IMO

ECONOMIC ASSESSMENT FOR BALLAST WATER MANAGEMENT IN NIGERIA

FINAL REPORT

2011

EXECUTIVE SUMMARY

Invasive Alien Species (IAS) has become a major topic of discussion globally. These invasive organisms have already been responsible for significant devastation of some native organisms. Annually, the problem is responsible for billions of dollars in lost revenue and control measures. Synthesizing this report therefore is in line with the GEF-UNDP-IMO Globallast project in 2011, i.e. preparation of national economic assessment for ballast water management. The importance of this is seen in terms of the need to identify cost-efficient strategies for ballast water management. After thorough assessment, we believe that ballast water management activities are feasible to implement, in order to halt further spread of IAS.

PREFACE: ABOUT THIS ECONOMIC ASSESSMENT

This report is prepared in order to assess the economic overhead of ballast water management activities to existing maritime operational system of Nigeria. It is believed that economic valuations or assessments are intended to improve decision-making process are ranging from community or industry engagement and ecosystem management to the development of national strategies and action plans to manage the risk associated with invasive alien species.

This report is aimed:

a) To make a comparison between the effects of the IAS and the cost of the national ballast water management system.

b) To quantify the economic values of an ecosystem and the potential impacts to these values by introduction of an invasive species, also it specifies funding needs to implement management policies.

c) To define that successfully managing invasive species can provide long term economic and environmental benefits and prevention activities are calculated than the post invasion damage.

d) To serve as a practical tool to support the actions on the national ballast water management strategy.

Some of the items in this report are not valued, we believe, this can easily be handled by existing maritime agency in Nigeria. So that it will not result in any extra cost to the country. Some of the items were assessed base on the training activities which were held in Nigeria within the scope of the Globallast partnership project.

In order to assist Nigeria on its implementation on Ballast Water Management (BWM), IMO Offered four consultants in Nigeria to carry out research studies on the following areas viz National Ballast Water status assessment, National Ballast Water Management strategy, legal

implementation of Ballast Water Management and guideline on the economic assessment for Ballast Water Management in Nigeria, these are captured in section 4.1.2.1-4. We did not include these section in overall calculations since IMO already paid for these research findings.

It is important to note that most of the trainings presented in section 4.1.1 have been carried out already under the IMO ITC programme, however because of the significance of IAS to the economy of Nigeria, we wish to repeat this trainings to accommodate quite a number of major stakeholders and others for adequate awareness of IAS. Again the international maritime organization (IMO) and other entities outside Nigeria would assist the country with funds needed for most of these programmes unveiled in this report. The results of this report are in support of the national decision on ratification of the ballast water convention.

Sources of information:

The major sources of information in this report are as follows:

a). Nigerian Maritime Administration and Safety Agency (NIMASA)

b). Food and Agricultural Organization (FAO) reports on Nigeria.

c). Statistical base in some Nigerian Universities.

d). Federal Ministry of transport, Nigeria.

ACKNOWLEDGEMENT

This economic assessment for ballast water management in Nigeria is a product of the International Maritime Organization (IMO) in collaboration with the Nigerian Maritime Administration and Safety Agency (NIMASA) synthesized by Dr. Inyang, Iniobong, Assisted by Dr. Ohimain, Elijah.

Major inputs have been made by a number of people to whom great thanks are due. The Director General of NIMASA, Mr. Ziakede Patrick Akpobolokemi, the Director Marine Environment and Management (MEM), Mrs. J. Gunwa, Special Assistant (Technical) to the Director general, Dr. P. Jumbo and Special Assistant to MEM, Mrs. U. Okorigba. We acknowledge greatly, the Federal Ministry of transport, Niger Delta University, and Rivers State University of Science and Technology, Port Harcourt for their valuable suggestion and support.

We are also indebted to the Technical Adviser, Globallast Partnership, International Maritime Organization (IMO), Mr. Fredrick Haag and the entire Management of IMO for awarding this contract to us.

INTRODUCTION

It is now known that organisms from different habitat transported via ballast water to a new habitat can establish themselves under a suitable environment and alter the existing ecosystem. These organisms are referred to as non-native, alien, non-indigenous organisms. Because of their threat to the ecosystem they are referred to as invasive alien species (IAS).

Shipping moves up to 85% of the world's commodities and transfers up to 5 billion tones of ballast water internationally each year (Peters, 2010). Some aquatic bacteria, viruses, pathogens and other living organisms are transferred in this mass of ballast water (Peters, 2010).

These invasive Alien species arrive in the ballast or on the hulls of ships, through the movement of shellfish and bait, by the opening of new channels or canals, through intentional release, and other vectors. Once established, they can change ecosystem, reduce native biodiversity and impact local economics consequently, aquatic communities are becoming increasingly homogenized as a result (Roman 2010).

The economic impact of IAS can be so enormous. One of the greatest sad event was recorded in the early 80's when North American Comb Jelly *(Mnemiopsis Leidyi)* was introduced into black sea via ship ballast water. Its invasiveness was much as they spread and consume fish eggs and larvae as well as zooplanktons that are prey to fishes. By 1992, the annual losses caused by drops in commercial catches of marketable fish were estimated to be at least US$240 million (GBMS, 2010). According to Carlton (1995), six countries near the black sea have been affected by the Atlantic Comb Jelly. Shellfish in Fasmania

have been wiped by North pacific sea stars, toxic red tides have closed clam and mussel farms and fishes.

