



**Users Manual
Tourism and Recreation Valuation Tool
World Resources Institute**

This document serves as a Users Manual for the Recreation and Tourism Component of the Coral Reef Valuation Tool. This Tool was developed at the World Resources Institute (WRI) with intended use throughout the Wider Caribbean. The purpose of the Tool is to serve as a guidebook and calculator: a way for policymakers, civil society or other interested parties to assess the value to their economies of goods and services provide by coral reefs and to aid in setting coastal management policies. To that end, we have developed a tool we hope to be flexible enough to accommodate the many different types of data necessary for valuing coral reefs, while simple enough to be implemented by those not intimately familiar with the economics of natural resource valuation.

The Tool, which is comprised of three individual spreadsheets, calculates the net benefits from fisheries and tourism values separately, then adds them together (optionally with shoreline protection values) to estimate use value from coral reef goods and services. The Tool is a guide to the implementation of the more formal Coral Reef Economic Valuation Methodology found at <http://www.wri.org/project/valuation-caribbean-reefs>.

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Read Before Using the Tool

Macros Setting

The Tool uses Excel macros to perform calculations and assist in entering data. In order to use the Tool, please make sure that the security level on Excel is set to Medium or below. (To change this setting, open Microsoft Excel, and select “Options” from the Tools menu. Then select the “Security” tab and choose “Macro Security,” set the security to “Medium”). While some Microsoft Excel files could contain macros which pose a danger, the Valuation Tool will not harm your files or operating system.

Data Collection

Using the Valuation Tool will require collecting data on the fisheries and tourism sectors within your site, island, country or region. To get a sense of the data required for Tourism and Recreation, please see Appendix 2, “Data Needs for Tourism and Recreation Valuation.” Not all data are required to do a valuation as several options are available depending on the level of detail possible. For the tourism accommodation section, for example, data can be entered a) for each individual property; b) for each category of accommodation (i.e. average values for all guest houses); and c) based on total units and average price and occupancy for the year. In addition, one can do a partial valuation and save the results until more data are available. In Fisheries, for instance, one could calculate the value from commercial fisheries, leaving sections on fish processing and local use of fisheries empty. These values could be filled in once additional data is available.

For the more data-intensive elements of the valuation – accommodation by individual property, for instance – you may wish to collect and organize data in an external spreadsheet, and then import into the Tool when doing the final valuation. Cutting and pasting data into the Tool is discouraged as this may introduce errors. Instructions on how to import data can be found on the relevant pages of the Tool and manual.

Caution: Do not delete or otherwise alter the contents of “grayed – out” cells. This will introduce errors into the Tool.

Structure of the Tool

The Tool consists of two separate Microsoft Excel files – one for the fisheries valuation, and one for the tourism and recreation valuation.

Fisheries Component

The Fisheries component of the Tool allows for the valuation of coral reef-related services in four areas: (1) commercial fishing, (2) commercial fish processing and cleaning value added, (3) local non-commercial fishing, (4) and the multiplier impacts of fisheries-related sectors upon the overall economy. The first three areas each have a page allowing the user to input data as well as a page showing the economic analysis for that area. The fourth area can be estimated using standard default or user-defined multipliers. There is also a summary value page showing the total estimated value of coral reef associated fisheries. The Tool offers the option of exporting the results from the summary page to an external spreadsheet.

Tourism Component

The Tourism component of the Tool has detailed valuation calculations for Accommodations and Recreation (diving and snorkeling sections) as well as for Marine Park Revenue, Local Use, and other

spending by tourists who visit because of the reef. In the Tourism tool, users may enter accommodations data by hotel or hotel type and can enter data on dive operations in aggregated or detailed form. The options for entering data should be easily accessible on worksheets within the Tool. The tourism component also has a summary page with an option to export final results.

Navigating the Tool

The Tool may be navigated through the linked underlined cells available on many pages. In the upper left-hand corner of the page, short text containing information on the current location with a link back to the top of the section can be found. In the upper right-hand corner are links to the previous and next pages. The Help button, found on the upper-right of each page, also contains a navigation menu.

Both the Tourism and Fisheries Tools have been developed so that one can start at the beginning of the Tool and work forward in a stepwise manner. Please work through the pages, entering data in the appropriate fields. On the valuation calculation pages, the Tool will use entered data, automatically generating estimates of coral reef associated values. If at any time you want to see how the Tool calculates an estimate, see the *Calculations* Appendix at the end of this manual or on the “Calculations” tab in the Tool.

Data may be entered in a number of different ways, to account for the different types of data that may be available for the selected study area. For instance, if detailed dive revenue data is available in your island, enter that type of information. If only aggregate numbers (or best guesses) will likely be available, use that method for calculation.

Multiple Years

Data in the Tourism Tool can be entered for one year. In the Fisheries Tool, data can be entered for one or more years. While data for all components ideally would be for the same period, availability may require different components to use data from different time periods. If data for only one year are entered, information for that year alone will be calculated. If data exist for multiple years, an average will be computed, generating a value for a “typical year.” The subcomponents of each of the Tools are calculated discretely and added together – even if data are for different years.

Tourism Valuation Tool

The tourism component of the Coral Reef Valuation Tool currently calculates revenue generated from four elements of tourism and recreation: (1) accommodation, (2) marine park visitation, (3) reef recreation (diving, snorkeling and boating), and (4) local use of the resources. In the next version of the Reefs Valuation Tool, the revenues and costs from cruise tourism will be included in the calculation of coral reef value.

This document gives an overview of the method behind the Tourism Valuation Tool and serves as a brief guide to entering data and calculating value.

The Tourism Tool is designed to offer a stepwise progression of the subcomponents – information can be entered in order, with the total valuation coming at the end. However, users may choose to enter in data in any order, and have the option of using different valuation options, exploring how alternate methods of entering data may yield different results.

At this time, all information should be entered for annual revenue and costs in US dollars. Additional currencies and study durations will be included in future versions if there is demand for such options. The Tool contains the worksheets described below:

Site Description Worksheet

This is identical to the “Site Description” worksheet on the Fisheries tool. Information about the study site is entered here. This information will be helpful for others evaluating the valuation and some of these data will be used in other portions of the tourism valuation tool. At present all values in the tourism tool are set to US dollars.

Recreation and Tourism Profile and Defaults Worksheet

The data required for this worksheet are:

- Total number of tourists
- Average length of stay
- Percent of visitors using the reef – either engaging in reef recreation (diving, snorkeling, etc.) or visiting white sand beaches (of coralline origin).

Estimating the percent of visitors using the reef is a critical step in the valuation. This information enables the valuation estimate to focus on only those visitors who came to the study site at least partially because of its coral reefs. Revenues from the major tourism categories – accommodation, miscellaneous spending, etc. – will be prorated using the percentage of visitors using the reef. When more specific data are not available in the reef recreation sections, these values can also be used to approximate user numbers.

Accommodation Valuation Component

Accommodation Defaults Worksheet

The Tool offers three different methods for calculating accommodation revenues, each suited to different levels of data:

Method 1. Revenues for the sector as a whole

Method 2. Average revenues by accommodation type

Method 3. Revenues by hotel

The Accommodation Defaults worksheet covers the first two methods, and provides default values that can be used to fill in data gaps if the third option is used.

Costs, Taxes and Service Charges

The costs, taxes, and service charges section will be used to estimate the costs for the tourist accommodation sector, regardless of the method selected for estimating accommodation revenues. Any information entered on this page will override matching information previously entered on the Tourism Profile and Defaults Worksheet.

