving clubs | Private |
| | TAC and Quotas and other regulations are established on complete knowledge-based and when possible ecosystem-based information through an eco-systemic approach. Specific selective techniques are developed | DMR / CRFM | Public |
| | Data collection is standard and harmonized nationally. All boats are registered including small fishermen and all activities licensed. All boats are using Electronic logbooks and are geolocalized through a national GIS management system developed by fishermen together with the authorities | DMR / STATISTICS DPT / ACADEMICS | Public |
| | MPAs are created by fishermen and MPAs are fully involved in fisheries management. All MPAs are effectively managed following ecosystem-based management. Ministries of environment and fisheries develop joint programs and activities. | DMR / Fishermen cooperative | Public / private |
| | All resources are managed through regularly revised and adapted management plans on all species of commercial interest. | DMR / Fishermen cooperative | Public / private |
| | Improve fishermen's capacity to be involved in the management process: training, exchange of experience, proposal of MPAs by fishermen, etc. Andros' experience is replicated. | DMR / CRFM / FAO | Public |

4.2 COSTS ESTIMATION

Costs have to be discussed with DMR.

4.3 SOURCES OF FUNDING

| NATURE OF FUND | USE |
|---|---|
| Equity investment | Attracting private investors |
| IADB Multilateral Investment Fund | Microfinance, small projects |
| World Bank SME Fund | May grant financing to fishers' cooperative |
| GEF Small Grant Fund | Focal area: International Waters |
| IDB | Investment fund |
| CARICOM Regional Fishery Machinery | Technical assistance |
| Food and Agriculture Organization (FAO) | |
| GoB | Incentives |
| Tax waivers | |
| Monthly rent | Paid by the cooperative |

After the first application of the management plans, the economic value of fisheries resources should be updated to determine the revenue generated by commercial and recreational fisheries. Taxes could be developed based on the results.

Fisheries management should be linked to socio-economic interests and The Bahamas tourism product. Fisheries management improvement should be supported regarding the sustainable national yield. Beyond generating employment and contributing to the local economy, sustainable small-scale fishing has cultural and social dimensions associated with traditional knowledge, way of life, rituals and social organization that contribute to touristic attractiveness.

Small-scale fishing has had some positive effects on the community by strengthening social links owing to participation in cooperative management and the decision process, reduction of poverty and internal migration to cities. It has also contributed to infrastructure improvement and development, which, along with poverty reduction and job creation, are economic development indicators for rural areas.

Investments should focus on technical assistance and capacity building on co-management and should be linked with other key functions of fisheries management with special emphasis on other topics like control and enforcement, legislation strengthening and co-management issues among fishermen.

4.4 MANAGEMENT MODEL

Co-management and support to the established network of MPAs should be the model adapted to address the issues of fisheries management in Andros. It could be developed with some local area management when possible, and value could be added to some local area specificities where fishermen are predominant as a social power, having the capacity to regulate some aspects of the activity socially (development of professional bans, licensing and support to emergency).

The size of Andros' territory requires the development of creativity in management tools, for instance decentralized and local powers working in partnership with various national authorities and administrative bodies (RBPF, RBDF and land system of alert)⁵.

⁵ For more details on co-management see different experience in the Caribbean, build up on regional networks on fisheries (exchange of experience) and on reviews of MPAs and co-management and other technical reports.

⁵ http://spsr.org/medias/csrp/projets/AmpCogestion/capitalisation/CL_13-05_CS_Synthese_AMP_Fra.pdf

4.5 STUDIES NEEDED FOR EXECUTION

To be defined with DMR and BAMSI.

4.6 PRIORITY AND RELATION TO OTHER INITIATIVES

- ▶ Complying with the *United Nations Convention on the Law of the Sea* (UNCLOS - 1982) Art. 61 for Exclusive Economic Zone (EEZ), the *United Nations Fish Stocks Agreement* (UNFSA - 1995) Art. 5 (i), and the *Food and Agriculture Organization of the United Nations Code of Conduct for Responsible Fishery* (FAO CCRF - 1995) Art. 6.18,
- ▶ Compatible with FisMIS development, WEFCAF and other regional management plans and strategies,
- ▶ Aligned with Vision2040: The National Development Plan.

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

The beneficiaries include:

- ▶ National fisheries and local fisheries in Andros through the development of resource sustainability allowing them to meet the demands of expanding tourism and local development,
- ▶ Fishermen and fishermen organizations through exchanges of experience and capacitation,
- ▶ Department of Marine Resources (DMR) through national capacity-building and the benefit of local testing sites and co-management experience in Andros, improving economic rent at medium and long term,
- ▶ BAMSI through capacity-building for the national institute allowing it to carry out activities in conjunction with DMR,
- ▶ NGOs and MPAs through the development of connections with the local and national levels on key ecosystem approaches.

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|------------------------------|---|----------|
| Economic & Social | <ul style="list-style-type: none"> ▶ Economic benefits through increased employment related to fishing and nature-based activities ▶ Fisheries income improvement ▶ Involvement of fishermen's communities and organizations ▶ Access to credit for fishermen ▶ New links between Local and Central Government ▶ Developing research capacity and excellency | |
| Environmental | <ul style="list-style-type: none"> ▶ Benefits to main species populations avoiding destruction of fish stocks ▶ Natural resources management ▶ Sustainable fishing practices ▶ Strengthened coastal resilience ▶ Reduction of pressure on resources due to Andros' development and tourism demand ▶ Analysis of indirect impacts and fisheries measures on other types of resources | |

6. PRODUCTS & INDICATORS

OUTPUT

- ▶ Research system on fisheries established with one strong base in Andros (Cluster of Excellence at regional level),
- ▶ Co-management process developed involving all parties,
- ▶ Four to six resource management plans adapted to Andros,
- ▶ MPAs managed with different fisheries management tools,
- ▶ Various elements developed as examples at national or regional scale (co-management, management plans and research, etc.).

OUTCOME

- ▶ Sustainable yield maintained comprising various species at local level (Andros) with reference to national and regional fisheries, upholding employment and economic activity on Andros,
- ▶ Capacity of economic rent strongly developed in the long term with the respect of social issues and traditional fisheries maintaining local area balance and the tourism product of Andros Island (local development, culture and social aspects),
- ▶ Developing and maintaining national fisheries' exports without resource depletion,
- ▶ Creation of local employment in the fisheries sector,
- ▶ Maintaining the attractiveness of sport fishing activities,
- ▶ Developing tourism on fisheries but also supplying the demand from tourism with local fisheries produce.

INDICATORS

- ▶ Number of researchers and research expenses on fisheries and marine ecosystems,
- ▶ Creation of BAMSI units and numbers of publications,
- ▶ Evolution of data national system and Andros reporting,
- ▶ Export rates and landing rates,
- ▶ Number of MPAs implementing fisheries agreements,
- ▶ Number of management plans ratified/updated,
- ▶ Number of training sessions,
- ▶ Number of workshops and exchanges between the researchers and fishermen of the region,
- ▶ Evolution of fisheries rent from Andros and contribution to national taxes on fisheries.



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APPENDIX E.

RECOMMENDATIONS AND ACTION SHEET
FOR AGRICULTURE

AGRICULTURE

1. STRATEGY AND RECOMMENDATIONS

In an effort to reduce the country's \$1 billion food bill, the agricultural sector must continue to develop. Andros, with its large available areas of farmland, is primed to lead such growth.

Recommendations include the following:

► **Establish relationships between local farmers, lodges, restaurants and schools**

Coordinating relationships between local farmers, lodges, restaurants and schools will require that established farmers' associations and businesses make formal supply agreements. It is recommended that specific product lists are agreed upon to ensure that farmers meet the needs of the lodges and that there is no major competition between farmers. These linkages will benefit from the farm-to-table trend where visitors are turning away from processed foods to eat local produce. Similar decisions by the national authorities to have farmers supply local products for school lunches will also provide healthy alternatives for local youngsters. Establishing these relationships will also reduce the island's dependency on imports. Furthermore, it helps to support both large and small scale local farmers.

► **Feasibility study for the development of the cottage industry such as canning/bottling of coconut, crab, tomatoes etc.**

The feasibility study will determine whether or not there would be sufficient benefits to move forward with creating certain types of processing plants. It is hoped that the plants will provide opportunities to increase economic activity, create jobs, enhance crop yields and reduce farm production costs and wastes. Agribusiness opportunities such as canning and bottling of goods should be explored. Joint ventures should be considered for the production, processing and export of fruit, vegetables, flowers and other labor-intensive crops.

The development of processing plants can be established once marketing and feasibility studies determine they are viable. It is recommended that the associations create business plans with the assistance of BAIC or the Bank of The Bahamas in order to attract investors. Possible processing plant types include:

- Land crabs, that will be cleaned, separated, frozen and shipped,
- Coconut products such as flour, candy, water, soaps, oil, etc. and,
- Products from lower grade crops that are unmarketable such as jams, soaps, candy, etc.

Coconut products from "Coconut Queen" in South Andros



Source: BRLi – 2016

► **Raise healthy eating awareness**

The improvement of food and nutritional security depends heavily on educating the population to make better food choices. This strategy would be in conjunction with a national program to promote healthy eating throughout the islands of The Bahamas. It will include sourcing local produce from farmers to provide healthy food alternatives. This initiative should be spearheaded by the Ministry of Health and BAMSI.

► **Implement a processing and packaging unit for BAMSI in North Andros**

BAMSI is currently in the planning stages to create a processing facility in North Andros that will further support the cottage industry, i.e. the production of agricultural by-products.

► **Implement future commercial agriculture in all zoned areas**

Presently, Mangrove Cay and South Andros do not have agriculture-zoned areas: the most suitable areas should be identified and road access will to be created. If those areas are dominated by pine forest, there should be collaboration with the Forestry Unit to develop a plan for thinning to establish agroforestry areas. In the case of the Duncombe Coppice site in South Andros, the area has been identified but has not been formally designated for agricultural purposes. These remote areas should have alternative energy technologies introduced such as the farm from a box (see illustration). These boxes include solar panels, hydroponic systems and an aerator to regulate temperature and airflow. They are closed systems that allow crop production all year round; they are particularly relevant for use in isolated areas with solar powered water pumps and electricity generated from plants to power water systems and lighting.

Farming land and Duncombe Coppice land in South Andros



Source: BRL – 2016

► **Develop research capability at BAMSI & MOUs with Universities**

Agricultural research is important as a source of new seed varieties, new farming practices and management. Private and public research will play an important role in the development of appropriate farming systems and improved production technologies, and should be developed in close association with extension officials and farmers. New technologies will include the use of the “farm from a box” system in remote areas.

The use and production of related goods that can be sold commercially, such as hybrid seeds, fertilizers and pesticides, should be studied. These programs should be led by BAMSI and Memorandums of Understanding established with international Universities and organizations.

Farm from a box, a concept that facilitates farming in remote locations



► **Implement best management practices in commercial agriculture including restricting distances between farming and fresh water lenses and shorelines**

Best management practices (BMPs) are to be developed and implemented based on the collaboration of local and international institutions and local stakeholders including farmers' associations, MOA, BAIC and BAMSI. BMPs should overlap the following areas: nutrient management and fertilizer use; pest management and pesticide use; water management as well as water use, conservation and disposal; sediment management and impacts on surrounding sediment; and invasive species mitigation and control. BMPs are to be developed for specific industries such as vegetable crop production, field nurseries, sod and forage production, cattle and poultry operations, etc.

► **Designate an Agriculture Officer for Mangrove Cay and South Andros**

To assist with the development of farming in Mangrove Cay and South Andros, there is a need to appoint one Agriculture Officer to serve both districts. The Officer's duty would be to facilitate efforts to prepare agricultural plots and to provide extension services to local farmers.

► **Create agricultural cooperatives in Mangrove Cay**

In order to access incentives and funds, all farmers need to register with the Ministry of Agriculture or the local government office. There is presently no form of farmers' association in Mangrove Cay, but areas such as North, Central (Big Yard Farmers Association) and South Andros (South Andros Farmers Association) have them and need to encourage more participants. Once associations have been established, farmers in South Andros and Mangrove Cay should establish a stronger relationship with the Ministry of Agriculture, BAIC and BAMSI to access farmer incentive programs such as land clearing assistance, etc.

► **Implement community education about sustainable agricultural practices in Mangrove Cay and South Andros**

Training on modern agricultural technology is required so that farmers are able to produce market quality crops and livestock. Training programs should be developed through collaboration with BAMSI, COB, BAIC, CARDI and IICA.

2. ACTION PROGRAM

The action sheet developed regarding agriculture is the following:

► **9 - Develop small-scale farming on Andros.**

| | | | | |
|---|-------------------------------------|-------------------------------------|-------------------------------------|---|
|  | Agriculture | | | 9 - Development of small-scale farming |
| | SA & MC | | | |
| | ST | MT | LT | |
| | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | |

1. OBJECTIVE

The main objective is to develop small-scale farming in South Andros and Mangrove Cay.