Significantly, IAS is widely recognized as one of the most important threats to global biodiversity (Wilcove et al, 1998). Biodiversity can change in three ways; species can be added (invasions, natural or human mediated), deleted (extinctions, also natural or human mediated) or relative abundances can change (of native species and previously introduced species), Carlton (1995).

Efficient management of IAS can provide long term economic and environmental benefits, including conserving biodiversity and health of ecosystem and maintaining the services they provide. This supports the case for strategic investments in prevention rather that post invasion damage control, including ratification of the ballast water management convention and developing necessary national strategies and policy framework (GBMS 2010). While national policy frameworks need not be unduly burdensome, they should meet standards set forth in the ballast water management convention. Associated with ratification of the convention in thus a certain cost in ensuring compliance related to e.g. planning, monitoring, enforcement and capacity building.

Economic analysis of IAS, their possible impacts and management options support strategic decisions regarding IAS responses and facilitate national regarding IAS responses and facilitate national planning. This report is primarily aimed to serve as a practical tool to support the development of a national ballast water management strategy, it also has a broader utility for considering the economic aspects of IAS impacts and management responses and can be used for other decision support, including making a case for ratification of the

ballast water convention.

Essentially efficient development of a national ballast water management strategy, a simple economic assessment based on readily available data, such as national statistics is often sufficient, this will enable quantitative assessment of ballast water introduction risk, the significant importance of this is seen in terms of the need to identify cost-efficient strategies for ballast water management. In some instances, however, much more detailed analysis may be desired, in which case it is recommended to engage an expert. While detailed methods for economic assessment and valuation is beyond the scope of this report, According to Roman (2010).

3.0 METHODOLOGY

Market Price Method

The market price method estimates the economic value of ecosystem products or services that are brought and sold in markets (www.ecosystemevaluation.org.).This method can be applied to e.g. loss of income, loss of employment, loss of marketable goods, cost etc. This is a comparatively inexpensive method, and requires less data intensive analysis to arrive at a value. In addition, this technique is flexible enough to that it can be used e.g. where an invasive alien species affect the production of marketable good or when invasive species themselves become marketable goods. This means that market price analysis often is recommended when a valuation study is to be conducted for an invasive alien species impact, whereas many other techniques, while valid and valuable in their own right, require much longer time periods for data collection, analysis and reporting. An added benefit is that many countries already collect the data necessary, through the collection of national statistics, making this an easy technique to carry out 'in house'. Additionally, price, quantity and cost data are relatively easy to obtain for established markets. Also this method uses standard, accepted economic techniques.

These are a few limitation to using this information, though, if the market for goods and services is distorted by subsidies or other market externalities, the results may not reflect the true economic and social costs of an invasive alien species impact. However, awareness of such factors can be sufficient to recognize that the market prices may under-or over estimate the true costs, and make necessary corrections. Lastly,

while this methodology determined the value of products derived from an ecosystem, it can miss the true (complete) value of the ecosystem due to only examining the market for goods, while excluding other non-marketable services.

Process Outline

The economic variables needed for this type of analysis are straight forward and generally easy to collect and analyse through the following steps:

a) Collecting data on or specifying the change in the quantity of the good or service.

b) Collecting data on the prices of goods, taking care to note if the price is distorted by taxes or subsidies and, if so, identifying similar goods that are unaffected by such distortions. Care should be taken to acquire price data from substantial range of time spans, including inter-annual and seasonal variation of prices and socio-economic preferences.

c) Multiplying the price by the change in quantity to determine the value of the change.

Case Study

A valuation study was conducted by Asian development bank in 1999. The bank estimated that the Marshall Islands subsistence and commercial fisheries to be worth U5$3.8 million dollars respectively. The FAG reported that fish exports were worth US$473,OOO in 1999 and were only for aquaria, constituting approximately 6.2 percent of the total exports. These figures represent the market value of fish caught by the

Marshallese in 1999, simply multiplied the tones of live weight by the price at market to arrive at the overall value of the fish, which are mostly tuna, (FAG fisheries and Aquaculture, Marshall Islands).

Travel Cost Method

The travel cost method is used to estimate economic use values associated with ecosystem or sites that are used for recreation, e.g. the value of a given water body for fishing activity. This method can be used to estimate the economic benefits or costs resulting from changes in access costs for a recreational site, elimination of an existing recreational site, addition of a new creational site and changes in environmental quality at a recreational site (www.ecosystemvaluation.org). Significantly this method does depend on a large data set and complex statistical skills and is very labour intensive as it depends on gathering information from visitors to recreational sites.

Process Outline

a) Determine total zone from which visitors come to visit the ecosystem, divide into zones of equal distance from recreational area.

b) Analyse within each zone samples to determine the cost increased in visiting, motivation for going, frequency of visits and socio-economic variables.

c) Obtain visitation rates for each zone, use the info to estimate total number of visitor days per head of local population.

d) Conduct a statistical regression to test the relationship between visitation rates and other variables.

e) Construct a demand curve relating number of visits to travel cost.