To calculate the costs, taxes, and service charges in the accommodation sector, you will need to enter:

1. Average hourly wage in US dollars
2. Average hours worked per week
3. Average number of persons employed by room
4. Non-labor operating costs as a percentage of base revenue
5. Tax rate
6. Service charge rate

If you do not have data available for each of these variables click “Use Defaults” and the tool will automatically enter default values for costs, taxes and service charges.

In order to estimate the amount of revenue that remains in the local economy, enter the percent of rooms that are foreign-owned in the box under “Leakages.” Accommodation revenues will be adjusted using foreign ownership as a proxy for leakage of profits out of the country. At this time, the Tool assumes that no foreign profits are spent in the local economy. This may overestimate the effect of foreign ownership, making the accommodation value estimate a conservative one.

Average Revenues

This section enables you to calculate reef-related accommodation value using only national-level accommodation data. The data required for this section are:

1. Average room rate in US dollars excluding taxes and service charges
2. Average occupancy rate in the accommodation sector
3. Average number of rooms per hotel
4. Number of accommodations in study area

If this information is available, please enter it even if you plan to calculate accommodation revenues at the accommodation type or hotel level (options 2 and 3 above). The Tool will use the sector (national) averages to fill in gaps (for instance, occupancy rate in a given hotel) if you opt for one of these more data-intensive options. **Note: The tool calculates taxes and service charges separately from room revenues. To avoid double-counting, check to see that your estimate of average room rate does not include taxes and service charges. Adjust downwards using the tax rate if they are included.**

Default Revenues by Accommodation Type

The lower section of this worksheet should be used to provide a more specific picture of the types of accommodation in the study area¹: how many hotels, guesthouses, apartments, etc. there are, the average room rate for that category, how many rooms are in these types of accommodations, and their average occupancy rates. These numbers can be estimated based on existing data for individual hotels, even if this information is incomplete. **Please note: The Tool will not be able to process information on individual hotels without at least two pieces of information: a listing of the different types of properties in the study area and the estimated number of each type of property (hotel, apartment, guesthouse, etc.) that exists.** Where possible, also fill in:

1. Average room rate in US dollars excluding taxes and service charges
2. Size
3. Occupancy information
4. Percent of visitors using the reef

These data will provide a more accurate estimate of the revenues from the accommodation sector than the average information described in method 1 above.

You may specify whether each given property type should be included in the valuation calculation. (For example, you might want to exclude categories with very unreliable data.)

Accommodation Revenues Worksheet

The “accommodation revenues” sheet is optional. Any information that you can enter about individual hotels—how many rooms they have, their occupancy rate in different seasons, their cost—will allow the tool to calculate a more precise valuation of revenues, and subsequently, what portion of these revenues can be attributed to coral reefs. Ideally, information on all of the hotels in the study area would be entered on this sheet.

Importing data from a separate file

Users may enter values into this sheet by directly filling in cells on the “accommodation revenues” worksheet. If there are a large number of hotels in the study area, or if there is a pre-existing list of accommodations, it may be easier to enter the values in a separate file called “Worksheet 1. Hotel Revenues.” Data entered into this separate worksheet must follow the format guidelines provided at the top of the sheet. Once the sheet is filled out, the information can be imported into the Tool by clicking on “Import Values from Worksheet 1.” Be sure to enter the path containing the file (such as “c:\tool_data\”) and include the final “\”.

Note: Do not cut and paste hotel information into the Tool. Enter the information directly or import using the method described above.

Entering Data by Season

In both the Tool and the Worksheet, users need to enter information based on season. This allows for estimates of different room rates and occupancies at high, middle, and low season. If data for a hotel cannot be distinguished in this way, simply enter data for one season, and have it begin on January 1 and end December 31. If the user only enters information for part of the year – say March 1 to May 1 – they will be given the option of either disregarding this hotel in the final revenue calculation or scaling revenues from this hotel. In this example, if revenues from March 1 to May 1 are \$10,000, the Tool would scale this value to a total revenue of \$60,000.

¹ You may also choose to differentiate accommodation options in other ways. For example, if the country collects hotel data by district, and the easiest way to estimate reef visitation is also by district, you may choose to group accommodations by district, rather than by type.

Accommodation Valuation Worksheet

Click on the “Calculate Revenues” button on this worksheet to direct the tool to calculate reef-related accommodation revenue using the values provided in the “Accommodation Defaults” and “Accommodation Revenues” worksheets. For more information on the specific calculations used in this section, see the appendix.

Net Accommodation Revenue Due to Reefs

The “accommodation valuation” sheet calculates total accommodation revenues in one of three ways, based on the amount of data entered in previous sheets:

1. As a product of sector-level averages of room rate, occupancy rate and number of rooms, and number of accommodations in the study area.
2. As a product of the average number of rooms by property type by average room rates and occupancy rates.
3. As a product of specific pricing and occupancy data for high-, mid-, and low-seasons in individual hotels.

Methods 2 and 3 may use more aggregated information on each accommodation type (e.g., each hotel, guest house, etc.), depending on data availability.

Since many tourists may not come to a site for its coral reefs, all of the accommodation revenues listed here have been pro-rated by the proportion of visitors engaging in reef-related activities or visiting a coralline beach. The percentage of reef usage is calculated at the national, accommodation type, or hotel level, depending on which method is used to calculate total revenue.

Accommodation Costs

Accommodation costs are separated into labor and non-labor operating costs. Labor costs are estimated based on the average hourly wage, the total number of hotel rooms, and the average number of employees per room in the study area. Non-labor operating costs are estimated as a percentage of total revenue, using the figure entered in the “Accommodation Defaults” worksheet. As with accommodation revenues, the costs estimates are pro-rated by the percentage of visitors using the reefs.

Net Revenue Remaining in the Country

Net revenue remaining in the country is calculated as $(1 - \text{Leakage Rate}) \times (\text{Net Revenue})$. Leakage of accommodation revenues is approximated using the percent of accommodations that are foreign owned, entered on the Accommodation Defaults page.

Transfers within the Economy

Transfers within the economy are separated into (1) Transfers to employees (total wages and service charges) and (2) Transfers to the government (taxes). These transfers are assumed to reenter the economy and create additional spending. The taxes and service charges are calculated by multiplying the tax and service charge rates entered on the “Accommodation Defaults” worksheet by the gross revenue in the accommodation sector. Taxes and service charges are assumed to be added on top of the posted room rates unless specified otherwise.

Total Reef-Related Accommodation Revenue

The total reef-related accommodation revenue is calculated as: net revenue remaining in the country + transfers (wages, taxes and service charges).

Accommodation Sensitivity Analysis Worksheet

The Sensitivity Analysis portion of the tool allows users to adjust average occupancy rates, room rates, wages, and additional operating costs relative to the values calculated in the accommodation revenues section. By using the up and down scroll arrows next to each of the four parameters, or by changing the percent variation, users can see—both visually in a graph and in the calculations below the parameters—how revenue is affected by changes in prices, occupancy, and labor. Use the radio buttons below the chart to view revenue estimates in thousands, millions, or billions.

Marine Parks Valuation Component

To calculate revenue generated from Marine Parks, users fill in the table on the “MP Net Revenue” sheet, and revenues are calculated directly on this sheet. To adjust the number of columns in the Marine Parks revenue table, enter the number of marine parks in the text box at the top of the page and click the “Adjust Revenue Worksheet” button (the worksheet will always retain at least 2 columns).

The table is divided into (A) general visitation information and (B) total fees collected in study year. Enter as much information as is available for section A, beginning with the park name/description, as this may be useful for providing an overview of marine park visitation in the region of interest. The total number of divers entered here may be used to calculate dive revenues in the following section. If the marine park does not collect fees, leave the fee section blank. Marine Parks costs should only include the costs of collecting and administering the fees (if available), not the cost of administering the marine park.

