

ECONOMIC FRAMEWORK

COST BENEFIT ANALYSIS

For the

Belize SAICM Initiative

Mainstreaming into Development Plans the Sound
Management of Chemicals (SMC) Priorities for Key
Development Sectors in Belize and Associated SMC
Governance
Project

Development of the Concept Papers, Policies and
Cost Benefit Analysis

Submitted to the

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TABLE OF CONTENTS	
Content	Page
1.0 Background	3
2.0 Current Step	3
3.0 Cost Benefit Analysis	3
4.0 Components of a Cost Benefit Analysis	3
5.0 Rule of Thumb	4
6.0 Economic Context	4
7.0 Cost Benefit Analysis Tools	6
8.0 CBA of a Concept	8
9.0 Process	8
10.0 Aims and Objectives	8
11.0 Explanation of Major Terms	9
12.0 Tables to be Prepared	10
13.0 CBA Spreadsheet and Tables 1, 2 and 3	10
14.0 Suggested Economic Analysis/CBA Framework	12
15.0 Bibliography	15

1.0 Background

The 2010 Situation Analysis Report for Belize shows that Belize is not a producer of chemicals in its own right. Chemicals are imported for use mainly in the agricultural sector. Many issues and priorities were summarized and high priorities were identified for attention during the next 4 -5 years of the Government of Belize's (GOB) Economic Development Plan and sectoral strategies.

2.0 Current Step

The present step or phase of the mainstreaming into development plans of the sound management of chemicals will develop the concept papers further in three major ways.

The first is to develop a cost benefit analysis or economic framework for the concepts. The second is to develop policies for the concepts. The third and final is to develop language for the inclusion of the major concept issues in the national development plan and sectoral strategies. A road map for the implementation of the necessary actions under the mainstreaming program will also be developed.

In support of the acceptance and inclusion of the concept papers and the issues they cover into the national development plan and sectoral strategies, an economic cost-benefit analysis (CBA) will be developed. It will demonstrate the importance of economic analysis for assessing budgetary commitments to sound management of chemicals priorities, starting with the high priority issues identified in this project. The method is also broadly applicable to other environmental policy issues for the country.

3.0 Cost Benefit Analysis

Cost-benefit analysis is a set of generally accepted methodological rules about how to identify, analyze and present economic information to decision-makers as one basis to make choices between options to address a problem or opportunity including, in this case, for the sound management of chemicals. For instance, if a problem has been identified as a potentially serious public policy concern, cost benefit analysis requires the practitioner to:

- a. Analyze that problem to determine how significant it is from an economic perspective; and
- b. Comparatively analyze practical options for responding to the problem in terms of which of these options will provide the greatest *benefits* to problem solving at the lowest *cost*.

4.0 Components of a Cost Benefit Analysis

All recommendations for policy consideration should include at a minimum the desired objective, a justification, the required actions that will result because of the policy, the benefits and the costs. A summary of the net benefits is also a basic requirement.

Benefits and costs are sometimes financial, however at times these benefits and costs are not directly financial. In these situations a qualitative description of the anticipated benefits and costs should be stated with the required course of action resulting in a net benefit.

It is normal to be able to show alternative courses of action with the base case being the no change or no action being taken. The base case does have costs and benefits either qualitative or quantitative or both. These should be shown as clearly and simply as possible. In order to gain acceptance an alternative needs to be demonstrated and the best scenario out of at least these two situations taken.

5.0 Guiding Principle or Rule of Thumb

In carrying out a Cost Benefit Analysis there should be a guiding principle adopted from early on. This is that there will not normally be complete information and that the information gathered and presented needs to be cost efficiently gathered in and of itself. This is the least cost principle.

The least cost principle is that the cost of gathering the information and making the case should be minimized and also proportional to the size of the policy or course of action or project being recommended. The larger the policy action or project being recommended then the more in depth the requirement for information.

Financial costs and benefits as a rule need to be shown wherever the subject matter relates directly or indirectly to either the expenditure of revenues or a supposed increase in revenue or both.

It should be noted that there are additional considerations involved in development planning. This is best shown through government policies or projects implemented even though they may not necessarily result in a net increase of government revenues, even when they may involve large expenditures of national income or tax revenues. This is the case of the infrastructure projects undertaken by any government for the common wellbeing of its citizens. These involve a social, environmental and economic analysis with the costs being socialized or internalized by the government. The benefits are to the people, or the environment or the economic sectors or all of these.

