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Second expert group meeting  
Development of economic frameworks in support of an assessment of  
the economic and social impacts of climate change in the Caribbean  
Port-of-Spain  
2-3 February 2012

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**REPORT OF THE SECOND EXPERT GROUP MEETING  
DEVELOPMENT OF ECONOMIC FRAMEWORKS IN SUPPORT OF AN  
ASSESSMENT OF THE ECONOMIC AND SOCIAL IMPACTS OF CLIMATE  
CHANGE IN THE CARIBBEAN**

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## **A. DECISIONS AND RECOMMENDATIONS**

1. The following decisions and recommendations were adopted:
  - (a) Consultants should seek to collect to the extent of availability, quarterly and monthly data, which would facilitate more accurate modeling of the impacts of climate change in the subregion
  - (b) Consultants should aim to start all series at 1970 for all sectors
  - (c) Copies of letters of introduction would be provided to the consultants. Also, national focal points would provide communication about the project and the role of the consultant to other national stakeholders, in order to facilitate the data collection process in the respective country
  - (d) Data should be supplemented from national censuses, multilateral agencies, and ECLAC sources
  - (e) In cases where inconsistencies in data sources are detected, priority should be given to national data sources
  - (f) Consultants should provide broader policy documents which would serve to explain the context, policy, and future development strategies for each sector in each country as these may be relevant to the analysis of the data in the future.

## **B. ATTENDANCE AND ORGANIZATION OF WORK**

### **1. Place and date**

2. The second expert group meeting, “Development of Economic Frameworks in Support of an Assessment of the Economic and Social Impacts of Climate Change in the Caribbean” was convened by the ECLAC Subregional headquarters for the Caribbean, from 2-3 February 2012 in Port of Spain.

### **2. Attendance**

3. International experts as well as resource persons recruited to collect national data in the areas of agriculture, coastal and marine resources, energy, health, tourism and water attended the meeting. The Caribbean Community Climate Change Centre (CCCCC) and the Caribbean Community (CARICOM) were also represented. The list of participants can be found at Annex I.

### **3. Agenda**

4. The meeting adopted the following agenda:
  1. Opening of the meeting
  2. Adoption of the agenda
  3. Data requirements for:
    - a. The agriculture sector
    - b. The coastal and marine sector

4. Data requirements for:
  - c. The energy and health sectors
  - d. The tourism and water sectors
5. Data collection to determine the economic and social impacts of climate change in the Caribbean
6. Conclusions and recommendations
7. Closure

## **C. SUMMARY OF PROCEEDINGS**

### **1. Opening of the meeting**

5. Charmaine Gomes, Coordinator of the Sustainable Development Unit, ECLAC Subregional headquarters for the Caribbean, opened the meeting and reminded participants of the objectives of the initiative. She referred to the first expert group meeting that provided a forum for preparation of the lists of data by sector. These lists were provided to national data collectors who were recruited from the sixteen participating countries with a view to standardizing the process of data collection and to ensuring quality control of data. She stated that the expectation of the data collectors was to devote the required time to the process but she also recognized that some data sets were not available. Ms. Gomes indicated that this meeting would provide the forum for national data collectors to present the data and metadata already collected and to highlight the challenges that had been encountered. It was expected that these challenges would be addressed by the meeting with a view to identifying solutions.

### **2. Adoption of the agenda**

6. The provisional agenda was adopted.

#### **3a. Data requirements for the agriculture sector**

7. Antigua and Barbuda - Data currently collected included rainfall, average mean and low temperature, incidence of extreme events, consumer price index (CPI) and number of boats.

8. Data on average wind speed, humidity and agricultural production remained outstanding. In a few cases, contact had been with data sources within the agricultural subsectors and data would be forthcoming. In particular, humidity data from the meteorological office and livestock data were anticipated. There were still challenges with making contact with focal points and meeting with the relevant agencies remained a challenge.

9. Bahamas - Data currently collected included climatic data from the 1960s. Up to the time of the meeting, this national consultant had not met with relevant stakeholders and data producers to obtain other data, and as such, the data obtained thus far were based on previous research. Information on extreme extents was available; however there were challenges with obtaining data on costs of damage and loss to the agricultural sector. Legislation on land use had been passed and data should become available. A Geographic Information System (GIS) dataset was only available for some of the islands.

10. Among the challenges identified was the fact that data for all the islands varied by island. Nassau data were easily available whereas that from the rest of the islands was sporadic. A formal request for the data would enhance access to data. Additionally, data on farm size, pesticides, herbicides and production were difficult to source. With respect to the availability of data from online sources, it was stated that

annual reports had been produced for some years, but such publications were not made available for electronic distribution. Reports were only available in hard copy within the respective departments. The Chair advised that data published in annual reports and which were available in the public domain should be accessed and used to fill current data gaps.

11. Other challenges included the unavailability of electronic copies of annual reports creating the necessity to schedule individual meetings to request data. Challenges in collecting data on farm level production were anticipated. With respect to the use of pesticides, there was some measure of uncertainty about import of pesticides, thus a problem in determining what farmers were using was envisaged. Damage costs for crops and livestock were not calculated. In terms of accessing time series data, the consultant was advised that data could not be distributed until prior approval was obtained from the relevant authority.

12. In attempting to address the challenge of lack of data from all islands it was suggested that data from representative islands should be collected. In response, the Chair noted that the degree of “representativeness of the data” could not be determined blindly, and would therefore necessitate some analysis of the information on the other islands. As such, it was recommended that as far as possible, efforts should be made to collect all available data. It was decided that individual island data should be found and the use of representative data from other relevant sources should be a decision for the modellers.

13. The participants indicated that it would be necessary to know for which islands data are unavailable. Also, it deemed useful to identify variables that are available in each island for level of production. The need to confirm which datasets were accessible in the public domain was necessary. In terms of actions taken to secure data, the consultant indicated that letters to focal points were circulated on Monday 30 January 2012 and plans were made to schedule meetings with department heads.

14. As a general comment to the consultants, Mr. Bynoe noted the limitation of annual data in capturing seasonal variations and patterns and noted that disaggregated data (monthly or quarterly data) would better explain those nuances that were typical of the agriculture sector. In light of that, an appeal was made for consultants to gather monthly or quarterly data where available.