Case Study

Hell Canyon on the snake river separating Oregun and Idaho offers spectacular vistas and outdoor amenities to visitors from around the country and supports important fish and wildlife habitat. It also has economic potential as a site to develop hydropower. Generating hydropower there would require building a dam behind which would form a large lake. The dam and the resulting lake would significantly and permanently alter the ecological and aesthetic characteristics of Hell Canyon. During the 1970's, there were major controversies regarding the future of Hell Canyon. Environmental economists from resources for the future in Washington, D.C. were asked to develop an economic analysis to justify preserving Hell Canyon in its natural state in the face of its obvious economic potential as a source of hydropower. Researchers estimated that the net economic value (cost savings) of producing hydropower at Hell Canyon was $80,000 higher than at the "next best" site which was not environmentally sensitive. They then conducted a low-cost/low precision travel cost survey to estimate the recreational value of Hell Canyon and concluded that it was about $900,000. The researchers did not attempt to strongly defend the 'scientific' credibility of the valuation method they used or the results. However, at public hearings, they emphasized that, even if the "true value" of recreation at Hell Canyon was ten times less than their estimate, it would still be greater than the $80,000.00 economic payoff from generating power there are opposed to the other site. They also illustrated that overall demand for outdoor recreation, for which the supply is limited, was

giving up, while many other sources of energy are available besides Hell Canyon hydropower. Based largely on the results of this non-market valuation study, congress voted to prohibit further development of Hell Canyon.

ECONOMIC CALCULATIONS AND APPROXIMATIONS

4.1: PREPARATORY PHASE COSTS

4.1.1: Capacity Building, Coordination and Communication

In this section the cost for preparing national and international meetings are calculated with respect to the national legislation on travel allowances and similar activities done other developed nations.

a) Introductory Training on Ballast Water Management;

i. **Expected Participants**

NIMASA, Nigerian Port Authority NPA), shipowners, Federal Ministry of Transport and Environment, Nigerian National Petroleum Corporation (NNPC) International Oil Companies (IOC) and Ministries of Transport and Environment in Nigerian Coastal States viz Cross River, Akwa Ibom, Rivers, Bayelsa, Edo, Delta, Ogun and Lagos.

ii. Participation: 65 people

iii. Duration: 5 days

Table 1: Cost Calculation for Training

Cost items	Calculation	Total Amounts (N)	Total Amounts ($)
Accommodation	65 x 5 days x N15,000	4,875,000	29,545.46
Training venue	N250,000 x 5days	1,250,000	8,064.52
Daily allowance	65 x 5 days x N25,000	8,125,000	49,242.42
Training documents	200,000	200,000	1,212.12
Travel costs	65 xN30,000	1,950,000	11,818.18
Trainers	15x 5days x N100,000	7,500,000	45,454.55
Lunch	65 xN3,000 x 5 days	975,000	5,909.09
Coffee Break	65 x N1,500 x 5 days	487,500	2,954.55
Dinner	65 xN3,000 x 5 days	975,000	5,909.09
Social Activities	N400,000	400,000	2,424.24
TOTAL		26,737,500	162,534.2

b) Training on legal Implementation of the BWM Convention;

i. **Expected Participants**

NIMASA, Nigerian Port Authority NPA), ship owners, Federal Ministry of Transport and Environment, Nigerian National Petroleum Corporation (NNPC) International Oil Companies (IOC) and Ministries of Transport and Environment in Nigerian Coastal States viz Cross River, Akwa Ibom, Rivers, Bayelsa, Edo, Delta, Ogun and Lagos.

ii. Participation: 65 people

iii. Duration: 5 days

Table 2: Cost Calculation for Training

Cost items	**Calculation**	**Total Amounts**	**Total Amounts ($)**
Accommodation	65 x 5 days x N15,000	4,875,000	29,545.46
Training venue	N250,000 x 5days	1,250,000	8,064.52
Daily allowance	65 x 5 days x N25,000	8,125,000	49,242.42
Training documents	200,000	200,000	1,212.12
Travel costs	65 xN30,000	1,950,000	11,818.18
Trainers	15x 5days x N100,000	7,500,000	45,454.55
Lunch	65 xN3,000 x 5 days	975,000	5,909.09
Coffee Break	65 x N1,500 x 5 days	487,500	2,954.55
Dinner	65 xN3,000 x 5 days	975,000	5,909.09
Social Activities	N400,000	400,000	2,424.24
TOTAL		26,737,500	162,534.2

c). Specialized training to the shipping industry (ship and port-side issues);

i. **Expected Participants**

NIMASA, ship owners and their staff. NPA, IOC, Federal Ministries of Transport and Environment and Ministries of Transport and Environment (Coastal States) viz, Cross River, Akwa Ibom, Rivers, Delta, Edo, Ogun and Lagos.

ii. Participation: 215 people

iii. Duration: 5 days

Table 3: Cost Calculation for Training

Cost items	Calculation	Total Amounts (N)	Total Amounts ($)
Accommodation	215 x 5 days x N15,000 (participants may cover their own expenses)	16,125,000	97,727.27
Training venue	5 days x N400,000	2,000,000	12,121.21
Daily allowance	215 x 5 days x N25,000 (participants may cover their own expenses)	26,875,000	162,878.79
Training documents	600,000	600,000	3,636.36
Travel costs	215 x N30,000 (participants may cover their own expenses)	6,450,000	39,090.91
Trainers	5 x 5days x N100,000	2,500,000	15,151.52
Lunch	215 x 5 days x N3,000	3,225,000	19,545.46
Coffee break	215 x 5 days N1,500	1,612,500	9,772.73
Dinner	215 x 5 days N3000	3,225,000	19,545.46
Social Activities	N500,000	500,000	3,030.30
TOTAL		**63,112,500**	**382,500** (If participants may cover their own expenses)

d) Training of Port State Control officers (compliance monitoring and enforcement);