6.0 Economic Context and Fundamental Economic Analysis

The economic conditions prevailing in the global economy and the existing foreign debt situation of Belize leave very little room for expanded programs or expenditure by the Government of Belize (GOB). This is true of many if not most developing countries. The goal therefore is to make smart investments that mitigate the much higher costs that can

occur if we do not take sound preventive action in the way chemicals are managed throughout their life-cycle.

What this means is that the best cost approach here is a preventative one. Take affordable actions today that will mitigate far higher costs in the future. The benefit is the prevention of a deterioration of the socio-economic situation and economic baseline. In fairness to the GOB and in recognition of the long term importance it places on human and environmental health, it should be pointed out, however, that the biggest cost shown in the National Implementation Plan and Financial Mechanisms which is the Solid Waste Management Project has already received financing through the Inter-American Development Bank (IDB) and the OPEC Fund for International Development (OFID). The total project cost of US\$14.5 million is being met with loans from IDB of US\$11.0 million and \$3.5 million from OFID. This major project has been in the making for the past decade after being identified as a national priority by the Department of the Environment. This starts implementation during 2010.

Often much can be achieved also by relatively low cost measures such as public education and awareness of chemical issues, the enforcement of chemical regulations, and monitoring of the economic sectors by the relevant Ministries and Departments. A key mechanism that can support these efforts is the Interagency Coordinating Mechanism (ICM) set up under the SAICM initiative with broader support being provided by the sector groups involved. Additionally, the integration of chemical management priorities into national development planning process will be a means to help government foster national budget commitment as well as bilateral and international donor assistance.

The objective is to prevent costs to human health, the environment and sustainable economic development arising from unrestrained or un-monitored use of chemicals. A second and equally important objective is to prevent deterioration in the revenue earnings from the productive sectors described in the economic baseline shown in the Situation Analysis Report 2010 which could come about from damages to land, sea or air on which the sectors depend for sustainability. Examples of damage to export earnings could be the use of prohibited chemicals in a mistaken attempt to boost food exports. These food exports which account for 65% of our major domestic exports could potentially come under threat by the trading partners to whom we export. An example of a preventable damage or cost to both fishing and tourism would be the overuse of chemicals in a way that contributes to runoff from the mainland and into the territorial waters damaging the fish stock and reefs. Both fishing and tourism are major contributors to foreign exchange earnings, with sports fishing having been recognized in Belize as a sustainable source of employment for Belizeans as well as a good source of income.

In summary Belizeans earn their living because of the excellent state of our environment. In order to continue to meet the needs (social, economic and environmental) of our growing population we need to ensure balance in our use of chemicals utilized in the production of our domestic and export crops and utilized in an attempt to ensure human health such as in fighting malaria.

7.0 Cost / Benefit Analysis Tools

There are standard tools that can be used in order to carry out a proper cost / benefit analysis of the Sound Management of Chemicals (SMC). It should be noted that not all are applicable to Belize and that some potentially useful ones may be limited by data availability. Nonetheless the preservation of and gradual improvement in the quality and sustainability of development is the goal. A basic introduction to and illustration of a potential use or application of CBA to an issue or concept that Belize is faced with is expected to assist in the adoption and the application of the tool to other issues, as noted previously.

The first step is to establish a baseline, both with regards to the chemicals situation and the broader economic baseline. This is the main objective of the Situation Report with special emphasis on making a document available that is informative to a planning/financial audience as well as to a broader profile of the population. The previous years have seen many documents being produced on chemicals in Belize but in a more specialized and technical manner that may not be approachable by a general audience without an environmental background.

In making a Situation Report available that is non-technical and more general in its language, a second step will be achieved which is that of public information and in this case more specifically economic mainstreaming of SMC.

A third step is estimating the benefits and costs of any change that enhances environmental conditions, measured as changes from baseline conditions. Under a risk prevention or preventative approach strategic investments are indicated to improve the baseline conditions or to mitigate the worsening of those conditions in areas that are particularly important to public health, the environment and sustainable economic development in Belize. The improvement or mitigation of baseline conditions also needs to be expanded to take into account possible future risks that may arise from well intended plans that do not take into account best practices in the SMC. Future risks can arise under different circumstances; one would be when the current baseline use of chemicals is continued even as agricultural production from existing crops increases in an effort to expand export levels. Another would be under the introduction of new crops or industries without giving adequate attention to the sound management of chemicals and its impacts on the baseline. The overall goal should always be to improve the national wellbeing in a holistic manner taking into account health, environmental, economic and other social considerations from the point of view of continuous improvement from the baseline and taking into account that development also needs to mitigate risks that may occur in the future under normal or unchanged practices.