15. The issue of collecting long time series of monthly data was reiterated by the Chair in response to an intervention from Ms. Elizabeth Emanuel who identified the format of archived data as a challenge. She observed that data (monthly and quarterly) that dated as far back as 1970 were available for Jamaica but only in hard copy. The challenge was in transcribing the long time series into electronic format.

16. In the discussion that ensued, consultants noted that in some cases there was reluctance on the part of some data producers to make data available as they did not have an appreciation of how that information would be used. It was therefore suggested that ECLAC could assist with facilitating more collaboration by sending out letters of introduction to the respective agencies and data producers.

17. ECLAC mentioned that letters were sent to Ministries of Foreign Affairs and consultants would be provided with copies of the letters.

18. Barbados - Substantial climatic data from the 1970s were collected. Fisheries data were also available.

19. In terms of challenges it was stated that data on production and other aspects of agriculture were very scarce. Many of the data sources have been identified and located but not yet collected. In addition, there were issues with sensitive data and in particular, information on pelagic fisheries was treated as a

“national secret”. There was difficulty in interpreting what data were needed, for example, size of different types of vessels used in fisheries, length of time at sea and vessel capacity. Some agencies provided information rather than data. Also there was an instance when the data producer directed the consultant to the website of the Food and Agricultural Organization (FAO) of the United Nations which did not provide the information.

20. The consultant stated that there was a good confidence level in available data. As fisheries data for Barbados were very difficult to collect, ECLAC suggested that the CARICOM Regional Fisheries Mechanism (CRFM) was a good depository of data. It was also suggested that hard copies could be examined and a camera used to capture the data which could then be entered in spreadsheets.

21. Mr. Oderson alerted the discussants to his challenge with getting permission to access the data which hindered the data collection exercise. In response, the Chair advised consultants to first collect data from the public domain rather than requesting agencies to provide the complete series of data.

22. In clarifying the issue of “interpretation of variables”, the Chair and other representatives indicated that the type and size of boats could be recorded in terms of length of the boat. Propulsion and fishing gear could be used as subgroups for disaggregation as well as other features such as the capacity of boat in terms of horse power and the length of time vessels spend out at sea.

23. Belize - Farm size and land tenure data were available and could be accessed through extension officers. Data on technology use in livestock research and development have been referred to the extension officers. It was stated that national library archives currently housed data from 1970.

24. Climatic data have been collected and service employees have been readily providing data as far back as 1960. CPI data have been obtained from the Statistical Institute of Belize but livestock data needed to be collected from several other sources.

25. Challenges arose in the availability of quarterly data as most data were collected annually. Data on changes in land use were difficult to obtain and as such related information from studies that have been published would be accessed.

26. The Ministry of Agriculture had been supportive in the data collection exercise. A letter stating the purpose for the data will accelerate the process of data collection. Dr Bynoe indicated that in terms of land use, the climatological impact should be the point of focus and advised that it would be more appropriate to examine which areas were drier or wetter and that information could be extracted. These data could then be disaggregated.

27. The consultant mentioned that data would be obtained from extension officers and the Chair mentioned that these officers would be able to give some more concrete information on changes, over time, in terms of the technologies used in agriculture. It would be good qualitative information although not applicable to modelling.

28. ECLAC stated that conducting land use surveys are expensive. Belize recently conducted an agriculture census and information was collected on land use holdings. There were challenges with compiling the data. CARICOM indicated that land use is a very important variable for looking at climate change patterns but the information in the region on that area was sparse. CARICOM also mentioned that there was an initiative conducted by the Caribbean Network for Integrated Rural Development on land use patterns and that study could be a source of data on agriculture. In responding to the challenge of availability of data in Belize, it was suggested that a study (1989- 1992) had been done and this could be a

source of data and information. The Chair indicated that FAO may be a good source of data on land under housing and agriculture.

29. Cuba - Data collected included irrigation data and types of crops. However, it was noted that the data were by crop type only. The data collector mentioned that there was a different classification of data on soil types by area in Cuba and there were different genetic types of soil. Information on the level of food storage capacity existed but no authorization had been obtained from the Ministry of Agriculture to access these data. Data were not recorded on size of farm. Data on irrigation was available by type of crop but not by flooding or drip irrigation. Financial and production information at farm level were not collected and most data were published annually. In the case of fisheries, five boat types were used.

30. CARICOM observed that the sugar industry was one of the dominant sectors in Cuba and data on this sector should be available. Recreational fishing data should also be collected.

31. Dominica - Data on GDP by sector, 2000-2010, population data by region and age group have been collected. Climate data from 2 airports have been gathered. Data ranging from 2001-2009 on imports of pesticides by type as well as fisheries data on registered vessels for the period 2007-2009 have been collected.

32. There was a gap in data from 1984-1994 and no data on livestock had been obtained owing to inaccessibility from the Ministry of Agriculture.

33. Dominican Republic - In some cases information from the private sector were available but the reliability was uncertain. It was mentioned that some information was available but there were gaps in the time series. A problem was that the country was preparing for political elections, so most people were afraid of giving information because they thought they would lose their jobs. In the agriculture sector information was provided by three or more institutions and all needed to be accessed.

34. Some information was not available electronically. The consultant enquired if data from all 30 climatological stations should be documented or if an average was adequate. The Chair responded that data by province should be gathered and these could be linked to the region. It was recommended that available data be collected and then estimates could be used to fill the gaps. ECLAC mentioned that only official data should be collected and where there are gaps or where data were only available from private sources, they could be collected but footnotes should reflect the situation.

35. Grenada - Data on humidity, incidence of extreme events, total input quantities, CPI, and changes in land use have been obtained. It was necessary to obtain data on billfish festivals and the yachting sector. Information on pelagic fisheries have been sourced but not submitted to ECLAC.

36. Data gaps included soil type by output and total imports (including VAT). Data on growth enhancers / medication for livestock were not disaggregated. Farm level production data were difficult to access and data on subsistence fishing were not available.

37. Guyana - Data on rice and sugar were collected but data on other crops were not available. Rainfall data have also been gathered but were only available for coastal areas and this would introduce an inaccuracy if data for the interior were not represented. This was also applicable to land use data so that data for both the coastal areas and the interior would need to be collected. Data on fertilizer use presented a challenge as in certain parts of the country purchase of fertilizers did not pass through the formal business arrangements and as such those data were not reported. The Forestry commission had data on geology and mines and these data from different sources would need to be collated. Farm level production data were not collected.