The Tool will automatically sum the fees for each park in the bottom of the column and then the gross and net revenues for all of the parks listed in the “Total” column.

Diving Valuation Component

There are four sections of the diving valuation, divided into two sections on the “Dive Revenues 1” worksheet and two sections on the “Dive Revenues 2” worksheet. These four sections are:

- (1) Tax rates (“Dive Revenues 1” worksheet)
- (2) Annual number of divers (“Dive Revenues 1” worksheet)
- (3) Dive price (“Dive Revenues 2” worksheet)
- (4) Equipment price (“Dive Revenues 2” worksheet)

Dive Revenues 1 Worksheet

To complete this worksheet, enter:

- Tax rates
- Service charge rates
- Number of dives taking place in the study area in the “Dive Revenues 1” worksheet.

The number of dives can be calculated one of four ways, depending on available information. Use the radio buttons to select one of the following options:

1. Using total visitors to the study area, estimate proportion that dive. For this approach, you will need:
 - Percentage of visitors diving
 - Average number of dives per year

The total annual visitors will automatically be taken from the “Tourism Profile and Defaults” worksheet. The sheet will calculate the annual number of dives by multiplying the total annual visitors by the percentage of visitors diving and the average number of dives per year.

For this approach, you may also enter the number of dive certifications issued as well as the proportion of dives taken at all-inclusive resorts to improve the dive valuation estimates. Entering the number of dive certifications will allow for revenue from the certifications to be included in the gross dive revenues estimate. Since dives taken at all-inclusive resorts would already be captured in the accommodation section, the tool will exclude those dives from the calculation of dive revenues. The revenue from dive certifications at all-inclusive resorts will be included in the estimate of dive revenue as it is assumed these revenues would not be part of the all-inclusive fees. The number of dives at all-inclusive resorts vs. those at other locations will be reported on the “Dive Valuation” worksheet.

2. Use total divers, average number of dives in study area. For this approach you will need:
 - Total annual number of divers (annual in entire region or estimated from marine parks)
 - Average number of dives per diver

To begin with this approach, first select whether or not you would like to calculate total number of divers based on marine park dives, clicking the radio button next to “Yes” or “No” as appropriate. Use of the marine park dives to estimate total divers may be appropriate if the values for marine park dives are believed to be more accurate than the figures for the total number of divers each year in the study site.

If you select “Yes” the boxes next to “Total Number of Divers Each Year” will be grayed out and the boxes next to “Number of Divers in Marine Parks” and “Proportion of all divers using parks” will come into focus.

- The data for “Number of Divers in Marine Parks” will automatically be taken from the “MP Net Revenue” worksheet if it has been entered.
- Enter the proportion of all divers who use parks. The total number of divers will then be estimated by scaling the “Number of Divers in Marine Parks.” For example, if 50% of divers use marine parks and there are 600 divers in marine parks, the total number of divers would be calculated as $600/.50$ or 1200.
- Enter the average number of dives per diver
- Total dives will be calculated by multiplying the number of divers by the number of dives per diver and reported on the “Dive Valuation” worksheet

If you select “No” the boxes next to “Number of Divers in Marine Parks” and “Proportion of all divers using parks” will be grayed out and the box next to “Total Number of Divers Each Year” will come into focus. You should then enter:

- Total number of divers each year
- Average number of dives per diver
- Total dives will be calculated by multiplying the number of divers by the number of dives per diver and reported on the “Dive Valuation” worksheet

For either of the two methods indicated here (marine park dives or total number of divers) you may also enter the proportion of dives taken at all-inclusive resorts and number of dive certifications issued to improve the dive valuation estimate as described in method 1 above. The revenue from dive certifications at all-inclusive resorts, but not revenue from the dives themselves at all-inclusive resorts, will be included in the estimate of dive revenue as it is assumed these revenues would not be part of the all-inclusive fees. The tool will separate the total number of dives for those at all-inclusive resorts vs. those at all-inclusive resorts on the “Dive Valuation” worksheet.

3. Use individual dive shop and all-inclusive resort data. This approach requires the most detailed level of information as it uses data from individual dive shops in the study site. Dive operators charging fees are counted separately from all-inclusive resorts.

Under section A, “Dive Shops,” enter:

- Number of dive shops that will be included in the calculation and click “Adjust Worksheet” so the tool will add the appropriate number of rows
- Information on the dive shop name, location, size, average annual number of dives, and annual number of certifications issued
- Proportion of all dives taken at shops listed – the Tool uses this proportion to account for missing data and scale up dive revenues accordingly

Under section B, “All-Inclusive Resorts,” enter:

- Number of all inclusive resorts that will be entered and click “Adjust Worksheet” so the tool will add the appropriate number of rows
- Information on the resort name, location, size, average annual number of dives, and annual number of certifications issued will not be included in the calculation of dive revenue as these revenues would be captured by the accommodation sector. The revenue from dive certifications at all-inclusive resorts will be included in the estimate of dive revenue as it is assumed these revenues would not be part of the all-inclusive fees.
- Proportion of all dives taken at resorts listed – the Tool uses this proportion to account for missing data and scale up dive revenues accordingly

The Tool will report the number of dives occurring at dive shops and all-inclusive resorts on the “Dive Valuation” worksheet. Dives occurring at all-inclusive resorts

Dive Revenues 2 Worksheet

Enter dive prices and equipment prices in the “Dive Revenues 2” worksheet. These dive and dive certification prices will be multiplied by the number of dives and the number of certifications to attain the gross revenue from diving on the “Dive Valuation” worksheet.

Dive Prices

Dive prices are entered one of three ways:

- The average price of a single tank dive and the average price of dive certification;
- Average dive prices with a bit more detail: dives can be priced by type (single, two-tank dive, package of ten dives, etc.). In order to calculate average dive prices here, users need to enter the proportion of all dives sold under each type. Enter the price per dive in this section: if a 10-dive package sells for \$300, the average dive price would be \$30.
- Average dive prices of individual shops. If shops were entered on the previous worksheet, they are copied here, although users can enter and delete shops as needed. To weight averages properly, users must indicate the number of dive shops, and the proportion of dives taken by type (see above) and by shop size. If a shop does not sell a certain kind of dive or offer certification, leave these values blank. Prices in this section should be per single dive: if a 10-dive package sells for \$300, the average dive price would be \$30.

Use the radio buttons to select one of the above methods to calculate dive price and follow the instructions below.

1. Average Price of Dive

To calculate the dive price using this method enter:

- Average price for a single dive – be sure to adjust multiple dive packages to the value of a single dive; for example a \$450 10-dive package would represent an average dive price of \$45
- Average price for a dive certification

For both of these values, do not include taxes and service charges.

2. Price by Type of Dive, with Distribution

To calculate the dive price using this method enter:

- Average price for each of the dive groups shown as well as night dive and certification
- Proportion of all dives represented by each of the categories

Again, for these values, do not include taxes and service charges.

3. Use Dive Shop Prices

To calculate dive price using this method:

- Add new rows or delete rows as needed and click “Copy Shop Information From Previous Screen” if it does not already appear; this will bring in the company name, location, and size of shop information from the “Dive Revenues 1” worksheet
- Enter the average price per dive of the various dive packages listed
- Enter the price for dive certification
- Enter the percent of dives taken at each type of shop
- Enter the proportion of all dives that fall into each of the package categories shown

Equipment Prices

Equipment prices are entered one of two ways:

- (1) Using average equipment price and rental rates
- (2) With specific shop equipment information. With the specific shop option, shops from the previous worksheet (if entered) are copied here, although users may enter and delete shops as needed. To weight averages properly, users must weight the proportion of dives taken by shop size, if these proportions weren't entered in the dive pricing section.