Measuring the costs and the benefits under the baseline and future risk scenarios is a useful information and analysis tool for decision making. At the same time the mitigation or improvement of existing and future conditions can only occur when well thought out actions are taken to address the key issues identified. These strategic actions do not always have to involve large and costly projects. At times they can involve low cost

measures such as in making use of existing best practices already being used in Belize or in other nations.

Some basic research may exist in other nations that are similar in stage of development and small open economy to Belize as such studies are not readily available in Belize. Some estimations and extrapolations may be necessary to do this. The economic value of an environmental improvement is the dollar amount that people consider to be of equivalent value to the improvement. Environmental valuation can be measured using Willingness to Pay (WTP), or by estimating Willingness to Accept (WTA). While WTP is the maximum amount of money someone would voluntarily pay to obtain the improvement, WTA is the least amount of money they would accept to forego the improvement. Note that the concept of WTP assumes that the public does not possess property rights to the environmental improvement, and therefore must purchase it from those who currently have the right to engage in pollution or other damaging activity. On the other hand, the concept of WTA assumes that the public already possesses property rights to the environmental improvement, and thus must be compensated in return for infringing upon those rights. Benefits can be to human health, to the environment itself and to the economy.

The fourth step is in estimating costs such as social costs for the measure being taken. The relevant social cost represents the total burden that each measure or its alternative would impose on affected individuals. Other costs that will need to be looked into may include opportunity costs when these can be estimated and direct compliance costs such as the cost of pollution or chemical management investment or equipment or training costs, personnel costs, etc. For Belize this type of cost may be more readily estimated and may be more practical as in a resource allocation situation under scarcity of funds the impact is more readily understood as long as the benefit is demonstrated. There may also be compliance costs incurred by individuals and companies such as in foregoing income from vegetation buffers along rivers or in managing the harvesting of fish to ensure sustainability. Yet these can be understood by the Belizean population, e.g. the value of the reefs and of sports fishing. Other costs include indirect costs that are borne by households, firms, or government agencies that are not under the direct scope of measure being undertaken. It should be noted that there are also indirect benefits resulting from a measure taken so there needs to be a balanced approach to the estimation of costs and benefits. A tool that is often used to summarize the flow of all quantifiable costs and benefits is Net Present Value. This of course assumes that the costs and benefits can be observed, are measurable in units and can be assigned a cost into the future.

These and qualitative methods will be utilized where applicable in the Economic Analysis of Selected Priorities. They would also provide valuable information in developing Targeted Policy Instruments as well as lending strength to any case being made for the goal of the SMC which is the Mainstreaming in Development Planning for achieving and sustaining the Millennium Development Goals.

8.0 Cost Benefit Analysis of a Concept or Issue

The SAICM Mainstreaming Project requires the CBA of one concept or issue for the purpose of illustrating the benefit of doing such an analysis to Government. This can then be applied to the other concepts and also to other government policies and projects in the future or as required.

9.0 Process

The process to be followed is taken out of the UNDP Technical Guide for Integrating the Sound Management of Chemicals and also the Supplemental Cost Benefit Economic Analysis Guide presented to UNEP. Other research and text books on economic analysis and financial analysis will also be consulted as needed.

These two main guidance documents set out a broad framework or process for carrying out an economic analysis/cost benefit analysis. There is no need to repeat these clear and logical steps in this presentation.

As is to be expected the guides are also generic and need to be adapted for local use in any nation, Belize specifically.

The CBA tool in and of itself needs to be simple and easy to understand while being applied to a real situation facing the nation of Belize.

The ideal result will always be one where the tool can be applied to all types of policies and decision making not just to big ones involving the expenditures of millions of tax payers' dollars. Soft policy decisions can often times lead to unplanned and unbudgeted major expenditures spread over many years especially when they were not subject to any type of economic analysis precisely because they were not a hard or infrastructure type recommendation with an obvious dollar investment cost.

10.0 Aims and Objectives

The overall aim and objective of the present CBA is to select one concept arising out of the four concept papers that were prioritized in the Situation Analysis Report 2010.

The agriculture sector in Belize was selected for the CBA example. In selecting this sector it we were guided by some principles:

1. Importance to Belize
2. Major relevance to the use of chemical inputs
3. Can show either a reduction in the use of chemical inputs without decreasing yields or
4. Can show an increase in yields or
5. Both decrease chemical inputs and increase yields

6. Other benefits such as social, health, environmental and economic can be derived.

By yields we intend to look at output in terms of either micro level i.e. farm level output or at a macro level i.e. at the national level. Subject to the availability of data it would be ideal to be able to find an industry or a user/farm that shows specific amounts and dollar values of recommended and actual chemical inputs and be able to extrapolate a net benefit that for the entire nation.