38. In the area of fisheries, many boats were not registered so accessing such data would be a challenge. Greatest challenge was with farm level production – large variation in size and method of data collection. Some people with large farms did not collect data for fear of taxation. For larger scale operations, data were generally more readily available.

39. Jamaica - It was noted that in some agencies it was a matter of getting the right contact to get the data and much success was reported in collection of all data.

40. Saint Kitts and Nevis - It was necessary to complete the economic database and consultations were being held with the statistics department as well as with relevant ministries to obtain estimates. It was noted that data from Saint Kitts was easily accessible but Nevis presented a challenge. The data from both countries needed to be compiled and gaps in data for Nevis should be provided as footnotes. In an intervention, the representative of CARICOM alerted participants to the various Dev Info applications which had been developed by member states and which houses a range of national data.

41. Saint Lucia - Data on soil type, climate and CPI were collected. Monthly data on import quantities were available from 2000 – 2009. Changing land use data were extracted from previous censuses and therefore were only available in 10 year gaps. Information on harvest (farm-gate) was available for crops sold to supermarkets and hotels. Annual data on fertilizers and pesticides were available and information pertaining to research and development under the sub groups of crops and livestock was obtained from interviews with stakeholders.

42. Data on extreme events were available but they did not identify loss of income. ECLAC mentioned that the ECLAC post-disaster assessments did provide data on losses incurred as a result of extreme events.

43. The Ministry of Agriculture published some data (in long series starting from 1970) on their website but the files were available only in project document format and required conversion and cleaning. Data on labour were unavailable. Information on irrigation methods/ practices could be obtained however the required data on type of irrigation per hectare was not available. In terms of production technology, data on greenhouses only were available. In this regard, extension officers could be helpful. Information on pests, diseases and infestations such as black sigatoka, pink mealybug and African snails could be obtained. However data on the incidence of infestation and damage costs were not available. Data on livestock were limited to broilers, poultry and pigs.

44. Fisheries data were collected monthly but only published yearly and it was stated that lack of technology limited the fisheries department's ability to produce data on the various species.

45. Difficulties were encountered in contacting the right resource persons who would be able to provide the required information. There were further challenges by the time allocated to obtain the data. It was recommended that consultants be provided with copies of official correspondence to national ministries.

46. Saint Vincent and the Grenadines - The consultant from Saint and the Grenadines noted that data from the fisheries sector had been collected for the period 2005 to 2010. Additional data would be submitted at a later date; however, because the data were not all housed in the same place the data collection process was a bit slowed. All indicators for the sector were collected, except for ex-vessel landed value – which was defined as the illegal selling of goods out at sea; therefore the goods were not classified as landed catch. It was noted that the data collected from the fisheries division was based on monthly data and it was indicated that another 10 years of additional data could be available. The

consultant highlighted that data on the number of trips taken by fishermen may have been lost, due to inconsistent record keeping. Species data, in terms of weight and landing sites were collected from 2005 to 2010.

47. Additionally, agricultural data for major crops, such as, ginger, dasheen, yam, eddoes (quantity and value in EC\$) from 2006-2010 were available. The data were collected in terms of the amount exported based on the value of the cost for exporting specific poundage. Although there were production estimates data for mangoes, peanuts, plantain, pumpkin, eddoes, coconut, tannia, yam, cassava and bananas for 2006 and 2010, this did not necessarily correspond to all of the production years. In response to a suggestion that production information could be retrieved from farmer groups, it was explained that such groups mainly existed for banana producers but not for general crops. However, there were some entities from which it would be possible to source some data.

48. Suriname - Thirty percent of the requested data had been received and it was necessary to convert data digitally. Conversion of data on livestock to the acceptable format had to be done and these data were only available annually. Farm level production data in terms of size, commodity and type of farm were inaccessible and irrigation data according to type was unavailable. With respect to the fisheries sector, 30% of the data were not usable and data on cost values and processing costs appeared to be unavailable. It was necessary to obtain data on extreme events and reference was made to the floods of 2006.

49. The consultant enquired about discrepancies in data from different sources, for example, data from FAO and what is produced by the statistical office. It was noted that it is best to use the official data on national statistics.

50. Trinidad and Tobago - Data sets were minimal and available in 10 year series. Data on farm machinery were collected but expressed in different units (kg and numbers). Farm level data and data on farm family labour and greenhouses were not available and there were challenges in obtaining data on livestock production especially in terms of medication used.

51. In the fisheries, reports were published irregularly and number of vessels and trips per boat were produced as estimates.

### **3b. Data requirements for coastal and marine sector**

52. Antigua and Barbuda - The gaps in data collection for Antigua and Barbuda included dive revenue inputs and snorkeling and boating revenue inputs, along with local (non-visitor) user valuation. To address this, it was suggested that a dollar value structure be implemented which would also facilitate comparisons across countries. It was agreed that this method would be revisited by the consultant once all the country data was collected.

53. In the case of marine parks and related revenue there were some data available, which were managed by the Fisheries Division; however, the national management plan had not yet been implemented. The representative for CARICOM suggested the development of a carrying capacity benchmark for tourist sites which could facilitate comparison across the region. The Chair stated that the applicability of either calculating the carrying capacity for each country would be assessed or a single indicator for the analysis at the end of the data collection process could be used. This type information could be used to infer a national situation. He expressed his satisfaction with the status of data collection for the Coastal and Marine sector.

54. Bahamas - The national consultant for the Bahamas shared challenges with collecting data for snorkeling and diving as there was uncertainty as to whether or not these activities were tracked by the

authorities. However, it was indicated that a 2008 willingness to pay study could provide some guidance in these areas. It was expressed that there may be hesitation on the part of the Bahamian government to sharing the national GIS maps; however, the Caribbean Adaptation to Climate Change (CPACC) project could provide some useful information.

55. Barbados - The consultant for Barbados stated that he would submit a substantial amount of data by mid month for the coastal and marine sector including fisheries, assuring that he had good sources of information. With respect to marine parks there were no existing entrance fees and the modeling team would have to input a user fee in order to calculate the value.