i. Expected Participants: Based on NIMASA nomination

ii. Participation: 40 people

iii. Duration: 5 days

Table 4: Cost Calculation for Training

Cost items	**Calculation**	**Total Amounts (N)**	**Total Amounts ($)**
Accommodation	40 x 5 days x N15,000	3,000,000	18,181.82
Training venue	N250,000	250,000	1,515.15
Daily allowance	40 x 5 days x N25,000	5,000,000	30,303.03
Training documents	N200,000	200,000	1,212.12
Travel costs	40 x N30,000	1,200,000	7,272.73
Trainers	15 x 5days N100,000	7,500,000	45,454.55
Lunch	40 x N3,000 x 5 days	600,000	3,636.36
Coffee Break	40 x N1500 x 5 days	300,000	1,818.18
Dinner	40 x N3,000 x 5 days	600,000	3,636.36
Social Activities	N400,000	400,000	2,424.24
TOTAL		**19,050,000**	**115,454.5**

e) Training on Port Biological Baseline Surveys

i. Expected participants:

NIMASA, Trainers (experts on PBBS), nomination from NIMASA

ii. Participation: 40 people

iii. Duration: 5 days

Table 5: Cost Calculation for Training

Cost items	Calculation	Total Amounts (N)	Total Amounts ($)
Accommodation	40 x 5 days x N15,000	3,000,000	18,181.82
Training venue	N250,000	250,000	1,515.15
Daily allowance	40 x 5 days x N25,000	5,000,000	30,303.03
Training document	N200,000	200,000	1,212.12
Travel costs	40 x N30,000	1,200,000	7,272.73
Trainers	15 x 5days N100,000	7,500,000	45,454.55
Lunch	40 x N3000 x 5 days	600,000	3,636.36
Coffee Break	40 x N1500 x 5 days	300,000	1,818.18
Dinner	40 x N3,000 x 5 days	600,000	3,636.36
Social Activities	N400,000	400,000	2,424.24
Diving equipment	N550,000	550,000	3,333.33
Laboratory equipment	N600,000	600,000	3,636.36
TOTAL		**20,200,000**	**122,424.2**

4.1.1.1 National Task Force (NTF) Meeting

i. Expected Participants: Strictly for NTF members appointed by NIMASA.

ii. Participation: 15 people

iii. Duration: 1 day

This would be a 1 day meeting which will be organized once per year.

Table 6: Cost Calculation for NTF Meeting

Cost items	Calculation	Total Amounts (N)	Total Amounts ($)
Accommodation	15 x 1 days x N15000	225,000	1,363.64
Meeting venue	N250,000	250,000	1,515.15
Daily allowance	15 x 1 days x N25,000	375,000	2,272.73
Meeting documents	N200,000	200,000	1,212.12
Travel costs	15 x N30000	450,000	2,727.27
Lunch	15 x N3000 x 1 days	45,000	272.73
Coffee Break	15 x N1500 x 1 days	22,500	136.36
Dinner	15 x N3000 x 1 days	45,000	272.73
TOTAL		**1,612,500**	**9,772.73**

4.1.1.2 Regional Task Force (RTF) Meetings

Regional task force meetings are organized under the activities of the regional organizations. The cost of these meetings is covered under the budget of these organizations. Also there are funding sources to tap into, such as the IMO Integrated Technical Cooperation Programme. On the below table the cost of these meetings are calculated.

i. Expected Participants: Strictly for RTF members

ii. Participation: 15 people

iii. Duration: 5 days

Table 7: Cost calculation for RTF meetings

Cost items	Calculation	Total Amounts (N)	Total Amounts ($)
Accommodation	15 x 5 days x N15,000	1,125,000	6,818.18
Meeting venue	250,000 x 5 days	1,250,000	7,575.76
Daily allowance	15 x 5 days x N30000	2,250,000	13,636.36
Meeting documents	N200,000	200,000	1,212.12
Travel costs	15 x 30000	450,000	2,727.27
Lunch	15 x N3000 x 5 days	225,000	909.09
Coffee Break	15 x N1500 x 5 days	112,500	681.82
Dinner	15 x N3000 x 5 days	225,000	1,363.64
Social Activities	N700,000	700,000	4,242.42
Interpretation	N1,000,000	1,000,000	6,060.61
TOTAL		**7,537,500**	**45227.27**

4.1.2 Legislative, Policy and Institutional Reform Cost

4.1.2.1 National BW Status Assessment

Table 8: Cost Calculation for Consultancy

Relevant Personnel	Time for Study	Fee for the Expert (N)	Fee for the Expert ($)
Expert on Shipping Industry	1 Month	825,000	5,000
Expert on Marine and Coastal environment	3 Month	2,475,000	15,000
Expert on Invasive Species (Hydrobiologist/Microbiologist)	2 Month	1,650,000	10,000
TOTAL		**4,950,000**	**30,000**

4.1.2.2 Economic Assessment

Table 9: Cost Calculation for Consultancy

Relevant Personnel	Time for Study	Fee for the Expert (N)	Fee for the Expert ($)
Expert on Shipping Industry	1 Month	825,000	5,000
Expert on Economics	3 Month	2,475,000	15,000
TOTAL		**3,300,000**	**20,000**

4.1.2.3 Developing a National BWM Strategy

Table 10: Cost Calculation for Consultancy

Relevant Personnel	Time for Study	Fee for the Expert (N)	Fee for the Expert (N)	Fee for the Expert ($)
Expert on Legislations	3 months	825,000/Month	2,475,000	15,000
Expert on Administrative Infrastructure	3 months	825,000/Month	2,475,000	15,000
Expert on Invasive Species (Hydrobiologist/ Microbiologist)	2 months	825,000/Month	1,650,000	10,000
TOTAL			**6,600,000**	**40,000**