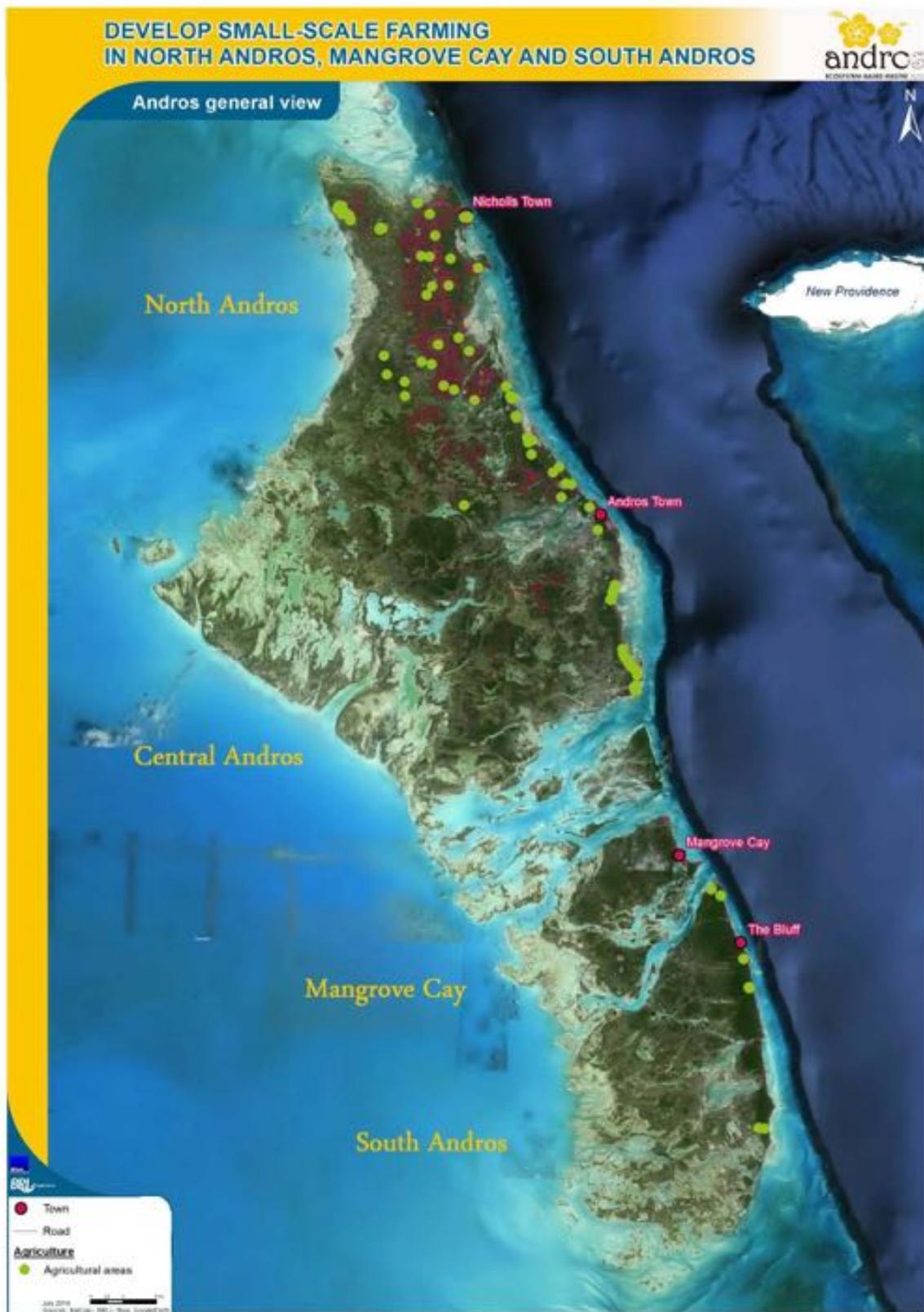
The sub objectives include:

- ▶ Improve concession programs for farmers,
- ▶ Develop agricultural plots with infrastructure such as water and electricity, that are accessible to farmers,
- ▶ Create educational programs accessible to all districts based on sustainable farming practices and business management.

2. LOCATION

This action sheet concerns South Andros and Mangrove Cay districts.

The map hereafter presents all existing and potential future agricultural areas.



3. ACTION PROGRAM

3.1 KEY ISSUES AND OPPORTUNITIES

Agriculture on Andros focuses on vegetable and livestock production. There are 13,869 acres of land on Andros that have been made available for lease to farmers for periods of up to 21 years.

On South Andros, one area has been designated but there is limited access and no infrastructure available. No such area has been designated for Mangrove Cay. These are much smaller districts with 21 farmers registered.

The Bahamas Agriculture and Marine Science Institute (BAMSI) was introduced to address many of the issues faced by farmers on Andros and throughout The Bahamas.

3.2 DEVELOPMENT STRATEGY

To develop small-scale farming throughout Andros the strategy must focus on creating economic and technological opportunities for local farmers and these will include:

- ▶ Providing road access to cleared land with the ability to access basic infrastructure such as water and electricity,
- ▶ Restructuring farmer incentive programs and providing better access to credit opportunities,
- ▶ Creating educational programs that focus on technology practices and business management,
- ▶ Improving market access to reduce reliance on government and BAMSI projects.

Short term – up to 5 years (2020)

- ▶ All districts have agricultural plots to lease to farmers – There are plots that are available for lease in North and Central Andros. South Andros currently has an area that has been identified but not formally designated. Work had already started to create road access but has not been completed. The area is also primary pine forest growth and will need to be thinned in conjunction with the Forestry Department. Mangrove Cay will need to have a site designated and access provided.
- ▶ Restructuring farmer incentive programs and providing better access to credit opportunities – All the existing government incentive programs need to be evaluated with farmer participation to determine their effectiveness and sustainability. Programs should be restructured where determined necessary. In order to access fertilizers and high quality seeds and implement the necessary infrastructure, farmers will need to rely on the availability of credit at reasonable interest rates. Local banks can develop small savings and loan programs that target groups of producers.
- ▶ Continued development and expansion of educational programs that focus on technology practices and business management – To improve the quality of products to increase marketability, farmers will need to improve on current farming practices. BAMSI, BAIC, MOA and IICA currently have educational programs that are available to farmers. Those programs should be continuously expanded. Emphasis should be placed on developing green techniques such as agro-forestry, small scale water harvesting, multi-purpose crops that feed people, livestock rearing and soil quality improvement.
- ▶ Audit of existing BAMSI projects - To determine the effectiveness of BAMSI, its projects should be audited. Based on the results of the audit, either the investment continues or BAMSI and its agricultural research and extension services are restructured.

Medium term – up to 10 years (2030)

- ▶ Education for farmers continues to be a priority as new technologies are developed and people leave and enter the agricultural sector:
 - Mobile applications and computers to allow real-time monitoring and diagnosis of crop, livestock and farm machine states,
 - The use of alternative energy sources such as solar power, wind or hydroelectricity for remote locations,
 - Climate control greenhouse systems or other closed ecological systems that allow farmers to provide certain crops all year round rather than seasonally,
 - Automation of harvesting, fruit picking, ploughing, soil maintenance, weeding, planting, irrigation, etc.
- ▶ Implementation of BAMSI projects such as the Associate Farmers Project.

Long term – up to 25 years (2040)

- ▶ Complete implementation of marketing plans to reduce reliance on government and BAMSI projects,
- ▶ Education of farmers continues to be a priority as new technologies are developed.

3.3 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effects regarding the different key pillars related to the Sustainable Prosperity development scenario:

| | |
|---------------------------|--|
| Major positive impact | |
| Contribution | |
| No effect | |
| Potential negative impact | |

| Development of small-scale farming | |
|---|--|
| Food and water security | |
| Connectivity and accessibility | |
| Education and capacity building | |
| Climate change and coastal resilience | |
| Livelihoods and income equality | |
| Land tenure security, land use planning and enforcement | |
| Health and wellbeing | |
| Strengthening local government | |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| | Sub activities | Institution responsible | Source of funding |
|--------------------|---|--|-------------------|
| Short term | Description | | |
| | Designate and provide access to agricultural plots on Mangrove Cay | BAIC | Public |
| | Provide Access to agricultural plots in South Andros | MWUD | Private |
| | Develop and implement a plan to cater for alternative infrastructure needs such as water catchment systems, solar power | MAMR, BAIC, IICA, BAMSİ, local farmers' associations | Public/Private |
| | Review and restructure government incentive programs | BAMSİ | Public |
| | Continued development of educational programs that are focused on farming practices and business development | MAMR, BAIC, IICA, BAMSİ | Public/Private |
| | Financial Audit of BAMSİ and its agricultural research and extension services | MAMR | Public |
| | Assessment of Program effectiveness | MAMR | Public |
| Medium term | Description | | |
| | Farmer education programs | BAMSİ | Public/Private |
| | Investment and implementation of research and extension services | MAMR, BAIC, IICA, BAMSİ | Public/Private |
| | Financial and program audits | MAMR | Public/Private |
| Long term | Description | | |
| | Complete implementation of marketing plans to reduce reliance on government and BAMSİ projects | MAMR, BAIC, IICA, BAMSİ | Public |
| | Education of farmers continues to be a priority as new technologies are developed and people leave and enter the agricultural sector. | BAMSİ | Public |

4.2 COST ESTIMATION

| Sub activities | | Estimated costs | |
|--------------------------------|---|-----------------|--------------------|
| | | Unit | Total amount (k\$) |
| Short term | Designate and provide access to agricultural plots on Mangrove Cay | U | 30 |
| | Provide access to agricultural plots in South Andros | U | 30 |
| | Develop and implement a plan to cater for alternative infrastructure needs such as water catchment systems, solar power | U | To be determined |
| | Review and restructure government incentive programs | U | To be determined |
| | Continued development of educational programs that are focused on farming practices and business development | One course | 5 to 10 per course |
| | Financial Audit of BAMS I and its agricultural research and extension services | U | 15 |
| | Assessment of Program effectiveness | U | 15 |
| Grand TOTAL short term | | | |
| Medium term | Farmer education programs | One course | 5 to 10 per course |
| | Investment and implementation of research and extension services | U | To be determined |
| | Financial and program audits | U | 30 |
| Grand TOTAL medium term | | | |
| Long term | Complete implementation of marketing plans to reduce reliance on government and BAMS I projects | U | To be determined |
| | Education of farmers continues to be a priority as new technologies are developed and people leave and enter the agricultural sector. | One course | 5 to 10 per course |
| Grand TOTAL long term | | | |
| Grand TOTAL | | | |

4.3 SOURCE OF FUNDING

Different sources of funds for agricultural lending may be utilized to develop small-scale farming on Andros. All these types of agricultural lending require specific access conditions and comprise different kinds of associated risks for the Government that may impact efficiency such as, for example, external technical assistance.

The following are the possible funding types:

- ▶ Official International funds
 - Bilateral and multilateral development agencies provide agricultural finance intermediaries with various types of support in the form of loans or capital ranging from concessionary to almost commercial terms and technical aid grants. The most significant providers of international funds are multilateral development banks (World Bank Group, IFAD, EIB, regional development banks) as well as bilateral development agencies or banks.
 - Besides these types of lending, as a borrowing member at IADB the Government of The Bahamas may also get access to donors' concessionary loans on their credit lines for Development and Donors' Trust Funds.
- ▶ Official National funds
 - The Bahamas Central Bank,
 - The Government of the Bahamas,
 - Deposits of savers used as a debt instrument,
 - Agro-cooperatives to access grants and other funds that may not be available to individuals or government agencies.
- ▶ Other sources of funding
 - Equity collected on the financial market.

4.4 MANAGEMENT MODEL

Specific small-scale farming management model description is welcome when it means that a government rents agricultural land to farmers within the frame of a national policy designed either to implement, experiment or revive specialized or non-specialized cropland farms in the aim of satisfying the domestic market and, possibly also at some stage, export markets. It requires the implementation of actions at two different levels that require very different strategies.

There is no information that such a strategy has yet been defined in The Bahamas. The Government of The Bahamas is about to lease available land to farmers acting independently, on a small-scale basis for their own livelihoods and to improve their income. The lease system is geared towards the very short-term, while medium and long term strategies have to be defined by the different local stakeholders, governmental satellites and the Government themselves in the frame of National Agricultural Policy. These medium and long-term strategies must also consider research and how to enhance farmers' knowledge and management skills through training. In addition, the improvement of key infrastructure and services on Andros as planned in the Master Plan will help avoid post-harvest losses and leave more for local consumption.

However, there are certain pre-requisites for sustainable small-scale farming activity. As a starting point, these pre-conditions are:

- ▶ a) Branding and marketing strategy,
- ▶ b) Diversification strategy,
- ▶ c) Incentive for farmers' groups,
- ▶ d) Trading regulation,

- ▶ e) definition of both research and green employment objectives.

In the present project, the management models the most liable to be implemented by the farmers are the ones based on either small subsistence-oriented family farms or small semi-subsistence or part-commercial family farms.

In this concept, plot management is the responsibility of each farmer. The farmers must achieve objectives such as quality, consumer assurance and reliability of supplies, and affordable or lower prices. Achieving these objectives implies that farmers are part of a collaborative chain, i.e. a farmers' organization or cooperatives. This type of alliance should allow the farmers to market their produce collectively despite differences in farm assets, and to achieve positive results, for instance lower prices. Indeed, when farmers act collectively, it helps to lower the transaction cost; there is no intermediary and they make sure that their trading agreements are honored.

4.5 STUDIES NEEDED FOR EXECUTION

- ▶ Marketing Strategy for goods and services.

4.6 PRIORITY AND RELATION TO OTHER INITIATIVES

- ▶ Aligned with Vision2040: The National Development Plan.

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

Beneficiaries include:

- ▶ Local farmers - Farmers and their families will directly benefit from a product quality improvement and increase sales. With the development of a marketing strategy, farmers will have access to export markets throughout The Bahamas, regionally and internationally.
- ▶ Local communities – Communities will have access to fresh and healthy products and will be less dependent on imports from New Providence and the USA.
- ▶ Local supermarkets – Products will be readily available to replenish stocks in a timely manner and at a reduced cost.
- ▶ Local farmers' markets – The creation and expansion of farmers' markets will attract visitors and locals to purchase produce and by products such as soaps, jewelry, jams, etc.
- ▶ Visitors – Visitors will enjoy improved visitor experience through healthy farm-to-table options as well as experiencing agro-tourism, which will assist with farm maintenance.

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|------------------------------|---|--|
| Economic & Social | <ul style="list-style-type: none"> • Increased economic benefits to local communities • Improved quality and quantity of products • Recruitment of younger generation farmers due to educational and funding opportunities • Reduced dependence on government and BAMS marketing and incentive programs | |
| Environmental | <ul style="list-style-type: none"> • Use of environmentally friendly technology | <ul style="list-style-type: none"> • Increase in practices that may have negative impacts on freshwater lens • Forest areas cleared for farmland |

6. PRODUCTS & INDICATORS

OUTPUT

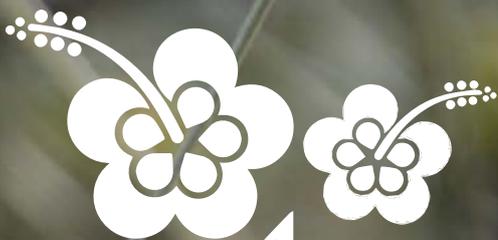
- ▶ Cleared sites with infrastructure installed,
- ▶ Installation of environmentally friendly technology,
- ▶ Marketing plans,
- ▶ Access to low interest credit.

OUTCOME

- ▶ Increase in crop production,
- ▶ Increase in local and export sales,
- ▶ Increased environmentally friendly technology use,
- ▶ Recruitment of younger generation of farmers.

INDICATOR

- ▶ Economic benefits for the agricultural sector,
- ▶ Reduced number of products trashed.