Another approach would be to look at aggregated data for chemical imports and agricultural output and acreages such as produced by the Statistical Institute of Belize. This has the benefit of being readily available, is gathered from many sources in the sector and is not subject to any detailed analysis at present.

At the same time without needing to carry out a pilot project due to the time limitation it may be possible to use nationally available data to see what the chemical imports are into Belize and how these relate to national output as measured by either GDP or dollars of exports.

As discussed above the guiding principle will be the selection of a concept and of data that can be cost effectively gathered. The objective will be to show at the local Belizean level what can be done in terms of a CBA without incurring great costs such as in requiring a pilot project. The result should be of a nature that can be replicated and can be done using readily available data. Any excessive amount of research or pilot requirements would defeat the purpose of illustrating the ease, use and benefit of carrying out a CBA for major and also minor policies and actions/projects.

11.0 Explanation of Major terms

Recommended. In carrying out a CBA it may be the case that there is a recommended standard for usage in an industry or at the micro level such as an individual farm unit. Where this is not available the data available at a macro level such as imports in dollar amounts of all or targeted chemicals (if available) will be looked at.

Actual. This is separate and distinct from the recommended and is what the situation on the ground is or what the national situation that has been changing is (for better or deteriorating)

Future risk scenario, this is often referred to as the costs of inaction on a problem. This takes into account the risks that a nation's population are trying to prevent and also gives an idea of what could face us if we do nothing to mitigate these risks. Risk is seen as the potential adverse impacts on human health, the environment and the economy at large.

Net benefit. This is the difference between the recommended and the actual or between the course of action recommended and an alternative or no action. It implies that an action is taken that will result in a positive or negative net benefit.

Net present value (NPV). This involves the use of very basic financial theory where a dollar held or spent today is worth more than a dollar in the future. The net benefit discussed above will need to be put into dollar terms and the value today (the present value) shown. The sum of all the values today is the present value.

Discount rate. The net benefits or net values obtained through the CBA need to be brought to the NPV using an interest rate. The selection of the interest rate is in and of itself a major part of the CBA. An interest rate that is too high will result in a low present value. An interest rate that is too low will result in an NPV that is higher than may be realistic. There needs to be some caution and careful study of the Belizean economic realities in adopting an interest rate in a situation where the GOB does not have an official discount rate or similar comparison.

12.0 Tables to be prepared

The data obtained for use in the CBA will by necessity need to be reduced to one table or to a set of short tables leading up to the summary of the benefits both quantitative and qualitative. An alternative would be to have a quantitative table for the summary of benefits and a separate set of notes or points for discussion of the qualitative benefits should these still be required. Ideally a quantitative table is considered superior to a qualitative one and the production of either or both tables is guided by the availability of data.

13.0 Cost Benefit Analysis Spreadsheet and Alternative Tables

Recommended Cost Benefit Analysis Spreadsheet/Accounting Statement

Category	Year 1	Year 2	Year 3	Year Etc.	Total NPV
<u>A. Cost Benefit Analysis</u>					
Monetized:					
Benefits					
Costs					
Net Benefits					
Quantified but Unmonetized:					
Benefits					
Costs					
Unquantified:					
Benefits Described					
Costs Described					
<u>B. Cost Effectiveness Analysis</u>					
Benefits					
(quantified but unmonetized)					
Costs (monetized)					
Cost Effectiveness Ratio					

The following set of tables is presented as a basic and usable alternative to the above Accounting Statement. Note that it is a generic set of tables and can in no way be relied upon to show what is useful for each CBA; it is for illustration purposes only.

Table 1

Heading or Concept or Option as Quantity i.e. tons of produce or chemicals

Category	Base Year 2008	Year 1 of Option	Year 2 of Option	Year 3 of Option
Base Scenario	Quantity A	Quantity A1	Quantity A2	Quantity A3
Future Risk Scenario	Quantity B	Quantity B1	Quantity B2	Quantity B3
Option being recommended	Quantity C	Quantity C1	Quantity C2	Quantity C3
Net benefit /cost in Quantity	Quantity D	Quantity D1	Quantity D2	Quantity D3

Table 2

Heading or Concept or Option

Qualitative Discussion in Summary and Table Format

Category	Base Year 2008	Year 1 of Option	Year 2 of Option	Year 3 of Option
Base Scenario	Qualitative A	Qualitative A1	Qualitative A2	Qualitative A3
Future Risk Scenario	Qualitative B	Qualitative B1	Qualitative B2	Qualitative B3
Option being recommended	Qualitative C	Qualitative C1	Qualitative C2	Qualitative C3
Net benefit /cost in Non financial terms	Qualitative D	Qualitative D1	Qualitative D2	Qualitative D3

Note. The number of rows for qualitative benefits and costs can be increased as needed.