4.1.2.4 Legislative Review and Implementation

Table 11: Cost Calculation for Consultancy

Relevant Personnel	Time for Study	Fee for the Expert (N)	Fee for the Expert (N)	Fee for the Expert ($)
Expert on Legislations	3 months	825000/Month	2,475,000	15,000
Expert on Administrative Infrastructure	3 months	825000/Month	2,475,000	15000
Expert on Invasive Species (Hydrobiologist/ Microbiologist)	3 months	825000/Month	2,475,000	15,000
Expert on Shipping Industry	3 months	825000/Month	2,475,000	15,000
TOTAL			9,900,000	60,000

4.1.3 Port Biological Baseline Surveys (PBBS) (Research and Monitoring)

The cost of the PBBS Study is calculated with an estimation of choosing 5 high risk areas on NIGERIAN coasts. This research and monitoring will be carried out twice.

Table 12: Cost Calculation for PBBS Service

Cost Items	Calculation	Total Amount (N)	Total Amount ($)
Accommodation	5 x 2 days x N15,000	150,000	909.09
Travel expenses	N2,000,000	2,000,000	12,121.21
Taxonomist	2 days x N500,000	1,000,000	6,060.61
Divers	2 days x 2 divers x N500,000	2,000,000	12,121.21
Diving Equipment	N550,000	550,000	3,333.33
Laboratory Equipment	N700,000	700,000	4,242.42
TOTAL		**6,400,000**	**38,787.87**

4.1.4 Risk Assessments

Table 13 highlights the cost of preparing the risk assessment studies under the national ballast water management project.

Table 13: Cost Calculation for Consultancy

Relevant Personnel	Time for study	Fee for the expert (N)	Fee for the expert (N)	Fee for the expert ($)
Expert on Risk Assessment	3 months	1,650,000/Month	4,950,000	30,000
Expert on Data Bases	3 months	1,650,000/Month	4,950,000	30,000
Expert on Invasive Species (Hydrobiologist/ Microbiologist)	3 months	1,650,000/Month	4,950,000	30,000
Expert on Shipping Industry	3 months	1,650,000/Month	4,950,000	30,000
Software		N1,000,000	1,000,000	6,060.61
Hardware		N600,000	600,000	3,636.36
TOTAL			**21,400,000**	**129,697**

4.2 COMPLIANCE-RELATED COSTS

4.2.1 Flag State Obligations

4.2.1.1 Establishing Procedure for Issuing BWM Certificate

It is planned to give an authorization to the NIMASA on Nigeria for the issuing the ballast water management certificate to the ships. The cost for this process is going to the reimbursed from ships by NIMASA.

Table 14: Cost Calculation for Service

Cost Items	Calculation	Total Amount (N)	Total Amount ($)
Establishing certification requirements	NIMASA will give the certificates with a service charge 500,000 x 400 Nigerian flagged ships	200,000,000	1,212,121.2
Communication of requirements and procedures to the shipping industry and IMO	Nigerian Shippers Council will communicate and coordinate with sector.	No cost	No cost
Maintenance of records of issued Certificates	NIMASA will give the service including the service charge for establishing certificates	No cost	No cost

4.2.1.2 Approval of Ships` BWM Plans

NIMASA will give approvals for ballast water management plans of the ships.

The cost for this process is going to be reimbursed from ships to NIMASA

Tables 15: Cost Calculation for Service

Cost Items	Calculation	Total Amount
Training of Staff	NIMASA will train their Staff	No Cost
Establishing protocols for vetting and approving BWM plans	NIMASA's responsibility	No Cost

4.2.1.3 Type Approval of BWM Systems

NIMASA will give type approvals for treatment facilities. The cost for this process is going to be reimbursed from companies to NIMASA.

Table 16: Cost Calculation for Service

Cost Items	Calculation	Total Amount (N)	Total Amount ($)
Review of the technical reports and test results	NIMASA will give the certificates with a service charge N3,000,000 per ship x 400 Nigerian flagged	120,000,0000	7,000,000

4.2.1.4 Surveys (Initial, Renewal, Intermediate, Annual, Additional)

NIMASA will give type approvals to the treatment facilities. The cost for this process is going to be reimbursed from companies to NIMASA

Table 17: Cost Calculation for Service

Cost Items	Calculation	Total Amount (N)	Total Amount ($)
Initial, Renewal, Intermediate, Annual surveys	NIMASA will give the certificates with a service charge Initial: N500,000 Renewal: N500,000 Intermediate: N400,000 Annual: N300,000 Total = N1,402,500 x N400 Nigeria Flagged Ships	680,000,000	4,121,212.1

4.2.1.5 Approval of Exemption Application

NIMASA is the responsible authority for approving the exemption applications

Table 18: Cost Calculation for Service

Cost Items	Calculation	Total Amount
Exemption application	NIMASA is Responsible	No Cost

4.2.1.6 Training of Crew Members

Table 19: Cost Calculation for Training

Cost Items	Calculation	Total Amount
Training Cost	The Seaman takes relevant certificates for education or the company of the ship give the fees for education	The cost of this activity is included to the industry obligations

4.2.2 Port State Obligations

4.2.2.1 Compliance Monitoring and Enforcement (CME)

No additional cost is defined under the CME activities. All the cost of compliance and enforcement activities will be included to the Inspection of ships.