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APPENDIX F.

RECOMMENDATIONS
FOR FOREST ACTIVITIES

FORESTRY

1. STRATEGY AND RECOMMENDATIONS

The Forestry Unit appears to be well on its way to reaching its strategic goals. If it remains focused and dedicated, Andros will be a regional example of forestry development and management. In order to manage such a large area of forest, building capacity will need to be a major focus.

Recommendations include the following:

► **Develop and implement Forestry areas management plans**

Introduced to provide for the conservation and control of forests, the Forestry Act, 2010 (“the Act”) was assented to by Parliament on July 1st, 2010 with power to repeal particular parts and sections of the Conservation & Protection of the Physical Landscape of the Bahamas Act, the Penal Code and the Bahamas National Trust Act.

“*Forest Reserve*” means an area of land declared to be a forest reserve by or under the Act to be managed as permanent forest estate for the sustained yield of timber and other forest produce. “*Protected Forest*” means an area of land declared to be a protected forest by or under this Act to be managed in the same manner as a forest reserve, until the land is required for agriculture, industry, residential purposes or other development.

The boundaries for these areas are currently being confirmed to allow for formal designation. As it was identified under the Forestry Act, five-year management plans are presently being developed for forestry areas in Andros and should be implemented upon designation:

“The Director of Forestry shall prepare and submit to the Minister for approval, every five years, a plan for the management of each forest reserve, protected forest or conservation forest...After the Minister has approved a forest management plan, the Director of Forestry shall manage the area in accordance with the applicable forest management plan.”

Management plans need to be developed and implemented for each forestry area on Andros.

► **Train Bahamians in sap and lumber production and employ 15 staff in the Forestry Department**

A training program should be developed in conjunction with The Forestry Unit, BAMSI, BNT, BTVI and COB. This program should include training in forestry management including fire management as well as sap and lumber production.

Continuous educational programs will need to be developed for the local community, to increase awareness of the forest ecological importance and management needs. This increased awareness will also heighten the interest of persons to enter the field.

► **Launch forestry research programs in collaboration with foreign centers of excellence for the monitoring/management of natural resources**

An assessment of data needs should determine the institutions and types of research to be conducted. Formal MOUs are to be established with international institutions with the capacity to develop monitoring plans as well as best management practices.

► **Implement best management practices to avoid erosion and contamination of the freshwater lens**

Forestry best management practices (BMPs) that create preventative measures to help control soil erosion and water contamination are to be developed and implemented prior to approval of any forestry industry. BMPs manuals should be created that are site specific to take into consideration the surrounding habitats and industry needs. Possible sustainable techniques include:

- Creating buffer zones (areas where vegetation remain intact) around identified bodies of water. The width should be determined based on the slope of the area, forest type as well as the type of water body.
- Designated logging, staging areas and other worksites should be located in areas that are away from bodies of water and well drained.
- Avoiding broadcast application of fertilizers and pesticides.
- Reduction of topsoil disturbance to promote future forest growth.

► **Develop small sized sustainable forest utilization industry including sap and lumber production**

Projects for local communities should be identified to create economic opportunities that are online with forestry management goals. For example, a partnership with BAIC and The Forestry Unit in South Andros in the Duncombe Coppice area to identify forestry areas to be cleared for farm use that may be thinned and the timber utilized for pulp production etc.

2. ACTION PROGRAM

No specific action sheet has been developed for this thematic.



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APPENDIX G.

RECOMMENDATIONS AND ACTION SHEETS
FOR NATURE-BASED TOURISM ACTIVITIES

NATURE-BASED TOURISM

1. STRATEGY AND RECOMMENDATIONS

Although income from fly-fishing is significantly high, the tourism product on Andros needs to be diversified in order to attract larger numbers and repeated visits. New ideas need to be introduced to offer alternative sources of growth. The Androsian economy is so dependent on commercial and recreational fishing that any negative changes in those industries will have major effects on it. Andros has long been known for its “wilderness” appeal that has fueled local conservation efforts to protect its natural resources such as blue holes, the third largest barrier reef in the world and wildlife, e.g. the Andros iguana, Bahamian Oriole, flamingos and many more. Economic incentives and the natural environment should be merged into a tourism product that is aimed at bettering the economy while also protecting and respecting the environment.

Recommendations include the following:

▶ **Plan bonefishing in Joulter Cays to avoid key bird areas and habitat**

A conceptual plan should be developed in conjunction with the BNT, Audubon Society, local birders and bonefishermen. The plan should take into consideration the needs of the resource users, as well as environmental factors such as bird nesting and feeding.

▶ **Create new craft markets at Long Bays Park in South Andros**

Presently, the Long Bays Park is home to a makeshift craft and agricultural market. More permanent structures can be designed and built to accommodate the vendors in an outdoor market. The structures and displays should be creative and can be made out of upcycled material such as closet doors, crates and even old doors (See photos). Tents can be used for shelter (See photo). These types of projects can be community led efforts that are very cost effective. This type of market is attractive and gives a personal touch to each booth. The market display is a first impression and must be attractive in order to attract and maintain the attention of customers. Labeling and packaging of products are also important and should be created under the marketing plan.

The development of the market should be funded by assistance from local government and vendor booth rental. Vendors will be responsible for decoration and upkeep of their stalls.

1. Nature-based tourism

Examples of upscaled display methods



Example of tent market stalls



► **Develop training programs for guides for nature-based activities, small business management and marketing**

The development of an interpretation masterplan will detail the messages to impart and the ways that this might be achieved. The overall masterplan will define the delivery of education and will also benefit Andros by improving the visitor experience. MOT and BNT, in conjunction with local colleges should develop programs to conduct training courses for all types of tour guides. Programs such as the birdwatching certification have been implemented in Central Andros and should be throughout the island. With the recent establishment of fly-fishing regulations, a new certification program for guides will be implemented in the near future.

Andros is the ideal island to develop an ecotourism center. The center will be developed to international standards for eco-tourism. It will aim to fulfill the national and regional requirements of the tourism industry and environmental agencies, and create significant career opportunities and socio-economic benefits on Andros. It will be built using sustainable building materials and methods and will utilize alternative energy sources.

► **Improve road signs, tourist maps throughout Andros and websites for tourist information**

The improvement of the visitor experience will be included in the interpretation masterplan development. This will ensure that a particular message about Andros is conveyed, strategies to convey the message, and goals and objectives that establish the purpose, and later, the effectiveness, of those strategies. The interpretation master plan should aim to analyze existing conditions while looking at opportunities and constraints for expanding interpretation and meeting visitor needs. The plan should recommend improvements such as signage and maps that not only provide opportunities for interpretive experiences, but also help solve resource management problems including safety, access and education.

Blue Hole National Park signage



► **Develop activities that attract tourists outside the bonefishing season**

Improving the quality and variety of recreational activities and interpretative programs is the main ecotourism goal, in addition to conserving and managing established areas and activities. However, before promoting any new activities and areas, the stakeholders have to consider whether or not they have the ability to manage them properly. This exercise should be done with the local communities, the Ministry of Tourism, the Bahamas National Trust, local NGOs and the Parks and Beaches Authority.

There are many nature-based activities that exist and have the potential for further development as well as introducing new activities for development; these include:

- *Cycling, backpacking and hiking* – The creation of a mapped trail system will allow these activities to take place safely. Bike rental stations can be set up at various locations.
- *Birding* – The development of infrastructure at various birding sites throughout the four (4) districts and the training of guides will increase birding tourism.
- *Deep-sea fishing* – Deep-sea fishing charters are limited on Andros. The island's proximity to the Tongue of the Ocean could be exploited by developing deep-sea fishing trips.
- *Camping and glamping (glamorous camping)*

Glamorous camping (Glamping) that allows you to be close to nature while enjoying luxurious amenities



- *Boat and Canoe/kayak Tours* – With its vast mangroves and marine environments, glass bottom boats and kayaks will allow non divers to see under water without getting wet.

Glass bottom boats and kayaks



- *Agrotourism* – It is a growing market that involves bringing visitors to farms and participating in various activities such as purchasing produce and eating farm-to-table meals, picking crops, feeding animals, collecting eggs, etc.
- *Botanical gardens similar to the Leon Levy Native Plant Preserve in Eleuthera* – A similar concept to be created that uses the natural environment to tell a botanical story. It should highlight medicinal and edible plant history.
- *Hunting tours* - Creating hunting adventures that allow people to hunt birds or wild boars during the hunting season. This can be done in conjunction with local lodges for accommodation, guides to take people hunting and the organization of the provision of hunting equipment including guns and ammunition.
- *Yoga and meditation retreats* – Andros' serene wilderness environment is perfect for creating yoga and meditation retreats.
- *Water parks, horseback riding, spas* – the presence of other activities provides options to encourage fly fishermen to bring along their families because they will be able to find entertainment outside the lodges.

► **Develop infrastructure to allow access to Blue Holes and other areas**

The Andros Ecotourism Plan has identified some blue holes exhibiting distinct differences in each of the four districts such as:

- North and Central Andros are known for large, circular inland and ocean blue holes such as Rat Cay, Conch Sound and Evans.
- The Blue Holes National Park in Central Andros is renowned for its almost perfectly circular blue holes.
- South Andros hosts a series of blue holes connected by underwater caves, located along a fault line in the bight.
- Mangrove Cay is known for shoreline blue holes with underwater cave systems connecting them to ocean blue holes.
- Other well-known inland blue holes which might be incorporated into the demonstration project include Captain Bill's Blue Hole (Central Andros) and Stargate Blue Hole (South Andros).

Additional areas will be identified and once new areas for nature-based tourism development have been identified, conceptual and business plans are to be developed. These plans will assist in determining infrastructure needs and carrying capacity. They should also include a concessions plan to ensure proper development and management of these areas.

Development of infrastructure should be similar to that implemented in the Blue Hole National Park. This includes composting toilets, solar lighting, boardwalks, pavilions and interpretive signage.

Blue holes in Central and South Andros



Source: BRLI - 2016

▶ **Re-vitalize festivals**

The existing festivals on Andros have developed over the years but certain key elements are lacking. Festivals should be properly planned by a committee of several sectors that take into consideration the condition of site infrastructure, local accommodation, entertainment, food and transportation. Effective and well-timed marketing strategies need to be developed in order to attract both domestic and international visitors.

2. ACTION PROGRAM

The action sheets developed regarding nature-based activities are the following:

- ▶ **10 - Definition of a marketing strategy for goods, services and tourism,**
- ▶ **11 - Development of birding areas and bird-watching tours,**
- ▶ **12 - Development of a Culture Heritage Village in Red Bays.**

| | | | | |
|---|-------------------------------------|--------------------------|--------------------------|--|
|  | Nature-based tourism | | | 10 - Definition of a marketing strategy for goods, services and tourism |
| | All districts | | | |
| | ST | MT | LT | |
| | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |

1. OBJECTIVE

The main objective of creating a marketing strategy is to develop promotional strategies for sustainable financial opportunities for local Androsians from the goods, services and tourism products they have to offer.

The sub-objectives include:

- ▶ Establishing institutional frameworks such as cooperatives, associations or committees that represent each sector in all districts. Examples of sectors include farmers, handicraft makers, nature-based tourism operators etc.,
- ▶ Promote the Andros brand to domestic and international visitors,
- ▶ Building capacity and training local communities.

2. LOCATION

Andros is 6000 square kilometers (2300 square miles) and the largest in The Bahamas archipelago. It lies about 45 km west of New Providence. The land mass is divided by many small islets and cays connected by mangrove estuaries and tidal swamplands. Andros has four main districts. The plan will take into consideration goods, services and nature-based tourism activities in all of them. They include:

- ▶ North Andros – The northern-most district is the only one with a settlement on the west coast of Andros (Red Bays). There are a number of settlements that run along the eastern shore from Morgan's Bluff in the north to Stafford Creek in the south.
- ▶ Central Andros – The largest district runs from the southern side of Stafford Creek south through its largest settlement of Andros Town, which centers around Fresh Creek Harbor, and further south to Behring Point which is situated along the northern shore of the Northern Bight. Central Andros is the widest of the four districts.
- ▶ Mangrove Cay – The smallest district is positioned between the Middle and Southern Bights. Its few settlements also run along the eastern shore, from Moxey Town in the north (also known as Little Harbor) to Lisbon Creek in the south.
- ▶ South Andros – This southern-most district begins south of the Southern Bight and runs from Mars Bay to the settlement of Driggs Hill on its northeast coast, and on to include the Curly Cut Cays and the Water Cays at the southernmost end of Andros.



3. ACTION PROGRAM

3.1 KEY ISSUES AND OPPORTUNITIES

Andros is the largest island in The Bahamas and it supports over a 100,000 acres of relatively pristine land. It boasts the third largest barrier reef in the world, the largest concentration of blue holes in the region, the Tongue of the Ocean, a rich variety of flora and fauna and many cultural treasures. Despite its size and resources, it only receives 10,000 visitors per year that only provides direct benefits to a small percentage of the population. Andros has an unemployment rate of about 17%. Andros is filled with untapped potential. It has very unique natural, historical and cultural resources that remain relatively unknown.

Andros also offers a budding agriculture industry that can be used to decrease the country's \$1 billion food bill. There are approximately 150 farmers on Andros and it is estimated that 40% of the produce are wasted because there is no market¹. There is a need to identify potential markets locally and internationally, and reduce the high food bill and increase export potential.

3.2 DEVELOPMENT STRATEGY

To create a sustainable marketing strategy for goods, services and tourism in Andros, it is recommended to design a plan that engages the local communities and stakeholders. The plan must also seek to foster partnerships between the private and public sectors, to create focused marketing efforts with shared objectives and strategies. During the plans, development efforts should be made to build local capacity to implement proposed marketing strategies as well as improve overall products and services.

Short term – up to 5 years (2020)

- ▶ **Establish institutional framework** – Members from similar sectors such as farmers, handicraft makers, nature-based tourism operators etc. will create an institutional framework. These types of frameworks have been implemented in some areas e.g. the Big Yard Farmers Co Ltd, the South Andros Farmers Association, the South Andros Handicraft and Manufacturing Association (SAHMA) etc. The formal establishments of such organizations will allow them to access funding opportunities such as the Global Environment Fund (GEF) Small Grants Program etc. that may not be available to individuals. This will extend the limited private and public resources through partnerships. This allows the communities to have an open forum to discuss opportunities and means of growth within their sectors. The dissemination of information within these sectors or small groups will ensure the continued growth and idea formulation efforts to keep the plan expanding.
- ▶ **Promote the Andros brand to domestic and international visitors** – The development of a marketing plan will take into consideration the following steps:
 - Review of past and present marketing approaches and compare them to tourist arrivals and sales of goods that have been done for Andros,
 - Review current market trends that have worked for the region and similar products/situations. This helps to identify the current advertising climate that caters to the needs of the traveler and consumer. For example, most travels rely solely on the internet to pick a destination and local activities.