Use the radio button to select the method you would like to use, and follow the instructions below.

1. Average Price of Equipment

To use this method, enter:

- Average price per dive of equipment rental
- Proportion of all dives with equipment rental

The average price per dive for equipment rental will be multiplied by the total number of dives and the proportion of all dives with equipment rental. The resulting dollar amount will be added to the gross revenue for the diving sector.

2. Specific shop information

To use this method:

- Click “Add New Row,” “Delete Current Row” to adjust the worksheet as necessary and click “Copy Shop Information From Previous Screen” if the company name, location, and size of shop do not already appear.
- Enter the price of daily equipment rental and percentage of divers at each shop renting equipment.
- Note the percent of all dives taken at each of the shop types to allow for averaging of the numbers listed in the table.

The equipment price and percentage of divers renting will be averaged across all shops and multiplied by the total number of divers. This figure will then be added to the gross revenue from diving in the calculation on the “Dive Valuation” worksheet.

Dive Costs Worksheet

Dive operation costs are calculated as a percentage of total revenue. Users should enter:

- Estimated labor costs as a percentage of revenue
- Estimate non-labor costs as a percentage of revenue

If you do not have estimates available, click on the “Use Defaults” button to have the tool automatically enter values in these two boxes.

Dive Valuation Worksheet

The total valuation of coral reefs from diving is calculated as the sum of gross dive revenue less costs plus transfers within the economy (total wages, service charges, and taxes).

$$\text{Gross Dive Revenue} = \text{Total Annual Dives} \times (\text{Avg. Price per Dive} + \text{Equipment Rental Price per Dive} \times \text{Proportion of Divers Renting Equipment}) + \text{Total Annual Certifications} \times \text{Average Price per Certification}$$

No revenues for all-inclusive resorts are included here; these dive revenues are captured in the accommodation revenues for all-inclusive properties.

The dive costs are equal to the sum of total wages plus non-labor operating costs as calculated below. Net revenue is calculated by subtracting the dive costs from the gross dive revenue.

Transfers within the economy are separated into (1) Transfers to employees (total wages and service charges) and (2) Transfers to the government (taxes). These transfers are assumed to reenter the economy and create additional spending. The taxes and service charges are calculated by multiplying the tax and service charge rate entered on the “Dive Revenues 1” worksheet by the gross revenue in the diving sector.

The net revenues are summed with the transfers to the economy to give a total diving valuation.

NOTE: The tool also provides an estimate of the all-inclusive resort revenue that is attributable to diving, but this figure is excluded from the dive value calculation in order to avoid double counting.

Snorkel and Boating Valuation Component

As with the Dive Valuation Component, the Snorkel and Boating Valuation Component has four sections for calculating revenues that are divided into two worksheets (“Snorkel Boat Rev 1” and “Snorkel Boat Rev 2”). The four sections for calculating revenue are:

- (1) Tax rates (“Snorkel Boat Rev 1” worksheet)
- (2) Annual number of snorkel trips (“Snorkel Boat Rev 1” worksheet)
- (3) Average price of snorkel trip (“Snorkel Boat Rev 2” worksheet)
- (4) Equipment price (“Snorkel Boat Rev 2” worksheet)

In addition to these two worksheets, there is also a worksheet for calculating the costs from the snorkel and boating component.

Snorkel Boat Rev 1 Worksheet

The first section of this worksheet requires the user to enter:

- Tax rate
- Service charge

As in the diving worksheet, these values will be used to estimate the transfers to the government in terms of taxes and transfers to employees in the form of service charges.

In the section 2 of the worksheet –“Annual Number of Snorkel Trips” – the user should select one of the methods below to calculate the annual number of snorkel trips using the radio buttons:

- (1) Use total visitors to study area, estimate proportion that snorkel or take boat trips
- (2) Use total snorkelers, average number of trips in study area
- (3) Use data from individual snorkel tour operators and all-inclusive resorts

If option 1 above is selected, you should enter:

- Percentage of visitors snorkeling
- Average number of trips per snorkeler
- Proportion of trips taken at all-inclusive resorts

Information on total annual visitors will be automatically entered from the “R & T Profile and Defaults” worksheet. The proportion of trips taken at all-inclusive resorts will be used, as in the diving section, to avoid double counting revenues already captured in the accommodation component of the Tool.

Using this method, the annual number of snorkel trips will be equal to the total annual visitors multiplied by the percentage of visitors snorkeling and average number of trips per snorkeler.

If option 2 above is selected, you should enter:

- Total number of snorkelers
- Average number of trips per snorkeler
- Proportion of trips taken at all-inclusive resorts

The annual number of snorkel trips will be calculated by multiplying the total number of snorkelers each year by the average number of trips per snorkeler. As mentioned previously, the number entered for the proportion of trips taken at all-inclusive resorts will be used to separate out the trips that occur at all-inclusive resorts and omit these from the calculation, to avoid double counting revenues from the accommodation sector.

If option 3 above is selected, you should:

- Enter number of individual tour operators that will be included in this component of the valuation
- Click “Adjust Worksheet” to have the tool automatically insert the correct number of rows
- Fill in the information for each individual tour operator
- Enter the proportion of trips taken at the operator(s) listed; this will be used to scale for any missing data on snorkel trips
- Enter the number of individual all-inclusive resorts that will be included in this component of the valuation
- Click “Adjust Worksheet” to have the tool automatically insert the correct number of rows
- Fill in the information for each all-inclusive resort
- Enter the proportion of total all-inclusive trips; this will be used to scale for any missing data for all-inclusive trips

The information on all-inclusive resorts will only be used for informational purposes and will not be included in the valuation for the snorkel component.

Snorkel Boat Rev 2 Worksheet

On this sheet, you will enter data for sections (3) Average Price of Snorkel Trip and (4) Equipment Price of the snorkel and boating revenue component.

Average Price of Snorkel Trip

As with other sections of this tool, multiple methods are available for calculating trip prices depending upon the type of data that is available for the study site. For the average price of the snorkel trip, you should choose one of the following three calculation methods:

- (1) Average Price of a Snorkel Trip
- (2) Price by Type of Trip, with Distribution
- (3) Use Prices From Individual Operators

If you choose method 1 above, enter:

- Average trip price for a single trip

This will be directly multiplied by the total number of snorkel trips to be included in the gross revenue from snorkeling.

If you choose method 2 above, enter:

- Average price for a short trip (1/2 day), long trip, and (if needed) miscellaneous trip
- Proportion of all trips accounted for by each trip type (this should equal 100 percent): If there are no trips of a certain type, enter 0 for the percentage for that trip type

The price will be averaged across each of the trip types according to their proportion of all snorkeling trips; this value for price will then be multiplied by the total number of trips to be included in the gross revenue from snorkeling.

If you choose method 3 above:

- Select the “Add new row” or “Delete current row” to adjust the worksheet

- Information for each trip type for the individual tour operators; you may import shop information from the “Snorkel Boat Rev 1” worksheet
- Enter the percent of all trips taken with large, medium, and small operators; this can be estimated by dividing the sum of trips taken by all operators of a certain size by the total number of trips taken. For example if there are 2 small shop operators with 10 trips each, one medium shop with 20 trips and one large shop with 60 trips, the proportion of trips at small operators would be 20/100, or 20%.
- Enter the proportion of all trips that are short trips, long trips or miscellaneous trips (again should equal 100 percent)

An average for the snorkeling price will be calculated for each trip type by size of shop. This number will then be multiplied by the number of trips of that type and at that operator size grouping. For example, if the average price of a short trip is \$20 for the grouping of small operators and 20% of 100 total trips take place at small operators and 10 % of all trips are short trips, the estimate for revenue from short tips at small operators would be $(\$20) \times (100) \times (.2) \times (.1)$ or \$40. This is then repeated for each of the other snorkel boat operator categories (medium, large). The overall results will be reported on the “Snorkel and Boat Valuation” worksheet.