56. Belize - The national consultant for Belize felt that an informal survey would be necessary to gather additional information to supplement existing information especially in the absence of reports. It was noted that consumer's willingness to pay over and above what was currently charged defined consumer surplus; however, there were some difficulties with this methodology. Studies on consumer surplus were conducted in Central America but there were a few hitches. During the discussions it was noted that GIS would play a significant role in estimating the cost of local land which was crucial for this sector. However, the meeting cautioned against the under or over-valuation of land in conducting such an exercise. It was also agreed that GIS would also provide information on erosion rates.

57. Cuba - The national consultant for Cuba explained that because of the structure of Cuba's economy some of the data were not available. Some of the challenging data areas were cruise ship data, recreational services (these data were not kept in official files and many activities were bundled together, making it difficult to disaggregate). It was mentioned that ownership of rooms did not apply as all hotels were state owned. The marine parks did not generate money, and there were scattered areas for diving. Furthermore, there were no official files on benefit and costs of such facilities. Issues with data on official fishers were encountered as records of catch did not exist. During the discussion it was noted that although historical data were not necessary for this sector, the consultants were encouraged to collect it. It was preferable to provide long time series, for example 10 years. Some of the variables which were essential for the assessment of the coastal and marine sector included water quality, mangroves and seagrass beds. In cases where data were deficient, proxies could be used.

58. Dominica - Difficulties with data collection were being experienced with respect to local fishing data, accommodation values and GIS. It was agreed that the average hourly wage rate per hotel be used to extrapolate a value for the sector.

59. Dominican Republic - The national consultant for the Dominican Republic discovered that several institutions had differing data which were conflicting. Although there was information on snorkeling, the dive data were not organized. Additionally, many of the dive areas were associated with hotels or private companies and not government owned, which posed a challenge for data gathering. Furthermore, there was no information on the cost per dive. The private sector housed plenty of this type of information. Information on reef users was still being accessed, but recreation information was easily accessed from the Ministry of Tourism.

60. Grenada - To date, information remained outstanding for local non-visitor use valuation in Grenada but a study conducted on user fees and a tourism valuation for Grenada had been identified as useful. No access to GIS data had been attained.

61. Guyana - The collection of data for the coastal and marine sector in Guyana was reported to be in progress. It was noted that data on marine park net revenues, dive revenue inputs and snorkel and boating revenue inputs were not applicable, as these activities were non-existent within the context of Guyana. Most of the fisheries related data appeared to be sporadic and/or not reliable.

62. Jamaica - In the case of Jamaica all required data were reported as available, with only some minor disaggregation calculations necessary to generate dive revenue inputs and snorkel and boating revenue inputs.

63. Saint Kitts and Nevis - Data collection for Saint Kitts and Nevis were also reported as in progress. Dive revenue inputs and snorkel and boating revenue inputs data would need to be sourced directly from the private sector which would require more time to access.

64. Saint Lucia - Sources of data for the coastal and marine sector had been identified in the case of Saint Lucia. Preliminary enquiries indicate that most of the data were available, with the exception of boats for the fisheries profile and the fisheries multiplier. Data on dive revenue inputs and snorkel and boating revenue inputs would need to be sourced from the private sector, which would be facilitated with an official letter from ECLAC.

65. Saint Vincent and the Grenadines - Saint Vincent and the Grenadines reported that no data had been collected on this sector yet. However, preliminary investigations show that most data were readily available. Data for marine park net revenues, dive revenue inputs, local user valuation, other values and the tourism multiplier would require more time to access and/or to confirm existence. Data from the tourism sector could be applicable to the coastal and marine sector. Regarding the Tobago Keys Marine Parks, there were no figures for reef quality; however, the consultant stated that some data from a PhD study on marine banks was available.

66. It was noted that GIS data maps did not specifically highlight erosion rates, unless it was specifically given by a particular agency. Saint Vincent and the Grenadines did not have a Coastal Zone Management Agency, but there was a chronological list of extreme events, which did not include costs. Furthermore, the National Emergency (NEMO) had information on tropical storms up to 2010, and the damage in terms of cost; however, the data were not disaggregated.

67. Suriname - Initial investigation into the availability of these data for Suriname indicated that it would be very difficult to collect. As in the case of Guyana tourism activities related to marine park net revenues as dive revenue inputs and snorkel and boating revenue inputs did not exist. It was anticipated that the rest of the data, where available, could be of poor quality and not adequate for the needs of the study. There could be a cost involved in accessing GIS data.

68. Trinidad and Tobago - To date, no data had been identified for local user valuation, other values, tourism multiplier, fish processing costs, commercial fisheries data, reef and coastal fish processing data by landing site, local fishing data and fisheries multiplier. The private sector would be consulted for data on dive revenues and snorkel and boating revenue inputs.

69. Discussion - Following the presentations on progress made with data collection for the coastal and marine sector a number of key issues were highlighted:

(a) It was noted that in the case of data for marine park net revenues, dive revenue inputs and local fishing data (namely (a), (c) and (d)) it was critical to focus on capturing a 'snap-shot' of the situation rather than attempting to engage in the challenging task of collecting historical series data. However, where this 'snap-shot' data were available periodically, it should also be included in the final data set. The ideal would be if each country collected representative data for a specific year (2010), or the closest possible year. For other variables, a 5-10 year series would be adequate.

(b) The importance of collecting GIS data could not be emphasized enough, as data reflected on maps also captured ‘snap shot’ information for the sector. GIS data had been requested in both numerical value form (Excel) and graphic form (jpeg, tiff or bitmap). It was urged that data on vulnerable infrastructure be recorded within the 5-10 mile buffer zone of the coastline. In the case of small islands such as Saint Lucia, where this could be a challenge, data collectors should aim for the 5 mile mark. The definition of the coastal zone extended to a depth of 30 meters.

(c) Data collectors were encouraged to be creative in sourcing data which were either owned by the private sector or did not exist. The conduct of interviews or the administering of small surveys to collect information on local (non-visitor) user valuation would be considered. Local use of the beaches, reefs and wetlands for recreational purposes or artisanal fishing (pots, seine nets) must be captured. Other country specific considerations should also be taken into account. In Guyana for example, an important part of the economy was the maintenance of the sea wall and dykes, which also minimized flooding in villages upstream of the coastline. Mangrove reforestation projects which also brought positive impacts within the context of climate change should also be included in the final valuation of adaptation costs.