¹ The Nassau Guardian, 2011

- Develop marketing strategies that describes each initiative and the purpose, intended audience and reach as well as the potential benefits of each method. Giving clear distinction between the immediate community market, island-wide market, Bahamas-wide market, regional and international markets,
 - The goals and objectives of the plan should be clearly defined. The descriptions are to define the intended market placement, growth goals over the short, medium and long term and possible financial goals for return on the overall marketing investment,
 - Each marketing program should be listed. This will include everything from website development, email blasts or major television ads etc. Each initiative is to include the description, cost analysis, projected audience and return figures as well as samples that best convey the concept,
 - A detailed schedule of all marketing initiatives will be created to allow for implementation of marketing plans.
- **Building capacity and training local communities** – The development of a marketing plan will require that the local community is capable of implementing the plan as well as providing quality products and services. To ensure this, a training program in marketing skills and product development will have to be created. Proper training will ensure optimal customer service, which will serve as a promotional tactic through word of mouth, which positions Andros as a popular destination and producer.

3.3 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effects regarding the different key pillars related to the Sustainable Prosperity Scenario of development:

| | |
|---------------------------|--|
| Major positive impact | |
| Contribution | |
| No effect | |
| Potential negative impact | |

| Definition of a marketing strategy for goods, services and tourism | |
|--|--|
| Food and water security | |
| Connectivity and accessibility | |
| Education and capacity building | |
| Climate change and coastal resilience | |
| Livelihoods and income equality | |
| Land tenure security, land use planning and enforcement | |
| Health and wellbeing | |
| Strengthening local government | |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| Sub activities | | Institution responsible | Source of funding |
|-------------------|---|--|-------------------|
| Short term | Description | | |
| | Establishment of an institutional framework | Consultant, MT, IICA, ANCAT, NHSA, local government | Private |
| | Marketing plan of Andros services and tourism | Consultant, MT, IICA, ANCAT, NHSA, BNT, local government | Private/Public |
| | Implement strategies for marketing, production and export of products from Andros | Consultant, BAIC, BAMSI, IICA, ANCAT, NHSA, local government | Private/Public |
| | Training program for local communities | Consultant, BAIC, BAMSI, IICA, ANCAT, NHSA, local government | Private |

4.2 COSTS ESTIMATION

| Sub activities | | Estimated costs | |
|-------------------------------|--|-----------------|--------------------|
| | | Unit | Total amount (k\$) |
| Short term | Hire Project Manager to lead initiative including facilitate workshops, drafting of articles of association and constitution and development of marketing and branding plans | U | 30 |
| | Stakeholder consultations (introductory meetings and formation of board) | U | 5.5 |
| | Training workshops in marketing and branding, entrepreneurship, e-commerce, social media strategy and project management (including materials) | U | 26 |
| | Hire consultants for training workshops | U | 15 |
| | Market research and surveys | U | 2 |
| | Travel and accommodations (international and domestic) | U | 40 |
| Grand TOTAL short term | | | 118.5 |
| Grand TOTAL | | | 118.5 |

4.3 SOURCES OF FUNDING

This action may be funded by:

- ▶ Government contributions,
- ▶ GEF Small Development Programme,
- ▶ Bilateral Aid Agencies,
- ▶ The Bahamas Private Sector Association,
- ▶ IDB soft loans,
- ▶ From the World Tourism Organization (STP) Sustainable Tourism Programme with regards to Target 12.b of Goal 12, as it is imperative to "*Develop and implement tools to monitor sustainable development impacts for sustainable tourism which creates jobs, promotes local culture and products*".

4.4 MANAGEMENT MODEL

Brand image is a prominent marketing tool as it is defined as the consumer's mental representation of the offering² where symbolic meanings are associated with the specific features of a product³ or destination⁴. It is thus crucial that the messages sent by Andros are clearly defined and understood by everyone at the national level and abroad. That is the first task of Androsians through their representatives and a Destination Marketing Organization.

The management model recommended is the one of a Non Profit Public Benefit Corporation or a Public interest Corporation.

4.5 STUDIES NEEDED FOR EXECUTION

- ▶ Market research and survey.

4.6 PRIORITY AND RELATION TO OTHER INITIATIVES

- ▶ Aligned with Vision2040: The National Development Plan.

² Dobni and Zinjkan, 1990

³ Padgett and Allen, 1997

⁴ P. Naidoo and al. « Tourist's perspective of the brand image of Mauritius » in International journal of Marketing and management Research, Vol. 3. N° 3, 2010

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

Markets and market for small-scale enterprises are characterized by very limited purchasing power of consumers and a limited range in local production. This section does not aim at promoting a specific product but Andros Island as a market in its whole to be developed, branded, labeled and promoted domestically on the short term and on the export market for the long-term. **“Act globally, think locality”!** is quite challenging in Andros.

It is about to promote the island natural assets, what makes its uniqueness, its cultural heritage with the upcoming Ecomuseum of the Black Seminoles descendants, the know-how and affordability of its population, its typical handmade products, its Nature diversity, treasures and richness. In brief, a vibrant tourist destination that contributes to Andros Prosperity.

By putting ahead these endowments, it is also about attracting a greater number of visitors owing to the maritime and aerial opening up spreading towards different ranges of beneficiaries. These beneficiaries are direct, indirect and secondary ones.

DIRECT BENEFICIARIES

- ▶ Androsians: taximen, shops owners, retailers, merchants, hotels and restaurants, fishers, farmers, fishing-tour guides....,
- ▶ Androsians' family: owing to income improvement, education and living conditions are also improved,
- ▶ The Government owing to increased amount of collected taxes, new strengthened links between business and new policy.

INDIRECT BENEFICIARIES

- ▶ Bahamians from New Providence and the rest of the Family Islands,
- ▶ External visitors from the first tourist markets of The Bahamas and others attracted by the branding strategy,
- ▶ Consumers,
- ▶ Youth for that relates to education, training and new jobs integrating as they integrate the Green Economy comprised into Island branding strategy,
- ▶ Andros labor market; as production is internal demand oriented, there is a need for additional workers, in both low-skills jobs (agriculture, fishery, tourism, retailers) and technical and skilled ones (restaurants, hotels, port & airport, Green Economy (tourism, energy), Culture Heritage Village),
- ▶ Self-employment creation.

SECONDARY EFFECTS EXPECTED ON THE LONG TERM

- ▶ Changes in consumer behavior; Andros production being valued, consumers will change their consuming patterns giving preference to the local production as it translates their cultural, personal and consumption values,
- ▶ Steady increase of farm and sea products consumption,
- ▶ Imports reduction, food security/self-sufficiency,

- ▶ Make Andros a secured niche in a competitive environment,
- ▶ Synergy between local business and the local community,
- ▶ Development of the link between formal and informal activities,
- ▶ Development of the link between small business and public policy,
- ▶ Breakdown of internal migration,
- ▶ Stabilization of the social and economic sectors.

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|------------------------------|---|----------|
| Economic & Social | <ul style="list-style-type: none"> • Improved quality of goods and services • Direct economic benefits to business owners • Direct economic benefits to communities • Improved marketing of Andros tourist product • Increased visitors • Increase in available markets • Improved local capacity to market future products • Public and private partnerships | |
| Environmental | | |

6. PRODUCTS & INDICATORS

OUTPUT

- ▶ An association or group formed for each sector in all 4 districts,
- ▶ An implemented marketing plan for each sector,
- ▶ A series of training workshops.

OUTCOME

- ▶ Decrease in individual expenses in each sector as associations form,
- ▶ Increase in exported farm goods and products,
- ▶ Increase in production of goods,
- ▶ Increase in business owners,
- ▶ Increased employment opportunities in all sectors,
- ▶ Improved packaging and distribution of goods.

INDICATOR

- ▶ Total number of products exported and sold,
- ▶ Total number of visitors to Andros,
- ▶ Total number of jobs created in each district,
- ▶ Total number of visitors to Andros.

| | | | | |
|---|-------------------------------------|-------------------------------------|-------------------------------------|--|
|  | Nature-based tourism | | | <h2>11 - Development of birding areas and bird-watching tours</h2> |
| | All districts | | | |
| | ST | MT | LT | |
| | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | |

1. OBJECTIVE

The main objective to develop birding areas and bird-watching tours is to further develop the bird-watching industry by providing sustainable infrastructure and trained guides.

The sub-objectives include:

- ▶ Identifying and mapping an island wide trail system and providing infrastructure in bird-watching hotspots,
- ▶ Protecting and conserving bird sites that are ecologically and economically important to Andros,
- ▶ Developing sites with sustainable infrastructure that are properly managed and maintained,
- ▶ Training local community members to serve as bird guides that effectively and sustainably manage nature-based tourism businesses.

2. LOCATION

At present, there are numbers of existing birding trails throughout Andros:

NORTH ANDROS BIRDING TRAILS

- ▶ Uncle Charlie's Blue Hole, San Andros Queens Hwy about 5 miles north of the airport; park at the sign and walk the trail to the blue hole. (vegetation: pine forest),
Bird list:- Bahama Woodstar; Cuban Emerald; Cuban Pewee; Blue Gray Gnatcatcher; Greater Antillean Bullfinch; Western Spindalis; Red tailed Hawk; Pine Warblers; La Sagra's Flycatchers.
- ▶ Back-So Hiking Trail, Morgan's Bluff near Capt. Morgan's Caves (vegetation: cultivate trees and coppice; canopy of Almond Trees, Coconut trees makes this an easy shady hike and good place for birding during the day,
Bird list:- Black Whiskered Vireo; Thick -billed Vireo; Greater Antillean Bullfinch; Bananaquit; Yellow bellied Sapsucker; Black and White Warbler; West Indian Hairy Woodpecker.
- ▶ Old Conch Sound Road, Conch Sound Blue Hole Beach, (short walk towards the mangroves along the northern shore is an old rocky foot road that leads into the wetlands of Conch Sound. This is the old road from the seashore to the Johnson Road. (vegetation: mangroves),
Bird list:- Clapper Rails, West Indian Osprey, Louisiana Water Thrush; White Ibis; Yellow Crown Night Herons, Little Blue Herons.
- ▶ Joulter Cays: Lowe Sound dock, this is a day away trip by boat,
Bird list: - Piping Plover, Wilson Plover, Semipalmated Plover; Brown Pelican; Red breasted Merganser; Ruddy Turnstone; Red Knot; American Oyster Catcher.

CENTRAL ANDROS BIRDING TRAILS (NORTH OF ANDROS TOWN AIRPORT)

- ▶ Owen's Town, this old abandoned logging settlement is located south west of San Andros Queen's Highway (vegetation: pine, wetland grasses; tidal creeks; mangroves, cultivated plants),
Bird list:-Black faced grassquit; Bahama Woodstar; Cuban Emerald; Bahama Oriole; Bahama Yellowthroat; Great Lizard Cuckoo; Black Whiskered Vireo; Thick Billed Vireo; White eyed Vireo; Blue Headed Vireo; Red Legged Thrush; Greater Antillean Night Hawk; Blue Gray Gnatcatcher; Pine Warbler; Magnolia Warbler; La Sagra's Flycatcher; Loggerhead Kingbird; Black-throated Green Warbler.
- ▶ Blue Holes National Park, north road: Goby Bird Trail, Crossing Hog, Maiden's Hair Fern Road (vegetation: pine; coppice, thickets, cultivated plants, wetland and canopies cover the roads that loop from North Blanket sound to south Staniard Creek). Watch out for the wild hogs and be careful not to frighten the Bahama Racers and Andros Iguanas,
Bird list:-West Indian Hairy Woodpecker; White Crown Pigeon; Black faced grassquit; Bahama Mockingbird; Bahama Woodstar; Cuban Emerald; Western Spindalis; Bahama Oriole; Bahama; Yellowthroat; Greater Antillean Bullfinch; Zenaida Dove; Key West Quail Dove; Great Lizard Cuckoo; Black Whiskered Vireo; Thick Billed Vireo; Red Legged Thrush; Antillean Night Hawk; American Redstart; Blue Gray Gnatcatcher; Pine Warbler; Oven Bird; Cuban Pewee; American Coot; Pied billed Grebe; Least Grebe; American Wigeon.
- ▶ Blue Holes National Park, south road: Cuckoo's Roost, Captain Bill's coppice trails, Logging Road, Gaulin Pond,
Bird list:- Blue-gray Gnatcatcher, Pine Warbler, Prairie Warbler, Cuban Emerald, Bahama Mockingbird, Western Spindalis, Bahama Woodstar Hummingbird; Cuban Emerald Hummingbird; Great Lizard Cuckoo; White Crown Pigeon, Redtail Hawk, Black throated Blue Warbler, Little Blue Heron, Great White Heron, Greater Antillean Bullfinch; Red Legged Thrush; West Indian Hairy Woodpecker; Barn Owl, Yellow throated Warbler.
- ▶ Rainbow Blue Hole Trail, Queens Highway, north Love Hill,
Bird list:-Bahama Yellowthroat Warbler; Least Grebe; Bahama Pintail.
- ▶ Maiden's Hair Fern Coppice Road, Queens Highway, south Staniard Creek.
Bird list:-Black faced grassquit; Bahama Woodstar; Cuban Emerald; Bahama Yellowthroat; Black Whiskered Vireo; Thick Billed Vireo, Western Spindalis; Red legged Thrush.