Equipment Price

For the final segment of calculating snorkel boat revenue, you must estimate the equipment price. This will be added to the revenue from snorkel trips to arrive at an estimate of gross revenue for the snorkeling section. The two methods available are:

- (1) Average price of equipment
- (2) Average prices from individual operators

If you choose option 1 above, enter:

- Average price of equipment rental per trip (if there is a charge for snorkel rental)
- Proportion of all snorkelers that require equipment (those that do not bring their own)
- Proportion of trips charging for equipment rental (in addition to the advertised trip price)
- Number of independent snorkel rentals per year

The average price of equipment rental per trip will be multiplied by the total number of trips, the proportion of snorkelers that require equipment, and the proportion of trips charging for equipment rental to estimate the revenue from snorkeling equipment rental. The number of independent snorkel trips (those not part of an organized excursion), if applicable, will be multiplied by the average price of equipment to attain the revenue from snorkeling rental on independent trips; this value will be added to the equipment rental from organized trips, and both values will be added to the gross revenue from the snorkeling sector.

If you choose option 2 above:

- Adjust the rows of the worksheet as needed using the “Add New Row” or “Delete Current Row” buttons
- Enter the information for individual shops on the rental price per trip, percentage of snorkelers renting equipment, and number of independent equipment rentals per year
- Enter the proportion of shops that charge an additional fee to rent equipment

The rental price per trip will be multiplied by the number of independent equipment rentals per year and the percentage of snorkelers renting equipment on each trip to determine the added revenue from equipment rental from individual operators. This will be added to the gross revenue from the snorkeling sector.

Snorkel Boat Costs Worksheet

For the snorkel and boating costs worksheet, you will need to enter:

- Estimates of labor costs as a percentage of revenue for snorkeling and boating operations
- Estimates of non-labor costs as a percentage of revenue for snorkeling and boating operations

If you do not have estimates available, you may click on “Use Defaults” to have the tool automatically enter values in these cells.

Snorkel and Boat Valuation Worksheet

Select “Calculate Revenues” and the tool will automatically calculate the values for the snorkel and boating component of the tourism and recreation component.

Gross Revenue = (Number of snorkel trips X Price per snorkel trip) + (Number of snorkel trips X Proportion of snorkel trips requiring equipment X proportion of trips charging additional fees for equipment rental) + (Number of independent snorkel trip equipment rentals X Price for equipment rental)

Total wages and non-labor operating costs are calculated as the indicated percentages of gross revenue and these values are subtracted from the estimated gross revenue to obtain net revenue from the snorkeling sector.

Transfers within the economy are separated into (1) Transfers to employees (total wages and service charges) and (2) Transfers to the government (taxes). These transfers are assumed to reenter the economy and create additional spending. The taxes and service charges are calculated by multiplying the tax and service charge rate entered on the “Snorkel Boat Rev 1” worksheet by the gross revenue in the snorkeling sector.

The net revenues are summed with the transfers to the economy to give a total snorkel component valuation.

NOTE: The tool also provides an estimate of the all-inclusive resort revenue that is attributable to the snorkel boat component, but this figure is not considered as part of the snorkel and boat valuation in order to avoid double counting with the accommodation valuation.

Cruise Ships Worksheet

This component of the coral reef tourism and recreation economic valuation is under development and not yet functional. Eventually this tool will allow the user to calculate the benefits and costs of coral reef-related cruise ship tourism.

Local Use Valuation Component

Local Use Worksheet

This worksheet allows for the calculation of the local use benefits from visits to coral reefs and coralline beaches (beaches whose sand is of coral reef origin). To calculate this component of the valuation, you will need data on:

- Population of study area
- Average hourly wage

For Coralline Beach Benefits:

- Percentage of local population visiting coralline beaches for pleasure
- Average number of visits per person per year to coralline beaches
- Average duration of visit to coralline beaches

For reef recreation benefits

- Percentage of local population engaging in reef recreation outside of organized tours
- Average number of visits per year per person
- Average duration of visit

To conduct this calculation:

1. Enter the population of the study area or click on “Import from Site Description” to import this value from the Site Description Worksheet.
2. Enter the average hourly wage
3. Under coralline beach benefits, enter the percentage of local population visiting coralline beaches for pleasure, the average number of visits per year per person, and the average duration of visit in hours. This information may be obtained from survey data.
4. Under reef recreation benefits, enter the percentage of the local population engaging in reef recreation outside of the context of organized tours (organized tour travel would be captured in prior tool calculations), the average number of visits per year per person to coral reefs, and the average duration of a visit in hours. Again, this information may be collected through surveys.

Coralline beach benefits are calculated by multiplying the population of the study area by the percentage of the local population visiting coralline beaches for pleasure, the number of visits per year per person, the average duration of visit, and the prevailing average hourly wage.

Reef recreation benefits are similarly calculated by multiplying the population of the study area by the percentage of the local population engaging in reef recreation outside of organized tours, the number of visits per year per person, the average duration of visit, and the prevailing average hourly wage.

The tool automatically sums both of these values to attain the total benefit from local use.

Local Use Sensitivity Worksheet

The local use sensitivity worksheet allows the user of the tool to vary selected parameters to see how each variation impacts projected benefits from local use. To change a parameter click on the up or down arrow located in its row. Clicking up will increase the value of that parameter by 1%, while clicking on the down arrow will decrease that parameter by 1%. You may also directly enter percentages into the appropriate box in the percent change column. The changes will be reflected in the table below the parameters as well as the bar graph to the right of the parameters. Such a sensitivity analysis can be useful in determining the relative contributions of each of the parameters to the local use valuation estimate.

Other Values Calculation

This worksheet allows the user to calculate values that might not have been captured elsewhere in the coral reef recreation and tourism valuation tool. The two sections for input on this sheet are (1) other revenue, (2) consumer surplus, and (3) multipliers.

Other Revenue

To calculate other revenue that should be included in this valuation exercise:

- Enter the percent of visitors using the coral reef or click “Import from Rec & Tourism Defaults” to have the tool pull this value from the earlier worksheet
- Enter a description of each revenue source, the gross value of that revenue source, and whether or not it should be prorated by reef usage (for example, departure taxes, in country transportation, meals, and other shopping by visitors can all be added here – all of these should be prorated by reef usage)
- Enter non-labor operating costs (as a percent of revenue) for each listed revenue source

The tool will automatically calculate the “Contribution to total value” as the gross revenue less the non-labor operating costs. This value will be summed across each of the revenue sources to give a total for “Other Revenue” that will be reported in the “Rec & Tourism Summary” worksheet.

Consumer Surplus

Consumer surplus is the additional value or satisfaction derived by a consumer above and beyond the price he or she actually paid for the experience. This is often considered an important component of natural resource valuations because the total enjoyment people take from natural resources often exceeds the market price paid to enjoy those resources. This tool provides a rough method to estimate consumer surplus for the diving and snorkeling sectors. Consumer surplus is typically evaluated by administering surveys. If resources are available to conduct surveys, this is the preferred approach. In the absence of local surveys, the tool provides lower-end estimates typical of the region. Before using these default values, it is recommended that you look for any consumer surplus studies that may already exist for the study site.