(d) Special consideration should be given to the energy sector as a user of coastal space in countries such as Cuba, Guyana, Jamaica and Trinidad and Tobago. The implications of these activities on the value of the coastal zone should be studied and the value of energy extraction should be calculated.

(e) In addition to the data requirements already specified, national data collectors were requested to identify data related to biodiversity (flora and fauna, number of species and their location, e.g., mangroves, reefs; densities, coverage, and other relevant units of measurement), as it was necessary to take into account resources which were not consumed directly but which still had a value (e.g. minerals on reefs which were not consumed). These data would cover near-shore fisheries such as species of mangroves, species of freshwater fish in brackish areas, species of coral and coral reef fish. Other considerations for the analysis included the change in wetland cover over time. It was suggested that this estimate could have been done through assessment of development along the coast over time. It was necessary to provide data from the most recent survey, and if possible, also data from previous surveys.

#### **4a. Data requirements for the energy and health sectors**

70. Antigua and Barbuda - Data collection for the health and energy sectors agencies was in the preliminary stage and persons (public utilities authorities) were identified and preliminary talks were conducted. GDP data had already been collected from the Eastern Caribbean Central Bank (ECCB). The West Indies Oil Company, the Statistics Division as well as other sources were contacted for energy data. On the other hand, no data were collected for the health sector, but the Health Information Division had been identified as a contact. Meeting with relevant officials who would facilitate access to repositories of data was a challenge.

71. The Bahamas - It was stated that an initial discussion with an engineer from the local electricity commission regarding access to the necessary data had been held and sharing of such data was pending approval by the relevant authorities. As such, letters were sent to the relevant supervisors requesting approval. Challenges encountered with collecting data included acquiring data on consumption of energy by major sectors; number of businesses in urban locations (there were a number of businesses that were not registered and as such it would be difficult to capture those businesses that were operating without a license); and prospects for energy. Transportation data were available for the period 1970 -2010. It was

mentioned that boats travelling between islands should have data the necessary data. The inter-island travel data, however, would be useful and should be available from the Port Department.

72. Within the energy sector electricity indicators would be available from the Statistics Agencies. It was stated that if residents lived in close proximity to an area where the electrical company provided service they would be obliged to subscribe to this company's energy service. However, if the Company was unable to provide the service to the consumer they were granted permission to use alternate sources. The consultant was not certain to what extent the electricity commission was recording alternative energy consumption. The Chair recommended that the number of recent installations be used as an indicator for energy consumption. The national consultant for Jamaica emphasized the point that although alternate energy resources were utilized in Jamaica, it could have been provided by the local electricity provider and not necessarily by private providers and as such this should be taken into consideration during data collection for all countries. Ramon Martin then provided websites at which energy data were available.

73. CARICOM alerted participants to the availability of data regarding energy sector interventions, but there were data gaps regarding energy taxes and subsidies in the region. It was also noted that the Central Bank in Trinidad and Tobago tracked losses in subsidies. The Chair explained that an example of the subsidy or regulations could be used to get the implicit subsidy. He agreed that information would be a useful intervention as this could be linked to policy adaptation and its use regarding subsidies across the region.

74. With respect to the water sector it was noted that local hotels were not allowed to use ground water supplies and these were sourced from the mains provided by the local provider. In the absence of this they would need to build their own plants.

75. The Chair raised two important issues that emerged with regard to water - renewable energy and the GIZ project. The constraint in establishing renewable energy facilities was the availability of land. Since land was already reallocated to golf courses owned by foreign interests it slowed the progress made in the use of renewable energy resources.

76. With respect to the health sector it was reported that most of the information was available through the Ministry of Health; however, fiscal information would be difficult to acquire.

77. Belize - With respect to the energy sector no data were yet collected but various sources such as Government Ministries, the Statistical Institute, the electricity company and the Public Utilities Company were identified.

78. For the health sector, it was noted that the Ministry of Health had an efficient Statistical Unit and should have data available, inclusive of fiscal allocation to the different areas. One question he posed to the Chair referred specifically to the price of each type of pharmaceutical as the original request seemed too general. The chair clarified by stating that those costs were associated with treating specific diseases. Another participant added that prevention costs or proposed costs should be included when collecting the data. ECLAC expressed some concern as to whether or not effective treatment was an issue that the health sector would report. CARICOM stated that subsidies and fiscal incentives for all policies over the years focused on treatment on the bauxite estates and treatment provided for workers. The Chair suggested that the group should collect information on treatment and actual costs of the subsidies.

79. Cuba - There were no documented data on land use patterns and the health situation. The meeting noted that Cuban health care was free for all citizens and that although overall costs were possibly lower, it did not translate into lower quality treatment when compared to treatment outside of Cuba. The chair interjected that historical data on income distribution would be useful for all countries in addition to the

types of diseases that had occurred over a long period of time. In the case of the energy sector, it was noted that a national program for renewable energy resources existed.

80. Dominica - It was noted that contact had been made with the Ministry of Health, but no data were yet collected. Regarding the energy sector, contact was made with the electricity company where data were obtained on energy consumption from 1980 to 2010. The consultant sought clarification regarding data on income distribution by percentage and the chair explained that it referred to the amount that each person in the lowest 10% of the income categories earned.

81. Dominican Republic - With respect to the energy sector it was explained that the generation of energy was regulated by the private sector with the exception of the hydroelectric service which was provided by the public sector. Challenges in acquisition of data on variables in the number of taxi trips were expressed, as those data were not being collected. The chair indicated that the travel cost of people to these areas could be used as an indicator. It was also doubtful that information on the number of businesses in urban areas would be available. Importation of energy was not applicable to the Dominican Republic.

82. For the health sector a query was made as to whether or not data on the unit cost of treatment of diseases should be obtained and what should be considered as an identified treatment of a disease. The chair explained that the treatment costs for those diseases listed were necessary as well as the pharmaceuticals needed (prevention costs) per person.