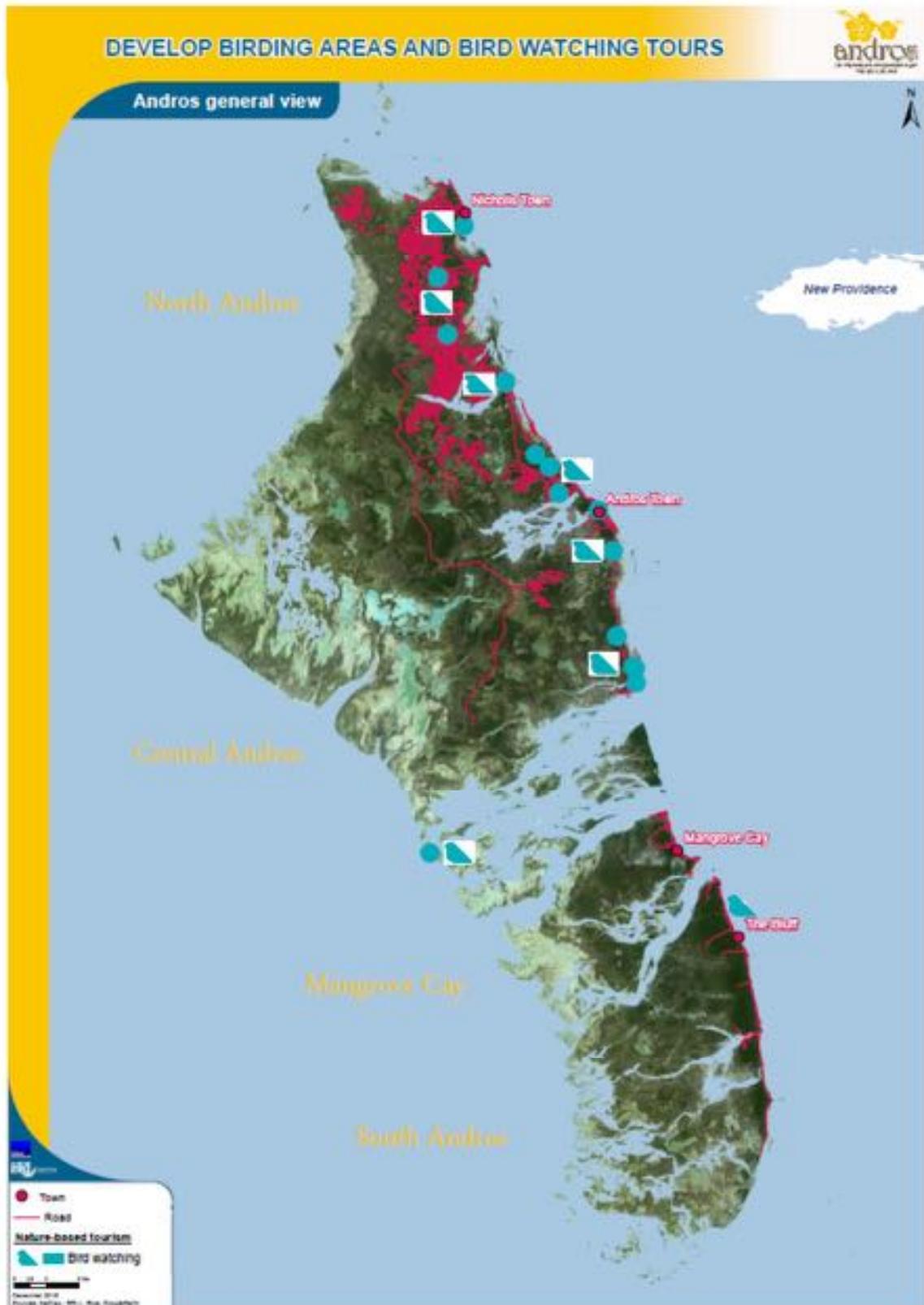
CENTRAL ANDROS BIRDING TRAILS (SOUTH OF ANDROS TOWN AIRPORT)

- ▶ Crab Replenish Reserve: Young Sound roadway to transitions from scrubland near the highway to wetland to seashore,
Bird list:-Piping Plovers; Ruddy Turnstones, Spotted Sandpipers; Black Bellied Plovers; Yellow Warbler; Limpkin.
- ▶ Man O' War Sound Road, (road lined with native fruit trees and shady tree canopies makes this a good area for birding). The road transitions to a mangrove area where a rocky footpath leads to the seashore,
Bird list:- Gray King Bird; La Sagra's Flycatcher; Cuban Pewee; Black and White Warbler; Black Poll Warbler; Cape May Warbler; Worm Eating Warbler; Thick Billed Vireo; Gray Cat Bird; American Redstart; Bananaquit; Bahama Mockingbird; Bahama Woodstar; Western Spindalis; Mangrove Cuckoo; Clapper Rail; Great Blue Heron; West Indian Hairy Woodpecker; Yellow Bellied Sapsucker.
- ▶ Nell Pond Hiking Trail, Cargill Creek (scrub, wetland, coppice and pine ridge trail to Nell Land blue hole),
Bird list:- Great Lizard Cuckoo; Bahama Woodstar; Thick Billed Vireos; Black Whiskered Vireo; Greater Antillean Bullfinch; Pine Warbler; Bananaquits; Yellow Crown Night Heron.
- ▶ Salvador Flats, Behring Point (mangroves east of the Cargill Creek Bridge to flats of Bering Point).

Bird list:- Willets; Belted King Fisher; Wilson Plover; Piping Plover; Semipalmated Plover; American OysterCatcher; Roseate Spoonbill; Pine Warbler; Bahama Swallows; Redwing Black Bird; American Kestral; Little Blue Heron; White Ibis; Reddish Egret; Great White Heron; Cattle Egrets; Gray King Bird.

The Bahamas National Trust is currently identifying all potential birding areas to be developed as birding trails in the four districts.

The map hereafter presents the birding areas identified, including the existing ones (identification for Mangrove Cay and South Andros is lacking but in progress).



3. ACTION PROGRAM

3.1 KEY ISSUES AND OPPORTUNITIES

There are approximately 10,000 visitors to Andros each year and three quarters of which are repeat visitors. The main reasons for visiting are bone fishing, diving and snorkeling (Andros Eco-tourism Development Plan 2010). Outside of these activities, the opportunities for professionally guided tours are limited. A few bush tours include kayaking and bird watching. Access and facilities to provide these bush tours are limited. In order to diversify the Andros tourism market, there needs to be further education of professional guides as well as the creation of access points and visitor facilities.

Developing birding areas and bird watching tours should be a priority. Andros is made up of large areas of hardwood forests, fresh and salt-water wetlands as well as rocky pineland, which are all prime habitat for resident and migratory birds. It is home to several threatened, endangered and endemic species of birds such as the Caribbean Flamingo and the Kirtland's Warbler. The Important Bird Areas (IBAs) program is one of Audubon Society's conservation programs, and has identified six (6) areas on Andros.

The bird areas that have infrastructure are Captain Bill's Blue Hole and Cousteau's Blue Hole in the Blue Hole National Park, Small Hope Pond and Uncle Charlie's Blue Hole outside of the National Park system. Identifying, protecting and developing birding areas will increase tourist related activities as well as create more job opportunities.



The Inter-American Development Bank (IDB), the Audubon Society, Ministry of Tourism and The Bahamas National Trust (BNT) developed a Bird Guide Training program in 2015 that aims to strengthen bird-based tourism as a conservation and development tool. The program aims to train expert and basic level guides in bird biology and identification, group management, business skills, safety and Bahama Host (special tourism training). To date, 50 persons on Andros have gone the course.



Students in Andros learning bird identification in the field.

3.2 DEVELOPMENT STRATEGY

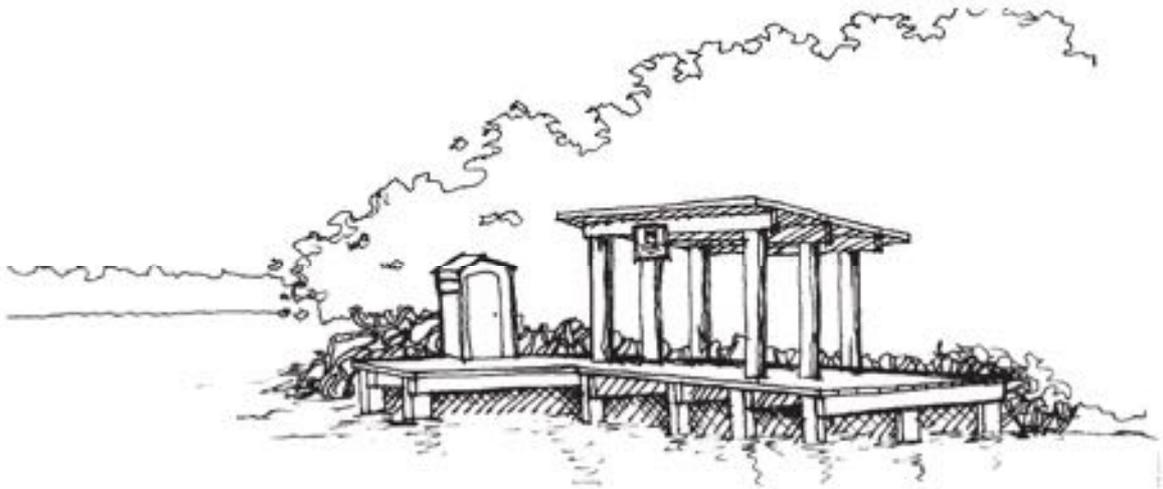
The strategy to develop bird watching areas and bird guides in Andros will include:

- ▶ Identify and map possible sites,
- ▶ Protection of sites,
- ▶ Conceptual plans,
- ▶ Construction of infrastructure,
- ▶ Development and implementation of management and concessions plans,
- ▶ Training of bird guides.

The development of birding areas and training bird guides will help to create additional experiences for visitors to Andros. Sites can serve as living classrooms to increase educational opportunities for Bahamian and international students alike. Training will increase the potential for business owners in nature-based tourism as well as employ more locals as guides and vendors in those areas.

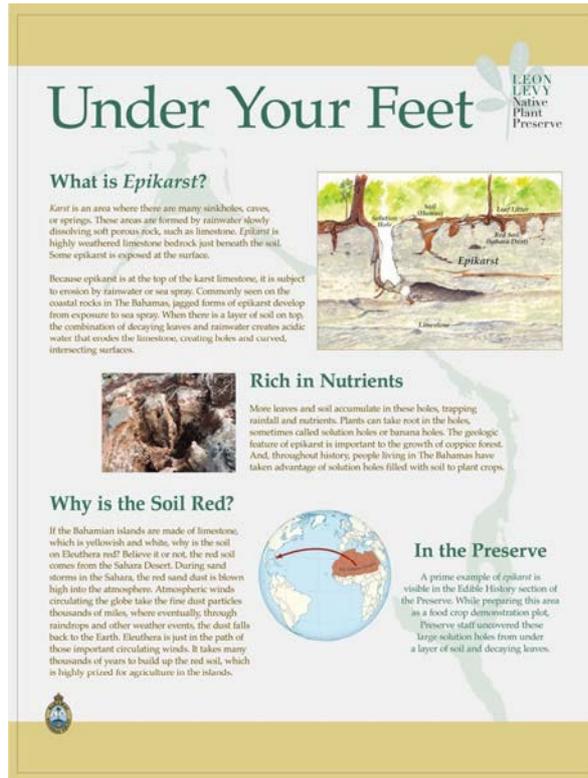
Short term – up to 5 years (2020)

- ▶ **Identify and map possible sites** – Working with local communities and expert birders, specific areas will have to be identified that are away from critically sensitive areas such as nesting for birds or sea turtles. GIS maps will be created to provide visitors with interpretative handouts that includes transportation routes and access points.
- ▶ **Protection of sites** – The status of each site will need to be confirmed and some level of protection awarded under either Local Government, The Bahamas National Trust, Parks or Beaches Authority, local NGO's or co-management opportunities. This is especially critical in areas that call for physical structures being erected.
- ▶ **Conceptual plans** – Conceptual plans will be developed for the sites to identify infrastructure needs and types of materials. The plans will include the use of sustainable materials and practices that will have limited effect on the environment. Some sites will require less infrastructure and work than others, e.g. The Maiden Hair Coppice site would only require widening of road ways and trail clearing versus The West Side National Park camping sites that would require construction of composting toilets, solar lighting and decking structures etc.

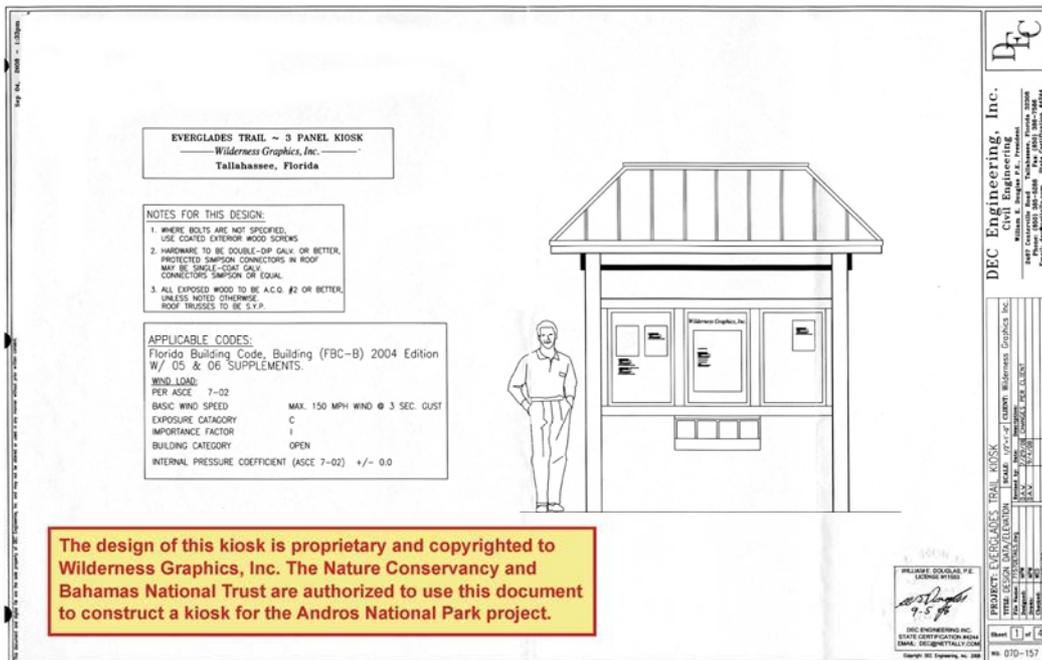


Example of West Side National Park Camp Site amenities including platform, open-sided shelter with sign and toilet

- ▶ **Construction of infrastructure** – Through public consultation identify two sites per District and implement conceptual plans. These plans may include composting toilets, solar lighting, boardwalks, interpretive signage etc.