4.2.2.2 Inspection of Ships

Table 20: Cost Calculation for Training

Cost Items	Calculation	Total Amount (N)	Total Amount ($)
Port State Cost (Inspection of Ships)	25,260 calls Nigeria ports annually 91.43% of them surveyed =22,987ships 1 surveyor gets N320,000 per months and surveys 30 ships per month = N10,666.67 per ship. 2 surveyors per survey x N10,666.67 per ship x 22,987ships per year=N490,389,349 per year.	490,389,349 per year	2,972,056.7

4.2.2.3 Sampling

1) Sampling for compliance with D-1 standard

Table 21: Cost Calculation for Training

Cost Items	Calculation	Total Amount (N)	Total Amount ($)
Salinometer	N30,000 X 70 Harbor Masters	N2,100,000	12,727.27

2) Sampling to ensure D-2 compliance

Table 22: Cost calculation for training

Cost Items	Calculation	Total Amount	Total Amount ($)
Equipment	N600,000 x 7 District Directorate	4,200,000	25,454.55
Expert on Invasive Species (Hydrobiologist/ Microbiologist)	N1650000 per month x 12	19,800,000	120,000
Laboratory cost	N550,000 per month x 12	660,0000	40,000
TOTAL		**30,600,000**	**185,454.6**

4.2.2.4 Sediment Reception Facilities

Waste handling costs calculation with respect to current tariff's in Nigeria

Table 23: Cost Calculation for Training

Cost Items	Calculation	Total Amount (N)	Total Amount ($)
Waste handling	N55,000/m^3 x 1000 tonnes per year	55,000,000	333,333.33

4.2.2.7 Designation of Areas for Ballast Water Exchange

Table 24: Cost Calculation for Consultancy

Relevant Personnel	Time for study	Fee for the expert (N)	Fee for the expert ($)
Expert on Risk Assessment	3 months	N1,650,000 per month = N4,950,000	30,000
Expert on Hydrodynamics of Sea water	3 months	N1,650,000 per month = N4,950,000	30,000
Expert on Invasive Species (Hydrobiologist/ Microbiologist)	3 months	N1,650,000 per month = N4,950,000	30,000
Expert on Shipping Industry	3 months	N1,650,000 per month = N4,950,000	30,000
TOTAL		N19,800,000	1,200,000

4.2.3 Industry Obligations

4.2.3.1 Training of Crew Members (IMO Model Courses, etc)

Table 25: Cost Calculation for Training

Cost Items	Calculation	Total Amount	Total Amount ($)
Training of the personnel	N50,000 per staff x 23,095 Nigeria seafarers	1,150,000,000	6,970,697

4.2.3.2 BWM Plans

Table 26: Cost Calculation for Service

Cost Items	Calculation	Total Amount (N)	Total Amount ($)
Service fee of NIMASA	N500,000 per ship x 400 Nigeria flagged ships	200,000,000	1,212,121.2

4.2.3.4 BWM Options

BW Treatment

Table 27: Cost Calculation BW Treatment

Cost Items	Calculation	Total Amount (N)	Total Amount ($)
Treatment equipment	N85,000,000 per ship (mean value) x 400 Nigeria flagged ships	34,000,000,000	206,060,061
Operational cost	2 per tons of ballast water (mean value) x 80,000,000 tons ballast discharged to Nigeria ports annually	N160,000,000	969,696.97

Table 28: Cost Calculation BW Exchange

Cost Items	Calculation	Total Amount (N)	Total Amount ($)
Operational cost	N9 per tons of ballast water (mean value) x 80,000,000 tons ballast discharged to Nigeria ports annually	720,000,000	4,363,636.4

4.3. OTHER ISSUES NOT COVERED BY THE CONVENTION

4.3.1 Port Biological Monitoring Programmes

The main problem of the port biological monitoring programmes is the sustainability. Funding mechanism is most difficult part. There is a synergy is needed between stakeholders. It is very difficult to carry on this system with a project based approach because monitoring programmes have to carry on continuously. There can be no project could be defined continuously.

The solution is to combine the port biological monitoring with other environmental monitoring studies and establish a combined system. The cost for biological monitoring system cannot be calculated easily because of this nature.

But as an example of calculating the extent of the work the below mentioned calculation was made. The monitoring has to be replicated on 4 times a year. (Short rainy, Long rainy, Short dry and Long dry season).

Table 29: Cost Calculation for Service

Cost Items	**Calculation**	**Total Amount (N)**	**Total Amount ($)**
Accommodation	6 x 2 days x N16,500 x 4 seasons	792,000	4,800
Travel expenses	N495,000 x 4 seasons	1,980,000	12,000
Expert on Invasive Species (Hydrobiologist/ Microbiologist)	2 days x N1,650,000 x 4 seasons	13,200,000	80,000
Divers	2 days x 2 divers x N500,000 x 4 seasons	8,000,000	48,484.85
Diving Equipment	N600,000 x 4 seasons	2,400,000	14,545.46
Laboratory Equipment	N700,000 x 4 seasons	2,800,000	16,969.70
TOTAL		**29,172,000**	**176,800**

4.3.2 Port BWM Plan Development

Table 30: Cost Calculation Consultancy

Cost Items	Calculation	Total Amount (N)	Total Amount (N)	Total Amount ($)
Expert on Ballast Water Implementations	N1,650,000 per month x 3 months	N4,950,000/per 5 major ports	N24,750,000	150,000