Gross revenues from diving and snorkeling are automatically imported from the earlier valuation worksheets. You then need to enter a “CS (consumer surplus) Factor” – a value that will calculate total consumer surplus based on gross revenue. Consumer surplus is typically estimated as a dollar value or as a percentage of trip price. To convert a CS percentage into a CS Factor, divide the percentage by 100 and add 1. For example, if the consumer surplus of divers is estimated to be 50%, the CS Factor will be 1.5. The tool will automatically sum the values for total consumer surplus from the diving and snorkeling sectors, and report this value on the “Rec & Tourism Summary” worksheet.

The default consumer surplus factors in particular are to be used with caution, as consumer surplus often varies considerably by site. Because the consumer surplus calculation has a high level of uncertainty, it is included on the “other values” worksheet as a component that users may choose to exclude if good data on consumer surplus for the study site is not available. In the final summary of results, consumer surplus is counted as “uncaptured value” because it represents value that does not actually make its way into the economy.

Multipliers

Multipliers are used to estimate the indirect effects arising within the economy of the study site when direct expenditures in one industry are transferred through backward-linked industries to the economy. For example if \$1 spent on tourism accommodations leads to an additional 70 cents in the economy of interest, the multiplier would be 1.7 and the indirect impacts for each dollar spent in tourism would be 70 cents. NOTE: Multipliers should only be used if they are developed for an economy similar to the region of interest so that the estimates of indirect impacts are reliable. If you do not have applicable multipliers available, it may be preferable to not include multipliers in the valuation exercise.

To use this section of the worksheet:

- Provide a short description of the multiplier available
- Indicate whether you would like to include the multiplier estimate in the valuation
- Enter the multiplier value
- Enter the value of revenue being multiplied; for example if gross revenue from accommodation were \$20,000 and the multiplier was a tourism multiplier, you would enter 20,000 under the value of revenue being multiplied

The tool will then automatically calculate the indirect impacts by multiplying the gross revenue by the multiplier value and then subtracting the gross revenue (direct impacts). The tool will then sum all of the indirect impacts included and report this value on the “Rec & Tourism Summary” worksheet.

Recreation & Tourism Summary Worksheet

This worksheet lists all of the values calculated throughout the tool. Total direct economic impacts are equal to the total values estimated for accommodation, diving, snorkeling and boating, and marine parks as well as other revenues from the “Other Values” worksheet. Total indirect impacts are estimated in the multiplier calculation(s) on the “Other Values” worksheet. Uncaptured values from local use and consumer surplus are then added to total direct and indirect impacts to give the total economic impact of reef-related tourism and recreation. The “export to spreadsheet” button enables users to export and save final results in a separate sheet.

Scenarios Worksheet

As with the sensitivity analyses included earlier in the tool, this worksheet enables the user to vary different components of the total economic impact of reef-related tourism and recreation. To increase the value of a certain parameter by 1% click on the up arrow in its corresponding row and to decrease the value of a certain parameter click on the down arrow in its corresponding row. You may also directly enter percentages into the appropriate box in the percent change column. Changes in the parameters will be reflected in the table below the parameters list and the bar graph to the right.

This feature allows a user to explore the sensitivity of the valuation results to particular assumptions. It can be used to establish error bounds around estimates, or to explore alternative potential futures.

Appendix I. Calculations used in the Tourism and Recreation Valuation

1. Accommodation component

1a. Reef related Accommodation revenues

- i. Using default values for the accommodation sector as a whole

$$\text{Gross Room Revenue} = \text{Occup_Rate}_i \times \text{Room_num}_i \times \text{Room_cost}_i \times \text{Acc_Num}_i \times \text{Reef_Usage}_i$$

Where:

Occup_Rate_i = Average occupancy rate (% of 365 days when rooms are occupied) in study site i

Room_num_i = Average number of rooms per accommodation in study site i

Room_cost_i = Average cost of room in study site i

Acc_Num_i = Number of accommodations in study site i

Reef_Usage_i = % of total visitors who visit coral reefs or coralline beaches in study site i

- ii. Using default revenues by accommodation type

$$\text{Gross Room Revenue} = \sum \text{Occup_Rate}_{i,j} \times \text{Room_num}_{i,j} \times \text{Room_cost}_{i,j} \times \text{Acc_Num}_{i,j} \times \text{Reef_Usage}_{i,j}$$

Where:

$\text{Occup_Rate}_{i,j}$ = Average occupancy rate for accommodation type j in study site i

$\text{Room_num}_{i,j}$ = Average number of rooms per accommodation type j in study site i

$\text{Room_cost}_{i,j}$ = Average cost of room in accommodation type j in study site i

$\text{Acc_Num}_{i,j}$ = Number of accommodations of accommodation type j in study site i

$\text{Reef_Usage}_{i,j}$ = % of visitors to accommodation type j who visit reefs or coralline beaches in study site i.

- iii. Using individual accommodation information

$$\text{Gross Room Revenue} = \sum \text{Occup_Rate}_{i,k} \times \text{Room_num}_{i,k} \times \text{Room_cost}_{i,k} \times \text{Acc_Num}_{i,k} \times \text{Reef_Usage}_{i,k}$$

Where:

$\text{Occup_Rate}_{i,k}$ = Average occupancy rate for accommodation k in study site i

$\text{Room_num}_{i,k}$ = Average number of rooms per accommodation k in study site i

$\text{Room_cost}_{i,k}$ = Average price of room in accommodation k in study site i (average prices by season if available)

$\text{Reef_Usage}_{i,k}$ = % of visitors to accommodation k who visit the reefs or coralline beaches in study site i.

1b. Accommodation Costs

$$\text{Total_Wages} = \text{Wage}_i \times \text{Hours}_i \times \text{Weeks} \times \text{Employee_Number}_i \times \text{Room_Number}_i \times \text{Acc_Num}_i \times \text{Reef_Usage}_i$$

Where:

Wage = average hourly wage in study site i (if available, average wage in the hotel industry)

Hours = average hours worked per week by accommodation staff in study site i

Weeks = weeks worked per yr (52 assumed)

Employee_Number = average numbers of employees per room in study site i

Room_Number = average number of rooms per hotel in study site i

Acc_Num_i = total number of accommodations in study site i.

Reef_Usage_i = % of visitors who visit coral reefs or coralline beaches in study site i

Total Non-Labor Operating Costs = Percent_Non_Labor X Gross_Room_Revenue

Where:

Percent_Non_Labor = percent of gross revenue from the accommodation sector that is spent on non-labor operating costs (average percentage is estimated for the study site)

Gross_Room_Revenue = gross revenue from rooms in accommodation sector

1c. Net Revenue Remaining in Country

Net_Revenue = Gross_Room_Revenue – Wages – Total Non-Labor Operating Costs

Net Revenue Remaining in Country = Net Revenue X (1-Leakage_i)

Where:

Leakage_i = leakage rate or percentage of foreign-owned accommodations in region i

1d. Transfers Within the Economy

Total_Wages (see Total Wages calculation under *Accommodation Costs* above)

Service Charges = Gross_Room_Revenue X Service_Rate_i

Where:

Service_Rate_i = charge for service included on accommodation bills in region i

Taxes = Gross Room_Revenue X Tax_Rate_i

Where:

Tax_Rate_i = tax rate charged on accommodation revenues in region i

1e. Total Reef-Related Accommodation Value

Total Reef-Related Accommodation Value = Net Revenue Remaining in Country + Total Wages + Service Charges + Taxes

2. Dive Component

2a. Dive Revenues

$$\text{Dive_Revenues} = (\text{Dives}_i \times \text{Price}_i) + (\text{Certifications}_i \times \text{Cert_Price}_i) + (\text{Rentals}_i \times \text{Rental_Price}_i)$$