Example of interpretive signage to be used at birding sites.



Signage kiosk

- ▶ **Development and implementation of management and concessions plans** – The maintenance plans will include the maintenance of access roads, infrastructure and invasive species management.
- ▶ **Training of bird guides** – The continued development and expansion of the bird guide course that was previously introduced by BNT and MT.

Medium term – up to 10 years (2030)

There will be continued construction of infrastructure and access clearing as well as training of bird guides at various levels.

Long term – up to 25 years (2040)

In the long term, all areas that have been identified, installed infrastructure and concessions should be properly managed with a sustainable finance mechanism in place.

3.3 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effects regarding the different key pillars related to the Sustainable Prosperity Scenario of development:

| | |
|---------------------------|--|
| Major positive impact | |
| Contribution | |
| No effect | |
| Potential negative impact | |

| Development of birding areas and bird-watching tours | |
|---|--|
| Food and water security | |
| Connectivity and accessibility | |
| Education and capacity building | |
| Climate change and coastal resilience | |
| Livelihoods and income equality | |
| Land tenure security, land use planning and enforcement | |
| Health and wellbeing | |
| Strengthening local government | |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| | Sub activities | Institution responsible | Source of funding |
|--------------------|--|--|-------------------|
| Short term | Description | | |
| | Identify and map possible sites | MT, BNT, PPBA, ANCAT, NHSA, Local Government | Public/Private |
| | Conceptual Plans | MT, BNT, PPBA, ANCAT, NHSA, Local Government | Public/Private |
| | Develop and management and concessions plans | MT, BNT, PPBA, ANCAT, NHSA, Local Government | Public/Private |
| | Protection of sites | BNT, PPBA, ANCAT, NHSA, Local Government | Public/Private |
| | Infrastructure to include composting toilets, solar lighting, boardwalks, interpretive signage | MWUD | Public/Private |
| | Training of bird guides | MT, BNT | Public/Private |
| Medium term | Description | | |
| | Construction of infrastructure | MWUD | Public/Private |
| Long term | Description | | |
| | Maintenance of all sites | MWUD, PPBA | Public |

4.2 COSTS ESTIMATION

| Sub activities | | Estimated costs | |
|--------------------------------|--|-----------------|--------------------|
| | | Unit | Total amount (k\$) |
| Short term | Identify and map possible sites | U | To be completed |
| | Conceptual Plans | U | To be completed |
| | Develop and management and concessions plans | U | To be completed |
| | Protection of sites | U | To be completed |
| | Infrastructure to include: <ul style="list-style-type: none"> Composting Toilets from Clivis Multrum complete with housing and two toilets - \$60k Solar lighting Boardwalks Interpretive signage - \$20k Signage kiosk – \$10 – 13k Decks - \$5k District wide trail system - \$1.2mil | U | To be completed |
| | Training of bird guides | U | 150 |
| Grand TOTAL short term | | | To be completed |
| Medium term | Infrastructure to include composting toilets, solar lighting, boardwalks, interpretive signage | U | To be completed |
| | Training of bird guides | U | 150 |
| Grand TOTAL medium term | | | To be completed |
| Long term | Maintenance and management of all sites | U | To be completed |
| Grand TOTAL long term | | | To be completed |
| Grand TOTAL | | | To be completed |

4.3 SOURCES OF FUNDING

The first funding source is the Biodiversity component of the GEF Small Grant Programme.

Other financing may be obtained from:

- ▶ The IADB Biodiversity and Ecosystem Services (BIO) Program,
- ▶ Domestic funding,
- ▶ International NGOs like the Abercrombie & Kent Global Foundation that relates to education, protection and conservation, USA,

- ▶ Bird Life international, United Kingdom,
- ▶ Conservation International, USA.

4.4 MANAGEMENT MODEL

A community-based management is recommended as it involves all stakeholders including government agencies, conservation, and local communities.

Stakeholders give direction to sites management, they set policy goals and management objectives including carrying capacity assessments, they ensure that all activities permitted at the site are in harmony with nature and with the history of the area, they provide opportunities for research that will benefit the society, and educate visitors, provide infrastructure for visitor safety, environment recovery, among other.

4.5 STUDIES NEEDED FOR EXECUTION

- ▶ Environmental Impact Assessment,
- ▶ Assessment of site carrying capacity,
- ▶ Feasibility study on road access into the backcountry,
- ▶ Sustainable finance plan.

4.6 PRIORITY AND RELATION TO OTHER INITIATIVES

- ▶ Aligned with Vision2040: The National Development Plan.

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

Beneficiaries include:

- ▶ Local residents in all 4 districts,
- ▶ International and Domestic visitors to Andros,
- ▶ Local and international educational institutions,
- ▶ Local businesses including construction, restaurants, lodges, transportation etc.
- ▶ Transportation companies such as airlines and ferries.

Alongside the growing interest for Nature conservancy that is also a conditional in International Financing, interest is primarily focused on resource management and conservation as it implies economic outputs. This Green economy field incorporates a range of activities from delivering impact statement and how to minimize habitat destruction in areas with new development like Andros Case.

On the medium and long terms, jobs creation supporting the birding industry should raise like, optics reps.

In line with Andros branding strategy, computer programming as organizations need to develop online tools. There are also opportunities to build applications and data analysis if Andros has to become an open-air classroom and a scientific spot.

Scientific illustration, graphic design and web designers and multimedia could be new jobs niche related with Education to ICT as scheduled in the Master Plan.

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|------------------------------|--|---|
| Economic & Social | <ul style="list-style-type: none"> • Economic benefits to local communities • Creation of business opportunities and jobs in birdwatching and area management • Increased tourism as more activities introduced to area • Persons in local communities trained in bird watching and entrepreneurial skills | |
| Environmental | <ul style="list-style-type: none"> • Protection of Important Bird Areas | <ul style="list-style-type: none"> • Increased disturbance to wildlife during construction |

6. PRODUCTS & INDICATORS

OUTPUT

- ▶ Possible sites identified and mapped,
- ▶ Sites protected,
- ▶ Infrastructure needs determined,
- ▶ Infrastructure to include composting toilets, solar lighting, boardwalks, interpretive signage,
- ▶ Management and concessions plans developed,
- ▶ Continued management of areas.

OUTCOME

- ▶ Increased visitors to Andros,
- ▶ Increased employment related to nature-based tourism sector,
- ▶ Increased number of trained professionals in birdwatching.

INDICATOR

- ▶ Number of environmentally sustainable functioning birdwatching sites,
- ▶ Number of visitors to Andros,
- ▶ Economic benefits related to nature-based tourism sector,
- ▶ Number of jobs created.

| | | | | | | |
|---|--|--|----|----|----|--------------------------|
|  | Nature-based tourism | <h2>12- Development of a Culture Heritage Village in Red Bays</h2> | | | | |
| | North Andros | | | | | |
| | <table border="0"> <tr> <td>ST</td> <td>MT</td> <td>LT</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table> | | ST | MT | LT | <input type="checkbox"/> |
| ST | MT | LT | | | | |
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1. OBJECTIVE

The overall objective is to develop a sustainable Culture Heritage Village in Red Bays, promoting both the culture and traditions of the Seminole Indians, and nature-based activities in North Andros.

The sub-objectives include:

- ▶ Create an Ecomuseum in Red Bays town center promoting the history, culture and traditions of the Seminole Indians,
- ▶ Create an eco-lodge promoting cultural and nature-based tourism,
- ▶ Attract more visitors in North Andros,
- ▶ Improve income in the cultural and nature-based sectors,
- ▶ Enhance employment in North Andros related to cultural and nature-based activities, particularly in Red Bays to avoid inhabitants (Seminole Indians) leaving the town because of the lack of resources,
- ▶ Develop Red Bays' inhabitants' skills in management to achieve effective sustainable development of the Cultural Heritage Village.

2. LOCATION

Red Bays is a small village located on the upper northwest side of Andros; it is the only settlement on the west coast of Andros island.

Red Bays is located within 30 km from Nicholl's Town, the main community of North Andros. Nassau is located about 105 km, or 57 nautical miles, away. Maritime routes provide connections to Morgan's Bluff (18 miles) and Joulter Cays (15 miles).



3. ACTION PROGRAM

3.1 KEY ISSUES AND OPPORTUNITIES

The origin of Red Bays is one of the more interesting features of Bahamian history. It is the fount of the Bahamian Seminole culture, although only slight vestiges of the culture remain today.

The village of Red Bays was founded in the 18th century by the Seminoles, a native American tribe that migrated from Florida during the violent Seminole wars, and persons of African descent who escaped enslavement.

The Bahamas Historical Society describes more precisely the foundation of Red Bays:

*“The period 1763-1784 when the English possessed Florida was also the period of the development of the Seminole culture as such. It occurred with the intermingling of runaway slaves with the Creek Indians of Florida. In fact, “Seminole” in Creek dialect signifies “runaway”.*¹

*Many runaway slaves took refuge with the Creeks who assisted them in opposing slave catchers. It was during 1821 that efforts were made by the Seminoles to gain a haven in the Bahamas. Seminoles on the coast of Florida occasionally encountered Bahamian fishing and wrecking vessels and it was a wrecking vessel, the “Steerwater”, which brought the first group of Seminoles to Red Bays, while another group established a small community at the Berry Islands.*²

*The group who went to Andros remained apparently undiscovered until 1828, when the Collector of Customs seized and brought them to Nassau on the pretence that they had been illegally imported into the Bahamas for later shipment to Cuba as slaves.³ But because many of them had served in the British Army in the war against the United States, and still retained their discharge papers, they were released. Thus, their names never appeared in the slave registers, and they were never considered as slaves in the Bahamas.*⁴

*The settlers managed to support themselves by living off the land and the sea. At the time of their discovery in 1828, the reports claimed that ninety-eight (98) Seminoles ate “fish, conchs, and crabs,” and also cultivated “Indian corn, plantain, yams, potatoes and peas ...”⁵ Three years later they had expanded their economic activities. They were depicted as living comfortably having made considerable money by felling timber, cutting dye woods, gathering sponge and picking up wrecked property as several of them have through their industry and good management purchased themselves small vessels.*⁶

Nowadays, Red Bays is known for its sustainable subsistence lifestyle. Every day, the locals harvest the ocean for fish and sponges and the land for straw, wild boars and land crabs. It is the venue for the annual Red Bays Snapper Tournament.

Residents are renowned for making beautiful, sturdy baskets crafted from palm thatch fronds, which can be used for many purposes. The art of creating these unique baskets has been passed down through the generations. They are not made anywhere else in the country and are a part of the rich cultural legacy of the Black Seminoles of Red Bays.

Red Bays is also considered as an important bird area, which consists of a diverse area of Caribbean pine forest, broad-leaf coppice, mangroves, shoreline scrub and beach.

It supports regionally significant numbers of wintering Laughing Gull *Larus atricilla* and breeding Royal Tern *Sterna maxima*. Six of The Bahamas' restricted-range birds occur, including the vulnerable Bahama Swallow *Tachycineta cyaneoviridis*. The near-threatened White-crowned Pigeon *Patagioenas leucocephala* is found in significant numbers. Other species such as the Cuban Emerald *Chlorostilbon ricordii*, Western Spindalis *Spindalis zena* and Great Lizard-cuckoo *Coccyzus merlini* are present, and the endemic subspecies, the Greater Antillean Oriole *Icterus dominicensis northropi*, occurs in the coconut palm trees within the Red Bays settlement.

¹ Goggin J. The Seminole Negroes of Andros Island Bahamas. Florida Historical Quarterly Vol. 24 No. 3 pp 201-206

² Bethel to Commissioner of Customs 4 August 1831. Governor's Despatches, Nassau Public Records Office

³ Ibid

⁴ Ibid and Register of Slaves 1831. Nassau Public Records Office

⁵ C. O. 23/78 (microfilm). Nassau Public Records Office

⁶ Bethel to Commissioner of Customs. 4 August 1831. Governor's Despatches. Nassau Public Records Office

Below are some pictures illustrating Red Bays settlement.

| | |
|--|---|
|  |  |
| <p><i>Red Bays traditional house</i></p> | <p><i>Straw basket making handicraft</i></p> |
|  |  |
| <p><i>Red Bays straw market</i></p> | <p><i>Omealia Marshall, one of the first people in The Bahamas to weave straw baskets and who has created and passed on this art form</i></p> |

Source: BRLi/Blue – May 2016

3.2 DEVELOPMENT STRATEGY

Red Bays is a wealth of rich natural, cultural and historical heritage that is still hardly known, recognized or utilized for its value today. Yet all this is a precious, fertile source of potential for revitalizing local livelihoods and making the place more attractive for young people, for visitors and for tourists. In general, very few people make a point of visiting Red Bays to find out about its treasures in terms of heritage..

Even if traditional knowledge and know-how (both material and immaterial) are still alive, there is a danger that they will not be passed on as they are mostly in the hands of somewhat older people and the young generation tends to turn their backs on them.

The challenge is therefore to highlight and utilize all these assets and to ensure that traditional knowledge, skills and know-how are passed on locally and kept alive, arousing motivation among the young generation. First of all, the links between the Androsians themselves, both between generations and within the different communities, must be nurtured; and secondly, visitors and tourists must be encouraged to come and discover the specific attractions of Red Bays.

The overall strategy is to develop, at medium term, a Culture Heritage Village in Red Bays, composed of:

- ▶ An Ecomuseum, promoting the history, culture and traditions of the Seminoles,
- ▶ An eco-lodge, promoting cultural and nature-based activities.

What is an Ecomuseum?

An Ecomuseum is a museum focusing on the identity of a place, largely based on local participation and aiming to enhance the welfare and development of local communities. Ecomuseums originated in France, the concept being developed by Georges Henri Rivière and Hugues de Varine, who coined the term "ecomusée" in 1971⁷. The term "éco" is a shortened form for "écologie", but it refers especially to a new idea of holistic interpretation of cultural heritage, in opposition to the focus on specific items and objects, performed by traditional museums⁸.

According to the European Network of Ecomuseums, an Ecomuseum is a **dynamic way in which communities preserve, interpret and manage their heritage for a sustainable development, based on a community agreement**:

- ▶ *Dynamic way* means to go beyond the formal aspect of an ecomuseum, beyond a simple set course, designed on paper; it is about designing real actions, able to change society and improve landscape.
- ▶ *Community* means a group with:
 - General involvement,
 - Shared responsibilities,
 - Interchangeable roles: public officers, representatives, volunteers and other local actors all play a vital role in an ecomuseum.