RESULTS

Direct use values Key Sectors	Total yield/catch/#users etc (where applicable)	#employed or dependent	Total value of sector	Total value of sector as % of GDP	Vulnerability to IAS (high, medium, low)	% loss (worst case scenario)	$ loss (worst case scenario)
Fisheries	304 413 tonne/year fish catch					60% loss in fish stocks in mnemiopsis leidy case	More than 1 billion USD loss in mnemiopsis leidy
	12.16% of Africa production (2008)	25000 registered fisherman	1.6 billion TL	0.4%	High		
Aquaculture	94000 tonne/year fish production						
	32% of world production	7100 workers in fish farms	512 million TL	0.13 %	High	80% can be lost if the ecosystem is changed	$409 million
	Bed capacity: 714 000 Hotels 9000 Yatchs 21 million tourists per year 2.5% of world capacity						
Coastal Tourism	13th place in the world ranking		$18 billion	6%	High	30% can be lost if the ecosystem is changed	$5.4billion

Additional Costs to Society or Industry	**#employed or dependent**	**Total value of sector**	**Total value of sector as % of GDP**	**Vulnerability to IAS (high, medium, low)**	**Type of costs possibly incurred**	**$ cost (worst case scenario)**
Shipping	142,687 Registered seaman in Nigeria	224,776,283 tonnes of cargo handled on 2008 400 Nigerian flagged ships	NA	Low	None	None
Coastal infrastructure	5 major ports		NA	Low	None	None

Public Health	**IAS Species (with potential human health impact)**	**Possible impact pathway (e.g. food, water, recreation etc)**	**Possible impacts (food poisoning, physical harm etc)**	**# affected (worst case scenario)**	**Treatment costs per person)**	**$ cost (worst case scenario)**
Vulnerable groups	Poisonous algaes	Food, water	Poisoning,	More than 10% of the population	$200	$ 1.4billion
	Pathogens like cholera	Water, recreation	Epidemic diseases	7 million people		

Issue	Obligation to whom flag/port/industry	Cost to whom flag/port/industry	Type of cost (cash/time , in kind etc)	Estimated cost ($)	Estimated cost (N)	Possible source of funding or funding mechanism (if application Status
PREPARATORY PHASE						
Capacity building, education and communication						
National Task Force Meetings	NIMASA	NIMASA	Cash and in kind	9772.73	1612500/year	IMO
Training (CME, PBBS, etc)	NIMASA	NIMASA	Cash and in kind	945447.1	155837500	IMO
Regional Task Force meetings	NIMASA	NIMASA	Cash and in kind	45227.27	7537500	IMO
LEGISLATIVE, POLICY AND INSTITUTIONAL REFORM						
National BW Status Assessment	NIMASA	NIMASA	Cash	30000	4950000	IMO (Concluded)
Economic Assessment	NIMASA	NIMASA	Cash	20000	3300000	IMO (Concluded)
National BWM Strategy	NIMASA	NIMASA	Cash	40000	6600000	IMO (Concluded)
Legal review and drafting	NIMASA	NIMASA	Cash	60000	9900000	IMO (Concluded)
Port Biological Baseline Studies (research and monitoring)	NIMASA	NIMASA	Cash and in kind	38,787.87	6400000	IMO
Risk Assessments	NIMASA	NIMASA	Cash and in kind	129,697	21,400,000	IMO
COMPLIANCE RELATED COSTS						
Flag State Obligations						
Establishing procedures for issuing BWM, certificate	NIMASA	Industry	In kind	None	None	
Approval of ships' BWM Plans	NIMASA	Industry	Cash	1,212,121.2	200,000,000	

Type Approval of BWM Systems	NIMASA	Industry	Cash	7,000,000	1,200,000,000	
Approval of exemptions	NIMASA	Industry	None	None	None	
Surveys	NIMASA	Industry	Cash	4,121,212 .1	N680,000,000	
PORT STATE OBLIGATIONS						
Compliance Monitoring and Enforcement	Port	No additional cost				
Inspection of ships	Port	Port	Time, in kind	2,972,056 .7/year	490,389,349 /year	
Introduction of BW reporting form	Industry	No additional cost				
Sampling	Port state	Port state	Cash	185454.6/ year	30,600,000/ye ar	
Sediment reception facilities	Industry	Industry	Cash	333,333.3	55,000,000	
Communication of requirements to IMO and other member states	Port state	Port state	Time, in kind	None		
Communication of BWM requirements to ships	Port state	Port state	Time, in kind	None		
INDUSTRY OBLIGATIONS						
Training of crew members	Industry	Industry	Cash/time	6,970,697	1,150,000,000	
BWM Plans	Industry	Industry	Cash/time	1,212,121 .2	200,000,000	
BWM Record Books	Industry	Industry	Cash/time	No additional costs		
BWM OPTIONS						
BW Exchange (D-1)	Industry	Industry	Cash/time	4,000,000	660,000,000	
BW Exchange (D-2)	Industry	Industry	Cash/time	200,000,0 00	3,300,000,000	
Port Biological monitoring programmes	Port, State	Port, State	Cash/time	112,800	18,612,000	
Port BWM Plan development	Port	Port	Cash/time	150,000	24,750,000	

CONCLUSIONS

The results show that the operational cost of ballast water management system is definitely cheaper than the cost of possible harms of the invasive alien species. Also it has to be mentioned that only the economical lost from invasive alien species was calculation. The economical assessment methodology could not assess the economical impart to culture, human sociology and psychology. Also the cost of the possible cleaning activities for AIS is not in the scope of this report.