Table 3

Heading or Concept or Option in Dollars

Category	Base Year 2008	Year 1 of Option	Year 2 of Option	Year 3 of Option
Base Scenario	Quantity A \$	Quantity A1 \$	Quantity A2 \$	Quantity A3 \$
Future Risk Scenario	Quantity B \$	Quantity B1 \$	Quantity B2 \$	Quantity B3 \$
Option being recommended	Quantity C \$	Quantity C1 \$	Quantity C2 \$	Quantity C3 \$
Net benefit /cost in Dollars	Quantity D \$	Quantity D1 \$	Quantity D2 \$	Quantity D3 \$

\$				
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Discount rate for example at 5%

NPV = net present value of the flows of years 1, 2 and 3

Scenario Analysis or sensitivity of the NPV to different interest rates for example to 7% or 8%

Efficiency Ratio (Cost-Effectiveness Ratio). Increased revenue or exports or benefits divided by the increased costs.

Note that where an NPV (dollar based) cannot be estimated the efficiency ratio can be used and may in some cases be used to summarize the qualitative costs and benefits. With practice the approach becomes more valuable as applied to decision making.

Note. The table stops at year 3; this is just for illustrative purposes and in an Excel spreadsheet format should normally run for 5 to 10 years or for an appropriate period of time governing the recommended policy or project. For short term projects a shorter time would be used.

14.0 Suggested Economic Analysis/Cost Benefit Analysis Framework

As part of this process it is worth while to recommend a basic framework for adoption by the Government of Belize for all or most of its policy analysis or major decision making.

1. Policy or Issue or project being considered for discussion – a statement
2. Justification – why should it be considered
3. Present Situation / Existing Conditions / Baseline
4. Issues that are being considered or that are perceived to be causing a problem requiring a resolution / State the intended objective (s) of the policy or project i.e. what needs to be solved and what is the end result desired
5. Possible difficulties that may need to be overcome in order to resolve the issues or problems identified. Where there are impacts these will need to be identified and shown how they will be mitigated.

This includes (where applicable) but is not limited to:

Technical issues

Information issues

Market/social/ health/environment/cultural/economic/infrastructure issues as relevant

Industry or sector issues

Financial structure or resources available at present

Regulations or legal issues

Impact if any on international obligations
Impact on future generation of Belizeans

6. Policy instruments or recommendations being offered for consideration including alternatives. Identify the impacts of each option.

This includes (where applicable) but is not limited to:

Technical assistance required

Financial assistance required

Possible Sources of these technical and financial requirements including the existing budget allocations or identified savings

What incentives will be made available to convince people or intended beneficiaries to use or implement the policies under consideration

What support will be given to the scheme or policy under consideration

Is there a tax implication

Are there restrictions on use or availability of the resource that may need to be utilized

7. Coordination needs with other entities, organizations or government agencies

8. Cost and Benefit (CBA) of the specific alternative being recommended – show a table or set of table. See examples above and amend as needed by the specific case under consideration.

These need not be only dollar values

Should include qualitative benefits and costs i.e. using the information prepared in this format in particular but not limited to the baseline, what is being solved, how will the recommended solution assist either or all of people / health / education / environment / economy / revenues / national interest / etc.

Where the implications or costs and benefits are spread over a number of years, then the Net Present Value of the recommended action should be shown where possible.

When an NPV analysis is not possible due to either a lack of data or a lack of financial resources to research and obtain the data then it is possible to substitute a Cost effectiveness Ratio. It should be noted that with practice obtained through consistent use of these tools it will become easier to prepare the NPV analysis.

Note that the estimation of the CBA is only one aspect of the economic analysis framework.

9. Indicators of success. How will the achievement of the required objectives be measured. The inability to measure an outcome may lead to the underachievement of the intended benefits and can lead to the misallocation of resources over time.
10. Summary with the final recommendation for consideration and possible approval

End of Economic Analysis/Cost Benefit Analysis Framework

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