Community involvement does not mean that the local authorities are irrelevant. On the contrary, their role, to be effective, must involve people, going beyond the narrow circle of "authorized personnel".

⁷ Marie-Odile de Bary, André Desvalles, Françoise Wasserman (editors), 1994, Vagues: une anthologie de la nouvelle muséologie, Mâcon; Savigny-le Temple (77), Editions W ; M.N.E.S.

⁸ Peter Davis, 1999, Ecomuseums: a sense of place, Leicester University Press.

- ▶ *Preservation, interpretation and management* means that reading and communicating heritage values, providing new interpretations of them and raising their profile, are part of the day-to-day activity for Ecomuseums. Heritage is very close to Place as a notion, including the history of inhabitants and things, what is visible and what it is not, tangible and intangible, memories and the future.
- ▶ *Sustainable development* is a central issue for Ecomuseums and it also implies increasing the value of a place instead of diminishing it. Evidence from best practices identifies two key elements in this process: place-based development, as previously described, and the improvement of local networks, where Ecomuseums have to play a key role as catalysts of social capital development.
- ▶ *Agreement* means a mutual consent, implying reciprocal commitments between local players.

What is an Ecolodge?

An Ecolodge is an accommodation facility comprising between 5 and 75 rooms. It is financially sustainable and built to make sure it is in harmony with nature therefore causing the least possible adverse effects on the environment. It helps protect fragile natural surroundings, involves the local communities and enables them to benefit from it; tourists are given the opportunity of an interpretive, interactive experience, and the concept in general promotes a certain spiritual communion between nature and culture.

An Ecolodge is construed, designed, built and operated in harmony with environmentally and socially responsible principles.

Ecolodge planning and design principles can be found in “The International Ecolodge Guidelines”, written by The International Ecotourism Society to guide the creation of Ecolodge. This book provides a framework for the design, development and running of future lodges so that they uphold the social and ecological integrity of their given environments and thereby afford sustained benefits from ecotourism without damaging or destroying the very natural resources on which they depend.

List of activities

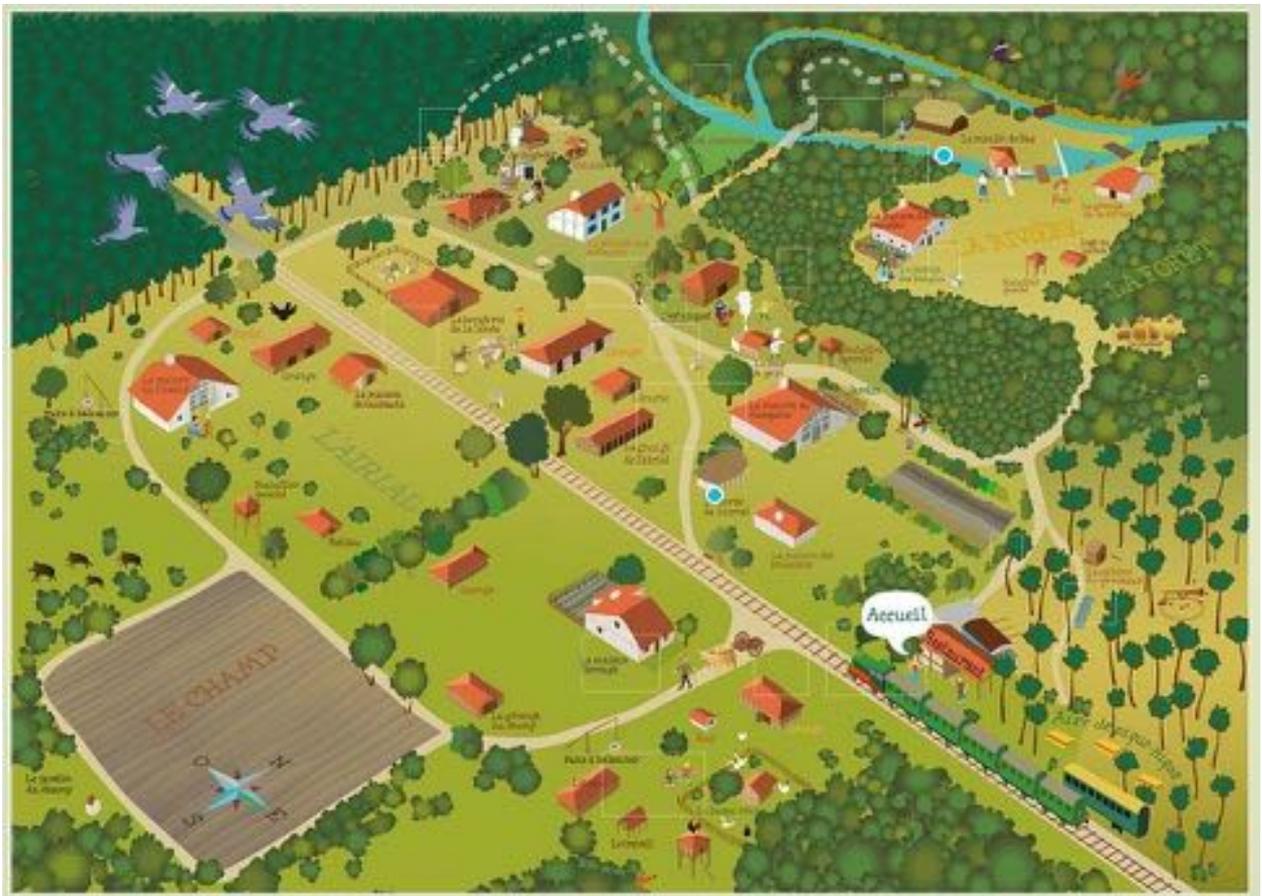
A preliminary list of activities and investments to be undertaken in Red Bays are presented below:

- ▶ *Design and achievement of the ecomuseum area:*
 - Building the reception area including the Red Bays Heritage Village Tourism Office,
 - Exhibition/cultural events pavilion,
 - Restored traditional houses and gardens,
 - Hand-craft market,
 - Discovery and interpretive trail,
 - Restrooms and picnic area.
- ▶ *Design and achievement of the Ecolodge area:*
 - Reception area,
 - Traditional restaurant based on the guesthouse principle (fresh and local products, traditional recipes),
 - Bedrooms/bungalows (about 20),
 - Natural swimming-pool.
- ▶ *Set-up and training of the Red Bays Heritage Village management team (managers / employees / volunteers / guides),*
- ▶ *Preparation of communication and awareness-raising tools to inform about and promote the Culture Heritage Village, the cultural, natural and historical skills, knowledge and wealth of Red Bays: websites, graphic charter, mobile apps, flyers, posters, documentaries, educational booklets, etc.*

- ▶ *Educational learning and discovery activity programme based on Red Bays' cultural, natural and historical skills, knowledge and wealth:*
 - Ecomuseum guided tours for visitors and school groups,
 - Organization of structuring events to highlight the value, promote and develop local handicraft products and traditional knowledge, skills and practices (local festivities, theme days, annual festival, local association workshops, etc.),
 - Creation and development of markets for local associations to sell their products,
 - Creation of guided discovery tours to get to know the natural heritage (walking trails / bonefishing / bird-watching),
 - Creation of a tourist package consisting of a 2-day visit and including guided tours of the Ecomuseum and handicraft workshops, a traditional meal with a night at the Ecolodge and guided outdoor activities (walks / bonefishing / bird-watching).

The figure below presents an example of a map of a French cultural heritage village.

Figure 1 : Example of map of a cultural heritage village (Marquèze Ecomuseum in France)



Source : Website <http://www.marqueze.fr/>

3.3 LINKAGE WITH SUSTAINABLE PROSPERITY SCENARIO

The table below highlights the action's effects regarding the different key pillars related to the Sustainable Prosperity development scenario:

| | |
|---------------------------|--|
| Major positive impact |  |
| Contribution |  |
| No effect |  |
| Potential negative impact |  |

| Action | |
|---|--|
| Food and water security |  |
| Connectivity and accessibility |  |
| Education and capacity building |  |
| Climate change and coastal resilience |  |
| Livelihoods and income equality |  |
| Land tenure security, land use planning and enforcement |  |
| Health and wellbeing |  |
| Strengthening local government |  |

4. ROAD MAP FOR IMPLEMENTATION

4.1 ROAD MAP

| | Sub activities | Institution responsible | Source of funding |
|--------------------|---|-------------------------|--|
| Medium term | Feasibility study for the cultural heritage village: historical study, pre-design, looking for investors (e.g. The Miami Seminole Foundation, Unesco) | Ministry of Tourism | International Assistance Donor (ODA), UNESCO, International NGOs, The Seminole Foundation Public |
| | Design of the Eco-museum and institutional arrangements | MWUD | Public |
| | New buildings (visitor center) and current building renovation/adaptation for the cultural heritage village | MWUD | Public/private |
| | Other infrastructure: parking, nature trail.... | MWUD | Public/private |
| | Feasibility study for an Ecolodge | Ministry of Tourism | Public/private |
| | Design study for the Ecolodge | Ministry of Tourism | Private investor (or Red Bays community) |
| | Building the Ecolodge | Ministry of Tourism | |
| | Training for the Red Bays Heritage Village management team | Ministry of Tourism | Public/private |
| | Communication, education and promotion activities (advertising at national and international level, leaflets, video...), | Ministry of Tourism | Public/private |

4.2 ESTIMATION OF COSTS

| Sub activities | | Estimated costs | |
|--------------------|--|-----------------|--------------------|
| | | Unit | Total amount (k\$) |
| Medium term | Feasibility study for the cultural heritage village: historical study, pre-design, looking for investors (e.g. Florida Seminole Indians) | Lump-sum | 50 |
| | Design of the Eco-museum and institutional arrangements | Lump-sum | 80 |
| | New buildings (visitor center) and current building renovation/adaptation for the cultural heritage village | Lump-sum | 500 |
| | Other infrastructure: parking, nature trail.... | Lump-sum | 200 |
| | Feasibility study for an Ecolodge | Lump-sum | 20 |
| | Design study for the Ecolodge | Lump-sum | 100 |
| | Building the Ecolodge | Lump-sum | 700 |
| | Training for the Red Bays Heritage Village management team | Lump-sum | 150 |
| | Communication, education and promotion activities (advertising at national and international level, leaflets, video...), | Lump-sum | 150 |
| Grand TOTAL | | | 1950 |

4.3 SOURCES OF FUNDING

- ▶ UNESCO as The Bahamas is a signatory of the '1972 UNESCO Convention for the Protection of the World Cultural and Natural Heritage since May 2014,
- ▶ The Caribbean Development Bank (CDB) through its Special Development Fund (SDF),
- ▶ IADB through its Cultural Development Grant Program,
- ▶ International NGOs,
- ▶ The ACP-EU SUPPORT PROGRAMME TO ACP CULTURAL INDUSTRIES through its grant scheme seeking to reinforce the technical, financial and managerial capacities of ACP cultural operators and cultural industries,
- ▶ The international Assistance Agencies that can look for funds close to ODA (Official Donors Agencies) such as the United nations, UE, USAID...
- ▶ User fees,
- ▶ Government subsidies.

4.4 MANAGEMENT MODEL

We recommend that the administrative management be placed under the responsibility of a Historian-Director under the supervision of a Board of Directors composed of representatives of the public sector and the Andros Black Indian Seminole Community.

4.5 STUDIES NEEDED FOR EXECUTION

- ▶ Design studies for Ecomuseum and Ecolodge,
- ▶ Land tenure verification,
- ▶ Environmental impact studies.

4.6 PRIORITY AND RELATION TO OTHER INITIATIVES

- ▶ Aligned with Vision2040: The National Development Plan.

5. BENEFICIARIES AND IMPACTS

5.1 BENEFICIARIES

The very first beneficiaries will be the employees recruited by the Museum:

- ▶ An administrative director,
- ▶ An administrative secretary,
- ▶ A receptionist-cashier,
- ▶ A guide,
- ▶ A maintenance agent.

The final beneficiaries will be:

- ▶ Employees' households,
- ▶ Taxi drivers, restaurants and hotels,
- ▶ Handicraft shops,
- ▶ Other tourism related activities,
- ▶ Government through taxes paid on shopping.

Other beneficiaries include:

- ▶ Local residents such as Red Bays, Morgan's Bluff and Nicholls Town communities,
- ▶ Local fishermen, bonefishing and bird-watching guides,
- ▶ Local authorities of North Andros,
- ▶ Local and foreign visitors.

The table below lists the potential impacts of the Culture Heritage Village on job creation and economic activities :

| Mere existence of cultural heritage | Direct impact | Indirect impact | Induced impact |
|--|------------------------|---|--|
| jobs created for/during a heritage project | day-to-day maintenance | restoration, conservation, construction | cultural industries, art and crafts, activities in sectors not related to culture, tourism |

5.2 POSITIVE & NEGATIVE ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

| Impacts | Positive | Negative |
|------------------------------|---|--|
| Economic & Social | <ul style="list-style-type: none"> • Direct economic and social benefits to Red Bays community through increased incomes regarding cultural and nature-based tourism sectors, • Direct economic and social benefits to bonefishing and bird-watching guides through increased income, • Direct economic and social benefits through increased employment related to the Ecomuseum and the Ecolodge, • Improved environment increasing the touristic appeal. | <ul style="list-style-type: none"> • Temporary impacts during works – limited access to Red Bays, • Temporary impacts during construction – noise, vibration and traffic due to construction vehicles. |
| Environmental | <ul style="list-style-type: none"> • Improved nature-based practices and safety, • Improved wastes management and sanitation, • Improved site aesthetics through landscape enhancement. | <ul style="list-style-type: none"> • Noise and vibration pollution during construction. |

6. PRODUCTS & INDICATORS

OUTPUT

- ▶ Design studies for Ecomuseum and Ecolodge,
- ▶ Functional and attractive Ecomuseum and Ecolodge,
- ▶ Guided cultural and nature tours,
- ▶ Cultural events promoting Red Bays Seminole history and handicrafts.

OUTCOME

- ▶ Increased number of local and foreign visitors,
- ▶ Increased bonefishing and bird-watching guides income,
- ▶ Increased benefits from cultural and nature-based sectors,
- ▶ Increased employment related to cultural and nature-based sectors.