Table 31: Results

Possible Economical Effect of AIS to NIGERIA	**8.16 Billion (worst case) ($)**	**N1,346,400,000,000 Billion (worst case)**
Operating Cost of BWM to port state	16,808,413	2,764,304,849
Operating Cost of BWM to industry	219,000,000	36,123,922,000
Total Cost of BWM	**235,808,413**	**38,888,226,849**

If we also include the lost on ``cultural value`` of the living place to the amount of possible effect of AIS then the difference between operating cost to the possible economical effects of AIS will increase. We can easily define that ballast water management activities are feasible with respect to the comparison between costs and lost.

Table 32: Results

OPERATIONAL COSTS	COSTS (N)	COSTS ($)	%
Capacity building	155,837,500	945,447.1	0.40
Port Biological Baseline Surveys (PBBS) (research and monitoring)	6,400,000	38,787.87	0.02
Flag State Obligations	2,080,000,000	12,333,333	5.23
Port State Obligations	575,989,349	3,490,845	1.48
Industry Obligations	36,070,000,000	219,000,000	92.87
Total	**38,888,226,849**	**235,808,413**	

The operational cost for ballast water management effects 5.23% the flag state and 92.87% the industry.

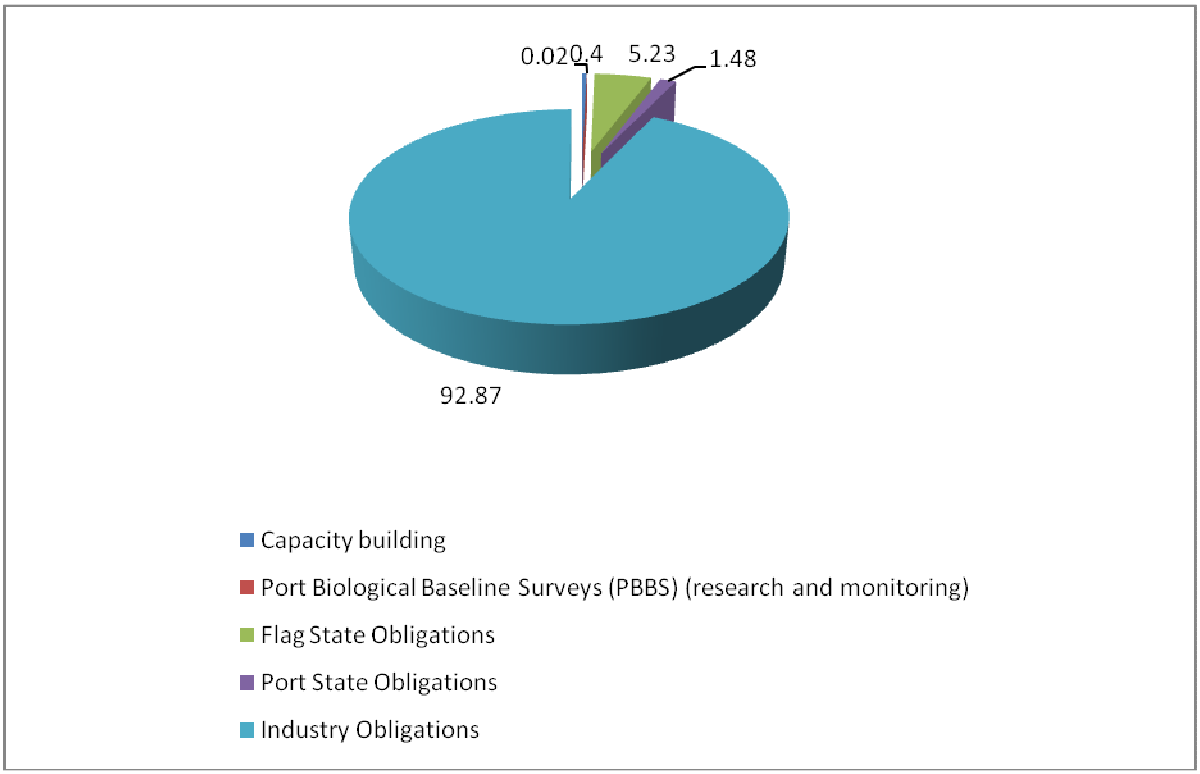

Figure 1. Percentages of operational costs

Also when we look at the cost items for industry we can see that 65.6% of the cost for industry is ballast water treatment. This is an obligation under the BWM Convention. All the ships have to treat their ballast water with respect to standards concerned in the convention.

Table 33: Results

INDUSTRY OBLIGATIONS	**COST (N)**	**COST ($)**	**%**
Training of crew members	1,150,000,000	6,970,697	3.18
BMW Plans	200,000,000	1,212,121.2	0.55
BW Exchange	720,000,000	4,363,636.4	1.99
BM Treatment	34,000,000,000	206,060,061	94.09
Port Biological Monitoring Programme	29,172,000	176,800	0.08
Port BWM Plan Development	24,750,000	150,000	0.06
TOTAL	**36,123,922,000**	**219,000,000**	

It is calculated that the 94.09% of all operational cost is ballast water treatment

Table 34: Results

INDUSTRY OBLIGATIONS	**COST (N)**	**COST ($)**	**%**
BM Treatment	34,000,000,000	206,060,061	87.38
Other activities	4,888,226,849	29,748,352	12.62
All operational cost	**38,888,226,849**	**235,808,413**	

In conclusion this economic assessment study shows that the ballast water management activities are feasible to implement. The total cost for the activities beside treatment is N4,888,226,849 ($29,748,352). This amount

could be achieved in Nigeria with IMO and other entities outside Nigeria in order to counteract such a huge treat of Alien species.