Where

Dives_i = Number of dives occurring in region i as calculated through multiple available methods

Price_i = Price of dives in region i as calculated through multiple available methods

Certifications_i = Number of certifications issued in study site i

Cert_Price_i = Price of certification in study site i

Rentals_i = Number of equipment rentals occurring in study site i as calculated by multiple available methods

Rental_Price_i = price of equipment rental as calculated by multiple available methods

2b. Dive costs

$$\text{Total Labor Costs} = \text{Percent_Labor} \times \text{Dive_Revenue}$$

Where:

Percent_Labor = percent of gross revenue that is labor operating costs

Dive_Revenue = gross revenue from diving sector

$$\text{Other Costs} = \text{Percent_Non_Labor} \times \text{Dive_Revenue}$$

Where:

Percent_Non_Labor = percent of gross dive revenue that is non-labor operating costs

Dive_Revenue = gross revenue from diving sector

2c. Net Dive Revenue

$$\text{Net Dive Revenue} = \text{Dive_Revenue} - \text{Total Labor Costs} - \text{Other Costs}$$

2d. Transfers Within the Economy

$$\text{Total Wages} = \text{Percent_Labor} \times \text{Dive_Revenue}$$

Where:

Percent_Labor = percent of gross revenue that is labor operating costs

Dive_Revenue = gross revenue from diving sector

$$\text{Service Charges} = \text{Dive_Revenue} \times \text{Service_Rate}_i$$

Where:

Service_Rate_i = charge for service included on diving bills in study site i

$$\text{Taxes} = \text{Dive_Revenue} \times \text{Tax_Rate}_i$$

Where:

Tax_Rate_i = tax rate charged on diving revenues in study site i

2e. Total Diving Valuation

Total Diving Valuation = Net Dive Revenue + Total Wages + Service Charges + Taxes

3. Snorkel and Boat Component

3a. Snorkel and Boating Revenues

$\text{Snorkel_Revenue} = (\text{Snorkels}_i \times \text{Price}_i) + (\text{Rentals}_i \times \text{Rental_Price}_i)$

Where

Snorkels_i = Number of snorkel trips occurring in study site i as calculated through multiple available methods

Price_i = Price of snorkel trips in study site i as calculated through multiple available methods

Rentals_i = Number of snorkel equipment rentals occurring in study site i as calculated by multiple available methods

Rental_Price_i = price of snorkel equipment rental as calculated by multiple available methods

3b. Snorkel and boating costs

Total Labor Costs = $\text{Percent_Labor} \times \text{Snorkel_Revenue}$

Where:

Percent_Labor = percent of gross revenue that is labor operating costs

Snorkel_Revenue = gross revenue from snorkel and boating sector

Other Costs = $\text{Percent_Non_Labor} \times \text{Snorkel_Revenue}$

Where:

Percent_Non_Labor = percent of gross snorkel revenue that is non-labor operating costs

Snorkel_Revenue = gross revenue from snorkel and boating sector

3c. Net Snorkel Revenue

Net Snorkel Revenue = $\text{Snorkel_Revenue} - \text{Total Labor Costs} - \text{Other Costs}$

3d. Transfers Within the Economy

Total Wages = $\text{Percent_Labor} \times \text{Snorkel_Revenue}$

Where:

Percent_Labor = percent of gross revenue that is labor operating costs

Snorkel_Revenue = gross revenue from snorkel and boating sector

$$\text{Service Charges} = \text{Snorkel_Revenue} \times \text{Service_Rate}_i$$

Where:

Service_Rate_i = charge for service included on snorkel and boating bills in study site i

$$\text{Taxes} = \text{Snorkel_Revenue} \times \text{Tax_Rate}_i$$

Where:

Tax_Rate_i = tax rate charged on snorkel and boating revenues in study site i

3e. Total Snorkel and Boating Valuation

$$\text{Total Snorkel and Boating Valuation} = \text{Net Snorkel Revenue} + \text{Total Wages} + \text{Service Charges} + \text{Taxes}$$

4. Marine Park Component

4a. Gross Revenue

$$\text{Marine_Revenue} = \sum \text{Visitor}_{i,k} + \text{Marine_Vessel}_{i,k} + \text{Other}_{i,k} + \text{Taxes}_{i,k}$$

Where:

$\text{Visitor}_{i,k}$ = fees charged to visitors to marine park k in study site i

$\text{Marine_Vessel}_{i,k}$ = fees charged to operators of marine vessels in marine park k in study site i

$\text{Other}_{i,k}$ = other fees charge at marine park k in study site i

$\text{Taxes}_{i,k}$ = taxes collected from users of marine park k in study site i

4b. Net Marine Park Revenue

$$\text{Net Marine Park Revenue} = \sum (\text{Marine_Revenue}_{i,k} - \text{Collection}_{i,k})$$

Where :

$\text{Marine_Revenue}_{i,k}$ = gross revenue from marine park k in study site i

$\text{Collection}_{i,k}$ = collection costs for marine park k in study site i

5. Local Use Component

5a. Coralline Beach Local Use Benefits

$$\text{Coralline_Beach_Benefits}_i = \text{Wage}_i \times \text{Pop}_i \times \text{Percent}_i \times \text{Visits}_i \times \text{Length_Visit}_i$$

Where:

Wage_i = average hourly wage in study site i

Pop_i = population of study site i

Percent_i = percent of local population of study site i visiting coralline beaches for pleasure

Visits_i = average number of visits per person to coralline beach for pleasure in study site i

Length_Visit_i = average length of visit to coralline beach in study site i

5b. Local Use Reef Recreation Benefit

Reef_Recreation_Benefits_i = Wage_i X Pop_i X Percent_i X Visits_i X Length_Visit_i

Where:

Wage_i = average hourly wage in study site i

Pop_i = population of study site i

Percent_i = percent of local population of study site i engaging in reef recreation outside of organized tours

Visits_i = average number of visits per person for reef recreation outside of organized trips in study site i

Length_Visit_i = average length of visit for reef recreation outside of organized trips in study site i

5c. Total Local Use Benefit

Total Local Use Benefit = Coralline_Beach_Benefits_i + Reef_Recreation_Benefits_i

6. Other Values

6a. Other Revenue

Other_Revenue = \sum Revenue_Source_{i,k} X Reef_Usage_i X (1-Non_Labor_{i,k})

Where:

Revenue_Source_{i,k} = gross revenue from other revenue source k not already captured in tool for study site i

Reef_Usage_i = percent of visitors using the reef in study site i (if applicable to prorate revenue source k)

Non_labor_{i,k} = percent of gross revenue for revenue source k that is non-labor operating costs in study site i

6b. Consumer surplus

Diving Consumer Surplus = Dive_Revenue X CS_Factor

Snorkel Consumer Surplus = Snorkel_Revenue X CS Factor

Total Consumer Surplus = Diving Consumer Surplus + Snorkel Consumer Surplus

Where:

Dive_Revenue = gross revenue from diving component

Snorkel_Revenue = gross revenue from snorkel component

CS Factor = factor relating consumer surplus to diving or snorkeling sectors, respectively

6c. Multipliers

Indirect Impacts = Gross_Revenue_{i,k} X (Multiplier_{i,k} - 1)

Where:

Gross_Revenue_{i,k} = gross revenue in study site i coming from economy sector k

Multiplier_{i,k} = multiplier developed for economy sector k in study site i (ideally)

Appendix II. Data Requirements for Tourism and Recreation Coral Reef Valuation Tool

1. Accommodation Component

At a minimum, to fully calculate this component, you will need:

- Average hourly hotel wage
- Hours worked per week per employee
- Employees per room
- Non-labor operating costs as a percentage of gross accommodation revenue
- Tax rate
- Service charge
- Leakage estimate
- Average room rate for accommodation sector as a whole
- Average occupancy rate for accommodation sector as a whole
- Average number of rooms for accommodation sector as a whole
- Number of accommodations in study area
- Percent of visitors using reef

For more specific and accurate calculation, you could include the number of rooms, occupancy rate, and room rate by either accommodation type or individual accommodation

2. Diving Component

At a minimum, to fully calculate this component, you will need:

- Total annual visitors to study site
- Percentage of visitors diving
- Average number of dives per diver
- Average price of dive
- Number of dive certification
- Price per dive certification
- Proportion of dives taken at all-inclusive resorts
- Average price per dive of equipment rental
- Proportion of all dives with equipment rental
- Percent of gross revenue for labor costs in diving
- Percent of gross revenue for other costs in diving
- Tax rate in diving
- Service charge in diving

For more specific and accurate numbers, you may estimate the number of dives using specific number of divers (in marine park or otherwise), prices by type of dive, and individual dive shop information on number of divers, dive price, equipment rentals, and equipment rental prices.

3. Snorkel and Boating Component

At a minimum, to fully calculate this component, you will need:

- Total annual visitors to study site
- Percentage of visitors snorkeling
- Average number of snorkel trips per snorkeler
- Average price of snorkel trip
- Proportion of snorkel trips taken at all-inclusive resorts
- Average price per snorkel trip of equipment rental
- Proportion of all snorkel trips with equipment rental
- Percent of gross revenue for labor costs in snorkeling
- Percent of gross revenue for other costs in snorkeling

For more specific and accurate numbers, you may estimate the number of snorkel trips using specific number of snorkelers, prices by type of snorkel trip, and individual snorkel operator information on number of snorkelers, snorkel trip price, snorkel equipment rentals, and snorkel equipment rental prices.

4. Marine Park Component

At a minimum, to fully calculate this component you will need:

- Fees collected (visitor, marine vessel, or other)
- Any taxes collected if applicable
- Collection costs if applicable

5. Local Use Valuation

At a minimum, to fully calculate this component you will need:

- Population of study area
- Average hourly wage
- Percentage of local population visiting coralline beaches for pleasure or engaging in reef recreation outside of organized trips
- Average number of visits per person per year (to coralline beaches and for reef recreation)
- Average duration of visit (to coralline beaches and to reefs for recreation)

Appendix III. Glossary

All-inclusive resorts: hotels/resorts that offer package deals that include room, meal, and recreation costs, including reef-related activities such as diving, snorkeling, and reef tours.

Area of Coral Reefs: total area of coral reefs in the study site. For a comparison of three recent estimates of reef extent in Caribbean countries, see Appendix A, Table A1 in *Reefs at Risk in the Caribbean* (Burke et al. 2004): http://pdf.wri.org/reefs_caribbean_app1.pdf. Reef estimates are sensitive to the definition of coral reef, as well as the data sources and mapping techniques used.

Area of Mangroves: land area currently covered by mangroves in the study site. The user may decide to limit this to mangroves within 1 km (or another reasonable distance) from the coast.

Average unit price of Reef Fish / Shellfish: market price of reef-associated fish or shellfish, preferably by species, averaged over the course of 1 year. Market price tends to vary seasonally; average price can be weighted, if the user has the data and wishes to be more precise.

Coastal Shelf Area (to 30 meter depth): If detailed local data is not available, shelf area estimates for many Caribbean countries can be found in Appendix A, Table A2 in *Reefs at Risk in the Caribbean* (Burke et al. 2004): http://pdf.wri.org/reefs_caribbean_app1.pdf. Shelf areas in *Reefs at Risk* were defined based on a bathymetric data set developed at WRI from depth point data from the Danish Hydrologic Institute's (DHI) C-MAP data product, interpolated at 1-km resolution.

Consumer Surplus: the difference between the total value consumers receive from a good or service and the total amount they pay for it. This is calculated by analyzing the difference between what consumers are willing to pay for something and its market price. In the case of reef recreation, for example, divers often state that they would have been willing to pay \$X more than the actual price charged.

Coral Reef Valuation Tool: The Tool is made up of two separate components: the *Fisheries Valuation*, the *Tourism Valuation*.

Current Exchange Rate: So that the final values can be in a single currency, the Tool requires users to enter the current exchange rate between local currency and the US dollar. Both current and historic exchange rates are available online at sites such as *oanda.com*. If available data on fisheries, tourism, etc. are primarily a year or two old, the average exchange rate from that earlier year can be substituted for the current rate. *Note: The Tourism Component is implemented in \$US only, while the Fisheries Component offers the option of enter data in the local currency.*

Discount Rate: the interest rate at which an agent discounts future events in preferences in a multi-period model. A present-oriented agent discounts the future heavily and thus has a *high* discount rate.

Gross revenue: total revenues (income from sales) collected by a business or industry

Land Area: the total land area, including land under crops, urban land, forested land, etc. within the study site.

Land area under Permanent Crops: land cultivated with crops that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee and rubber; this category includes land under flowering shrubs, fruit trees, nut trees and vines, but excludes land under trees grown for wood or timber.

Leakage rate: the percentage of tourist spending that leaves the country (does not benefit the local economy), due to foreign ownership or reliance on imports. In the Tool this is measured only in the accommodation sector, by estimating the percentage of total hotels that are foreign owned.

Local Currency: the currency used in the site, if different from United States (US) dollars.

Local Use: Local use of a natural resource for recreation or enjoyment. In the Tourism Tool, this includes visits to coralline beaches and visits to reefs outside of the context of an organized trip.

Marine Protected Area: any area of the intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment (*IUCN World Conservation Union*).

Multipliers: Multipliers are used to capture the indirect impacts arising within an economy of interest as the expenditures in one industry filter through its backward-linked supplying industries.

Net Revenue: total revenue (income from sales) collected by a business minus the total costs of running that business.

Occupancy Rate: ratio that shows rooms sold over a fixed period of time as a percentage of total available rooms in a property over the same period of time.

Operating costs:

Labor costs: the amount a business spends on paying its employees. In the Tool, this is sometimes calculated by multiplying average wage in the industry by number of employees and hours worked. For industries where this information is more difficult to collect, average labor costs for the industry can be estimated as a % of gross revenue.

Non-labor operating costs: all expenses incurred by a business except payment of wages, expressed as a % of gross revenue.

Population of site: total population living within the area being studied (if a national-level valuation - national population).

Population within 10km of the coast: total population living within 10km of the coast. (There may or may not be a reef present at the coast).

Reef Extent: see **Area of Coral Reefs**

Reef Productivity: Average weight of fish and shellfish produced (caught?) per unit area of coral reef over a one-year time period. Similar to Maximum Sustainable Yield (MSY) per unit area.

Sensitivity analysis: investigation into how the output of the model – in this case, economic value – varies along with changes in the key assumptions on which the estimates are based.

Service Charge: A percentage of the bill (usually 10% to 20%) added to the guest charge for distribution to service employees in lieu of direct tipping.

Stay-over Visitors: includes visitors staying in the country at least 24 hours.

Study Area: The geographic area included in the coral reef valuation. This may be a region, country, island, or sub-national site such as a Marine Protected Area.

Transfers:

To the economy: Includes wages and service charges, for example, which transfer to the economy to be spent by the employees in a given industry elsewhere in the economy.

To the government: Includes taxes as these involve the movement of money from expenditures in a given industry to the government.