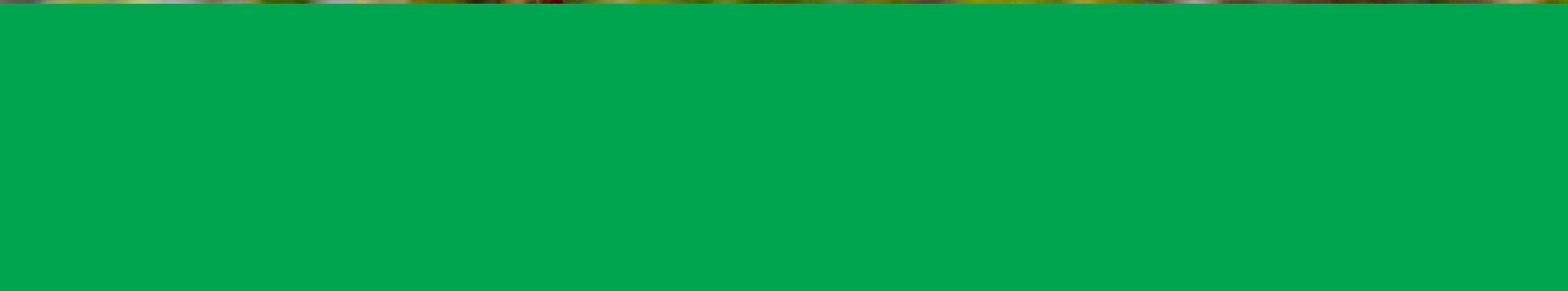
INDICATOR

- ▶ Number of visitors to the Ecomuseum,
- ▶ Rate of increase in bonefishing and bird-watching guides' income,
- ▶ Number of jobs created,
- ▶ Benefits from cultural and nature-based sectors.



andros
**SUSTAINABLE DEVELOPMENT
MASTER PLAN**

photocredit@ann-sophie gabellini





APPENDIX H.

RECOMMENDATIONS
FOR PROTECTED AREAS

PROTECTED AREAS

1. STRATEGY AND RECOMMENDATIONS

Bahamas National Trust has identified the need for seven (7) Wardens, three (3) Educational Officers and one (1) Office Manager that will work with stakeholders throughout the four (4) districts of Andros. Staff will have to be trained to develop effective outreach programs, and park management including enforcement of regulations. Educational opportunities are available through local and international partners including the College of the Bahamas (COB), Bahamas Technical and Vocational Institute (BTVI), The Nature Conservancy (TNC) and other conservation organizations as well as the Everglades National Park.

The increase in staff capacity will also require the establishment of a Headquarters (HQ) as well as office spaces in each of the districts. The HQ facility will be built or an existing location renovated to high standards of design, construction, materials, utility systems and waste management including recycling. The district offices, although significantly smaller, will serve as both a visitor contact facility and office spaces. The HQ may also include shared spaces for partner agencies and multipurpose rooms for presentations, meetings and community activities.

The recommendations regarding protected areas are the following:

► **Develop and implement marine, terrestrial and forestry protected areas management plans**

There is presently only one completed management plan for the Westside National Park. Establish management plans for all existing national parks is included in GOAL 1 of the 2013-2017 BNT Strategic Plan “*Expand and effectively manage an ecologically representative national parks system*”.

Every protected area or National Park will have its own management plan and regulations, formulated with input from local communities and stakeholders. The goal of each plan is to balance the needs of local communities with preservation of the surrounding environment, incorporating key species and ecosystems protection, and including action to reduce/eliminate exotic or invasive species.

In areas that protect necessary habitat for endangered or threatened species, special management plans will be put in place which speak to the monitoring of specific populations and set conservation goals for each species. These plans will also cover enforcement of wildlife regulations and seek to set recovery goals for endangered species.

National park and protected area management will be accompanied by science, community outreach, and environmental education, and will benefit from environmental advocacy.

The co-management of the Andros protected areas will be critical due to the size and many remote locations that will require monitoring. Relationships will have to be formally established and strengthened with the Department of Marine Resources, the Department of Forestry, The Royal Bahamas Defense Force and the Royal Bahamas Police Force. There is currently a project funded by Oceans 5 and lead by TNC, BNT and BREEF that seeks to determine the feasibility and benefits of co-management of The Bahamas National Protected Area System and will also develop and implement pilot co-management projects with Andros as one of those possible sites.

For forestry management plan, refer to conservation forest bullet hereafter.

► **Finalize Joulter Cays National Park**

The Joulter Cays, located just north of Andros Island, is well known for its:

- Impressive bonefish populations that contribute to a sustainable vibrant recreational fly-fishing industry in Andros,
- Extensive banks of unique oolitic sand,
- Sand flats that provide habitat for thousands of shorebirds, including the largest congregation of the endangered Piping Plover outside the United States,
- Mangroves and tidal creeks that provide nursery areas for sharks and commercially important reef fish species,
- Seagrass meadows that sustain nursery habitats for lobsters, conch and sea cucumbers, and feeding grounds for marine turtles,
- Areas of coppice that supports breeding populations of White Crowned Pigeon,
- Intact healthy coral reefs that provide shoreline protection and enhances fisheries productivity.

The primary users of the Joulter Cays are sports fishermen who target bonefish and permit on the flats and in the creeks, commercial fishermen that harvest demersal fish (grouper, snappers, grunts etc.), lobster and stone crabs on the reef, and commercial harvesters of sponge and conch on the banks. Fishermen that use the Joulter Cays are concerned by the increased fishing pressure they have observed on the flats, and the declining state of the reefs that will have a significant impact on their livelihoods. Other threats to this area include, poor handling of bonefish, vessel groundings that destroy reef sites, discarded fishing gear, and other marine debris.

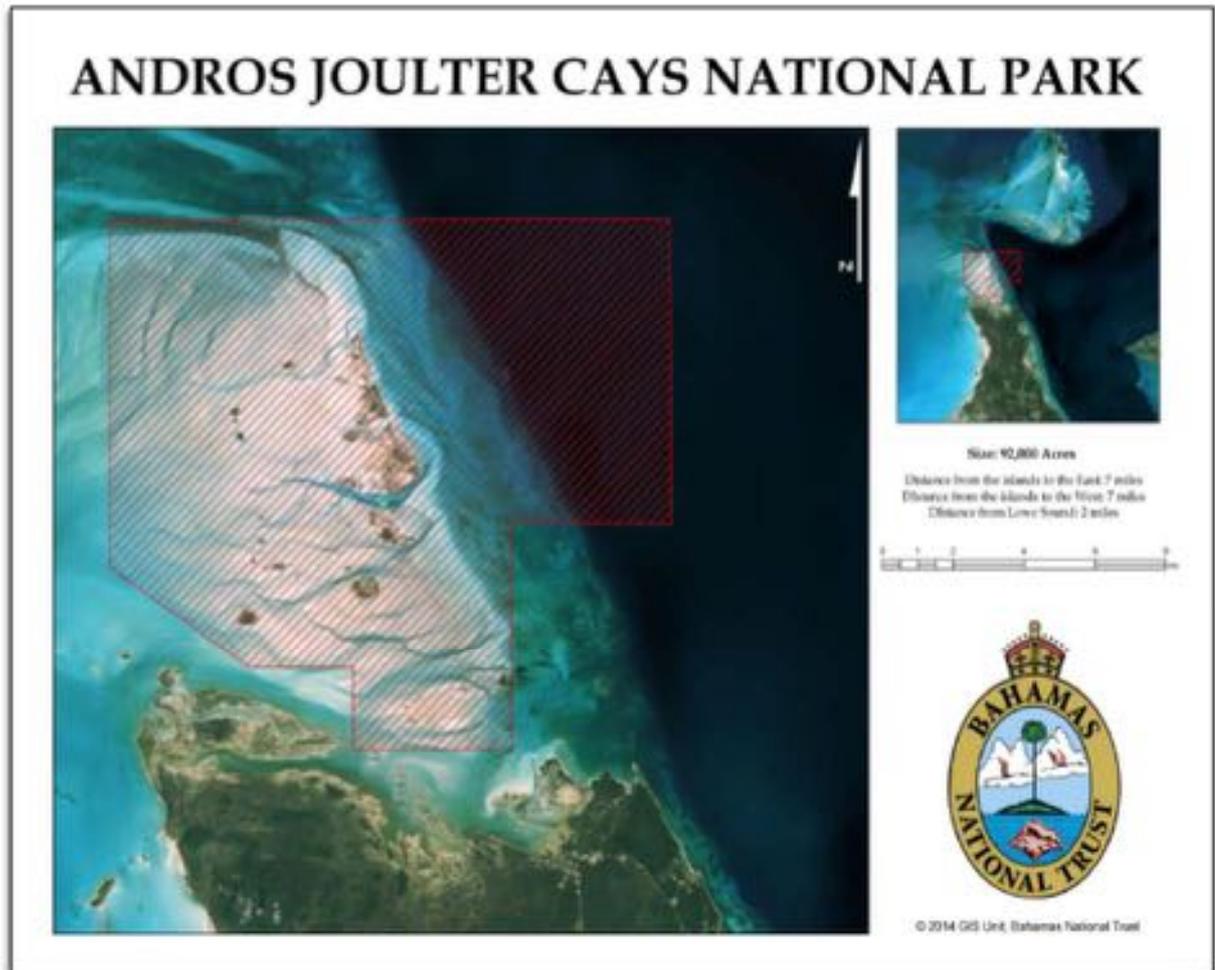
Although classified as a Wild Bird Reserve and an Important Bird Area (IBA), these designations do not afford the Joulter Cays any protection against current and future threats. **As a National Park, the Joulter will be protected in perpetuity, preserving the habitats and ecosystem functions, while safeguarding the traditional uses by local people (multi-usage of the park - notably fishing activities allowed but restricted and monitored). Its designation as a national park will protect the Joulter Cays from unsustainable development and sand mining to ensure long-term sustainability of the area, and the economy for the local communities and the country.**

The proposed Andros Joulter Cays National Park boundaries extend east and west from the cays, to offshore reefs, encompassing the IBA, a portion of the Andros Barrier Reef, deeper waters incorporating habitats for pelagic species, mangroves and tidal creeks, seagrass beds, coppice forests, and the vast oolitic sand banks that support the bonefishing industry, and provide habitats for endangered shorebirds.

The development of this park proposal was a participatory process involving resource users and local people through a series of outreach activities including Focus Group Meetings with fisherman and fishing guides, public meetings and survey assessments to reach the wider communities of Northern and Central Andros, avian surveys to identify areas of conservation importance for birds, and a Rapid Ecological Assessment (REA). The proposal focuses on providing economic stability and opportunities for Bahamians, and habitat protection to prevent unsustainable development and uses that are detrimental to marine ecosystems and shorebird habitat.

Based on the results of scientific investigations and community outreach initiatives, the Joulter Cays is highly prioritized for legal protection. The Bahamas National Trust has received support from The National Audubon Society, The Nature Conservancy, the Andros Conservancy and Trust, The Bahamas Environment Science & Technology (BEST) Commission, The Department of Marine Resources and the communities of Northern and Central Andros, to recommend to The Government of The Bahamas that the Joulter Cays Wild Bird Reserve and Important Bird Area be designated as a National Park, allowing traditional uses. This will ensure that the important matrix of habitats that support a recreational and commercial fishing industry, offers current and future economic growth for the Bahamian people, while protecting against threats that can cause irreversible damages to the environment.

Figure 1 : Proposed boundaries for the Joulter Cays National Park



Source: Andros Joulter Cays National Park proposal – BNT – March 2014

► **Designate Andros Barrier Reef National Park**

Andros has the third longest barrier reef in the world. The North and South Marine parks were established in 2002 to help preserve significant parts of this valuable reef ecosystem. Nevertheless, according to the Ministry of Tourism, a lot of special areas along the barrier reef should be under some protection and management for scuba-diving for example. Actually, the Bahamas ecological gap analysis is being updated and will determine if there is additional areas to be protected in Andros.

Proposed in 2015, the Andros Barrier Reef National Park should cover the entirety of the reef, but it has not been yet designated.

► **Formally acknowledge conservation Forests (Department Of Forestry)**

Introduced to provide for the conservation and control of forests, the Forestry Act, 2010 ("the Act") was assented to by Parliament on July 1st, 2010 with power to repeal particular parts and sections of the Conservation & Protection of the Physical Landscape of the Bahamas Act, the Penal Code and the Bahamas National Trust Act.

In its parts III, the Act specifies the declaration of conservation forests:

"Subject to affirmative resolution, the Minister may by Order declare any land to be a conservation forest, by reason of its being:

- *A significant wildlife habitat, wetland, woodland or area of natural or scientific interest (relating to saline lagoons, coastal estuaries and plant ecology),*

- *A significant natural resource, and*
- *An area of biological diversity.”*

The act specifies also the need of forest management plans:

“The Director of Forestry shall prepare and submit to the Minister for approval, every five years, a plan for the management of each forest reserve, protected forest or conservation forest...After the Minister has approved a forest management plan, the Director of Forestry shall manage the area in accordance with the applicable forest management plan.”

Andros conservation forest areas need to be formally acknowledged, management plans need to be developed and implemented.

► **Manage the Crab Replenishment Reserve effectively**

Established in 2002, this 2,979-acre Reserve is identified as the best land crab habitat in Central Andros. This Reserve protects this biological resource with management strategies to ensure sustainable exploitation.

The development and implementation of the Crab Replenishment Reserve management plan will allow its effective and sustainable management.

► **Enforce park policies**

Establish park policies for all existing national parks is included in GOAL 1 of the 2013-2017 BNT Strategic Plan *“Expand and effectively manage an ecologically representative national parks system”*.

The most pervasive and destructive threats to this protected areas system over the next five years are anticipated to be:

- Population growth and infrastructure development,
- Inadequate environmental management policies,
- Climate-change related storms and alteration of habitat due to sea level rise,
- Introduction of exotic or invasive plant and animal species,
- Inappropriate tourism or commercial development near parks.

To address these threats, BNT has evaluated the current level of protection for major habitats and species throughout the country, including Andros.

The BNT will work with key stakeholders to develop and implement management plans and policies for all Andros National Parks. An effective monitoring and evaluation system is key to protected area management. BNT new Science Division will incorporate conservation goals for key species and ecosystems into park management plans. Knowledge gained from the monitoring process will be applied using adaptive management techniques. Every national park will have its own management plan and regulations.

2. ACTION PROGRAM

No specific action sheet has been developed for this sector.