83. Grenada - Some data from the energy division had been collected from the Ministry of Finance. For this sector, data on imports of vehicles and prices of public transport had been collected. For the health sector, it was noted that information for some of the diseases would not be collected as they were not applicable to Grenada. Data so far could be sourced from the Strategic plans for 2006 and 2010 from the Ministry of Health. However, medical and life insurance data could be difficult to access.

84. Jamaica - Energy sector data would be accessed from the Ministry of Energy and Mines. Within the Health sector some data and information had been gathered. Sanitation data were available and health data would be obtained from consultants' reports. The first and second national communications to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) could be rich sources of data for the energy sector.

85. Saint Kitts and Nevis - Some challenges in obtaining data on the energy sector had been encountered but efforts to access these would continue. It was noted that research was being done on geothermal industry in Nevis but it could be too early to source any data.

86. Saint Lucia - It was reported that some data were collected on the energy sector and most of it was sourced from the power company. Regarding the data required for the health sector although no data had yet been collected, it was anticipated that the statistics department of the Ministry of Health should be a good source. The chair proposed the issue of air quality control was an area that should be considered during data collection.

87. Saint Vincent and the Grenadines - It was noted that inputs from the energy unit and the Saint Vincent electrical service were anticipated. Background information on the new energy policy of the country, along with the current energy mix (25% hydro and 75% diesel) and solar energy initiatives were outlined. With respect to the health sector, climate data, along with dengue fever statistics for the years 1981-2005 had been obtained. However, it was anticipated that securing monthly statistics on climate-related diseases and illnesses would be a challenge.

88. Suriname - It was noted that data for about 5 years for consumption of energy by sectors are available and other reports which could provide data were available. However, some challenges related to price data were encountered. Energy security and social indicators should be available but had not yet been collected.

89. Regarding the health sector no data had yet been collected but the Public health department had been identified as a source of data but only for two 2 years. Mortality data were also available and sanitation data provided by the Inter-American Development Bank (IDB) could be obtained. However there was uncertainty as to the availability of data on the unit cost of treating diseases. The chair emphasized the need for the consultants to try to include data on the location of hydroelectric plants.

90. Trinidad - The national consultant noted that contact had been made with the Ministry of Energy and Energy Affairs and it was necessary to sort through the data. Verification of the reference variables was sought and a query made on the length of the series required. Data on prices and public transport were sourced. Reporting on the health sector it was noted that the major stakeholders were quite accommodating. However, it was stated that the private health costs could be challenging to retrieve but data on overall average cost had been acquired.

#### **4b. Data requirements for the tourism and water sectors**

91. Antigua and Barbuda - It was noted that initial contact had been made with the national water and utilities authority. With respect to the tourism sector, most of the data were deemed available. However, data on the value of purchases of agricultural commodities and the distance of food and beverage establishments from the coastline would be difficult to obtain.

92. Bahamas - For the water sector, data on the volume of discharge of sewage, water quality, and number of households connected to the main water supply had been collected. However, it was noted that data on growth rates by sector were available by residential and non-residential classification only. Water used in the agriculture sector was extracted from ground water sources and therefore not monitored. Data on consumption of bottled water were available only for the past 3 years and data on energy use were available only for the past 5 years. The Integrated Water Resources Management (IWRM) policy had been completed but was yet to be approved by the Cabinet. Most of the data for this sector were available. However, data on the value of purchases of agricultural commodities and the distance of food and beverage establishments from the coastline would be difficult to obtain.

93. Belize - Initial inquiries indicated that all the requested data were available. For the tourism sector, the identification of data for this sector was well underway, with most of the requested data available.

94. Cuba - For the water sector, the data sources have reported most data to be available. Collection of data for the tourism sector was well underway, with most of the requested data available. It was noted that data related to amenities offered by accommodation would be available in 'snapshot' form, not time series. Data on food and beverage and travel services would be difficult to obtain. Information on the value of coral reef damage due to tourist activities would have to be based on studies recently undertaken.

95. Dominica - Initial contact had been made with the national water authority. For the tourism sector, a large proportion of the data had already been collected. However, data on cruise tourism and expenditure by source market, occupancy rates by type of accommodation establishment, characteristic of taxi vehicle fleet and number of inland flights were not available. Acquisition of data on the food and beverage industry would be challenging to collect.



96. Dominican Republic - It was noted that the selection of data sources and quantification of data had occurred. However, it was stated that in the Dominican Republic depending on the use of the resource and the region, the water sector was managed by both the government and a number of private institutions. An inquiry into the laws of water management in the country has been initiated and it was anticipated that in a few months the management system would change. This would have implications for the data collection process as new personnel would be in place and it would be necessary to approach them for the data. In the tourism sector, data sources have been identified and preliminary quantitative and qualitative data on arrivals, accommodation establishments, and transportation had been accessed. Some challenges with the availability of data on food and beverage, recreation and entertainment, travel services and the environment were anticipated.

97. Grenada - Collection of data for the water sector had not started yet. For the tourism sector, most data were reportedly available. It was noted that it would be necessary to follow up with the Inland Revenue and public health authorities for food and beverage statistics and the Ministry of Environment with respect to environment related data.

98. Guyana - Key sources in the water sector had been contacted in order to access the data but it was discovered that little data on run-off rates existed. Collection of data for the tourism sector had not started yet. It was noted that problems in collecting tourism data were anticipated as these data were collated in an *ad-hoc* manner and by different organizations. It was therefore likely that the data would be inadequate and insufficient in meeting the requirements needs of this sector.

99. Jamaica - It was noted that most data for the water sector appeared to be available although some indicators were not collected annually (consumption of water and water demand). Data in the form of GIS maps were also available. Within the tourism sector data for arrivals and accommodation establishments existed.

100. Saint Kitts and Nevis - It was noted that the consultant had appointments with relevant agencies to identify sources of data for the water sector but it was anticipated that there could be a paucity of data. With respect to the tourism sector, data on arrivals and accommodation establishments had been collected. The collection of all other tourism data would require further research. It was anticipated that data on transportation would not be available. It was reported that it was proving difficult to access time series accommodation rates from the hotel and tourism association due to fears of competition. It was noted that overseas tour operators would be approached to provide this information. Also, some data from the Caribbean Tourism Organization appeared to be inaccurate and incomplete, especially for Nevis.

101. Saint Lucia - Collection of data for the water sector has not yet started. For the tourism sector, data on arrivals and accommodation establishments had been collected. The collection of all other tourism data would require further research. It was anticipated that data on transportation, would not be available.

102. Saint Kitts and Nevis - The national consultant presented a preliminary report on the water sector. It was noted that local hotels were not allowed to use ground water supplies and therefore sourced supplies from the main sources provided by the local provider. In the absence of this they would need to build their own plants.

103. Saint Vincent and the Grenadines - Collection of data for the water sector had not yet started. Collection of data for the tourism sector was progressing very smoothly. However, there were missing data on transportation, food and beverage, recreation and entertainment, travel services and the environment. However, good suggestions had been given on how to overcome these shortcomings. Data on transportation, food and beverage, recreation and entertainment, travel services and the environment would require further research.

104. Suriname - Preliminary enquiries had been made of the relevant authorities in the water sector to determine the availability of the data requested. Data sources had indicated that growth rates for water use by sector would be difficult to obtain, especially for the tourism sector which was small in Suriname. However, with respect to the tourism sector, data were readily available for arrivals and accommodation establishments. It was noted that accessing data on transportation, food and beverage, recreation and entertainment, travel services and the environment would require further research.

105. Trinidad and Tobago - Data collection for this sector had just begun. It was anticipated that obtaining data on aquifers would be problematic, along with data on water quality and consumption of bottled water. Some of these would require collection of secondary data. In the case of the tourism sector, it was reported that data were available. However, accessing data on average room rates and the distance of food and beverage establishments from the coastline would be challenging.

106. During the discussion period, a number of key issues were highlighted as follows:

- For both the water and tourism sector, monthly data were preferable
- The purpose of collecting data on agricultural commodities purchased by the accommodation establishments served to inform the link between the two sectors and in particular the contribution of the tourism sector to the local agricultural sector. A ‘snapshot’ of this value was acceptable; time series data were not necessary.
- It was important to take into consideration the growing ‘small’ accommodation sector which includes guesthouses and bed and breakfast facilities.
- Data on the consumption of water by cruise ships was required. A number of islands sold water in bulk to cruise ships for consumption on the ship. It was necessary to take this into account in the final valuation of the resource.
- The Eastern Central Caribbean Bank and Caribbean Tourism Organization collected data on expenditure by market. This could be a good source for those countries which had been unable to obtain this data.
- It was necessary to distinguish between potable water and drinking water. Perhaps it was best to use the World Health Organization standards as guidance. The United Nations definition of “improved drinking water source” could also be considered.
- The United Nations Statistics Division collected very detailed data on water, based on questionnaires implemented every 2 years. Data collectors were encouraged to explore this data for any information outstanding.

##### **5. Data collection to determine the economic and social impacts of climate change in the Caribbean**

107. A representative of ECLAC summarized the challenges that data collectors had been experiencing.

These were as follows:

- Obtaining data in the required monthly frequency
- Significant gaps in series
- Some series could not be obtained from 1970 as required
- Some data were aggregated and it was difficult to disaggregate them
- The same data from different sources lacked consistency
- In some cases, sources were not properly identified
- Some data collectors were achieving results at a faster rate than others
- Does lack of availability of information infer lack of the importance placed on the data?

108. In terms of solutions offered by the meeting the following were deemed applicable:

- Data may be obtained from international organizations and this could supplement national sources
- Public libraries could be good repositories of data
- University theses and reports were also useful for updated but unpublished data
- Agricultural censuses could provide useful data for that sector
- In cases of gaps in series, proxies could be used
- Data needs should be prioritized
- In cases of concerns of confidentiality, operating guidelines of national Ministries may be referenced as to the use of data
- In approaching entities for data, it would be appropriate to indicate that the final publication which the data have informed will be made available to them.

## **6. Conclusions and recommendations**

109. The ECLAC representative concluded that, on the basis of the presentations over the two days, it was apparent that significant progress had been made with respect to data gathering for the agriculture and coastal and marine sectors for most countries, while with regards to the other sectors, data collection, as expected, was largely preliminary. Participants shared their experiences which showed varying degrees of success in mining data. It was reported that for the most part, data series in the last ten years, where available were provided in electronic format, while earlier data series tend to be in archives (non-electronic).

110. The following common elements emerged from the discussions over the two days:

- Many consultants noted the difficulty in starting this type of exercise over the Christmas period, since many national data sources were not available disposed to provide the necessary support.
- Consultants seemed to collect most annual data so far, although in specific sectors, quarterly and/or monthly data were needed.
- In some countries and sectors, it was noted that there were some areas of data that were deemed to be classified and would therefore be unavailable.
- Specific data sets were also unavailable. These included farm level data for the agricultural sector; agricultural output by soil type; recreational and diving costs and values; specifications for equipment and other fisheries technologies.
- A copy of the letter of introduction to the initiative which was sent by ECLAC to the countries was needed, thereby justifying the consultants' requests to these data form national entities.
- Many consultants reported definitional issues, or interpretation of some of the data requests; several of these issues were discussed and rationalized during the meeting.

- Generally, tourism and climate data were available for all participating countries.
- Technology and farming systems data were considered difficult to obtain. Many consultants suggested the use of national agricultural extension services to supplement the data, but there was doubt about the feasibility of this approach.
- The challenge of data sharing among national entities was also noted, particularly with respect to Geographic Information Systems data.

111. The following general recommendations were made:

- Consultants should seek to collect to the extent of availability, quarterly and monthly data, which would facilitate more accurate modeling of the impacts of climate change in the subregion.
- Consultants should aim to start series at 1970 for all sectors.
- Copies of letters of introduction would be provided to the consultants. Also, there should be communication from a national focal point to other national stakeholders in order to facilitate the data collection process in the country.
- Consultants should also, where possible, supplement data from national censuses, multilateral agencies, and ECLAC sources.
- Where there were inconsistencies in data sources, priority should be given to national data sources.
- The provision of broader policy documents which would serve to explain the context, policy, and future development strategies may be relevant to the analysis of the data in the future.

## **7. Closing remarks**

112. The representative of ECLAC thanked participants for contributing to the meeting and for the technical expertise utilized in finalizing the lists of data for each sector. Participants would look forward to the next meeting that would be convened by ECLAC under the AusAID project.

Annex I**List of participants**

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Annex II

**Background document**

1. List of data requirements for the (a) agriculture sector, (b) coastal and marine sector, (c) energy sector, (d) health sector, (e) tourism sector and (f) water sector.

## List of data requirements

### (a) Agriculture sector

Monthly series between 1970-2010 (if not available quarterly)

#### General agricultural data:

- (a) Soil type and area per hectare of each soil type by output type
- (b) Historical monthly climatic data from the meteorological office in each country
  - Rainfall (mm)
  - Average mean temperature (°C)
  - Average high temperature (°C)
  - Average low temperature (°C)
  - Humidity
  - Incidence of extreme events – tropical cyclones (storms, hurricanes etc) – dates of occurrence, severity, and a breakdown of costs to the agricultural sector in terms of direct damage and losses which represent the future lost income associated with the event.
- (c) Consumer price index
- (d) Total import quantities and total values (including the Cost Insurance Freight price, Value Added Tax (VAT) and all duties) of farm inputs, into each country:
  - Machinery
  - Fertilizers for crops
  - Growth enhancers/medication for livestock
  - Pesticides
- (e) Changing land use (e.g. land area by sector)

It would be good if the data could be obtained at the farm level i.e. data on each farm, but if this is not available, then aggregate data will have to be used.

- (f) Farm level production data by:
  - Farm size
  - Commodity
  - Land tenure
  - Type of farming (e.g. commercial, subsistence)
  - Region
- (g) Monthly data on total area under production hectares (ha) – all crops.
- (h) New area planted (ha) – all crops. This refers to new areas planted in each month.
- (i) Area harvested (ha) – all crops.
- (j) Studies on shifts in agricultural activity to alternative crops (e.g. marijuana)



- (k) Information on the level of food storage capacity
- (l) Information on the level of food processing capacity

Crops:

- (a) Monthly data on harvest quantity (kg) and prices (US\$/kg) at various levels (farm-gate, wholesale and retail) – all crops. The most important of the prices is the farm-gate price, followed by the wholesale price.
- (b) Monthly data on total input use on all farms:
  - Fertilizer [quantity (kg) and total cost (US\$)]
  - Pesticides [quantity (kg) and total cost (US\$)]
  - Farm machinery [quantity (kg) and total cost (US\$)]. (This is sometimes provided in numbers of tractors etc, but also provided in kg, which while not intuitive, provides a standardized approach for all types of machinery and equipment)
  - Herbicides [quantity (kg) and total cost (US\$)]
  - Labour
    - ❖ Quantity (# man-days, or # full-time and # part-time employees if the hours worked by each category of worker is clear)
    - ❖ Wages (total labour cost for all employees - US\$)
    - ❖ Family labour (US\$)
- (c) Type of irrigation used per hectare area under each kind of irrigation (e.g. drip, flooding)
- (d) Type of production technology by area planted (ha):
  - Protected (e.g. greenhouses, shade houses) and open field.
  - Description of the production system (e.g. highly mechanized or labour intensive)
  - Description of number and types of conservation measures (e.g. water, energy and soil)
  - Number, type and capacity of on-farm water storage facilities
  - Number, type and capacity of on-farm by-product use (e.g. livestock manure or mulch used to fertilize crops)
  - Level of integration between crop and livestock systems
- (e) Information on research and development to support adaptation to climate change (e.g. improved crop varieties)
- (f) Pest and disease incidence in terms of damage costs (US\$)

Livestock:

- (a) Monthly data for all types of livestock:
  - Key livestock: poultry, pigs, cattle, sheep, goats, other small ruminants such as rabbits
  - Data on quantity reared (kg)
  - Quantity slaughtered (kg of live weight)
  - Farm-gate, wholesale and retail prices for animals sold (US\$/kg)

- (b) Types of technology used in livestock rearing:
  - Intensive and extensive systems (e.g. for poultry: open pen system or wind ventilated tunnels)
  - Description of the production system (e.g. highly mechanized or labour intensive)
- (c) Information on research and development to support adaptation to climate change (e.g. improved livestock varieties)
- (d) Quantity and cost of all inputs used in livestock production:
  - Feed [quantity (kg) and total cost (US\$)]
  - Veterinary services/medications (cost in US\$)
  - Machinery [quantity (kg) and total cost (US\$)]
  - Labour
    - ❖ Quantity (# man-days, or # full-time and # part-time employees if the hours worked by each category of worker is clear)
    - ❖ Wages (total labour cost for all employees - \$)
    - ❖ Family labour (US\$)
  - Pest and disease incidence in terms of damage costs (US\$)
- (e) Monthly fisheries data for all the landing sites in each country (in aggregate) – this includes all types of seafood:
  - Landings (kg/tons)
  - Ex-vessel (landed) value \$/kg (or \$/ton)
  - Number of trips taken by fishers
  - Number of vessels
  - Type/size of vessels used in the fishery
  - Sea surface temperature

### **(b) Coastal and marine sector**

The challenge of separating human induced climate change from natural climate change was acknowledged. It was recognized that there was an intrinsic link between coastal and marine and tourism and therefore there was a natural pull to use the general equilibrium model. However, there was not a lot of data on sea surface temperature in the region, an important factor for determining impacts on coral reefs (bleaching).

#### Recreation and tourism profile

- (a) Number of stay-over visitors in the high season (December-April) and low season (May-November)
- (b) Number of cruise ship visitors in the high season (December-April) and low season (May-November)
- (c) Average length of stay (nights)
- (d) Number of cruise ship calls
- (e) Percentage of visitors using all coastal and marine resources for recreational purposes.

#### Accommodation Values

- (a) Costs, taxes and service charges
  - Average hourly hotel wage

- Hours worked per week
  - Persons employed per room
  - Non-labour operating costs, as percentage of base revenue (e.g. electricity, water and insurance)
  - Tax rate on accommodation (%)
  - Service charge rate (%)
  - Cruise ship passenger tax
  - Berthing fees for cruise ships
- (b) Leakages
- Percent of rooms that are foreign-owned
  - Percent of accommodations that offer all inclusive packages
- (c) Average revenues
- Average room rate (price per night excluding taxes and service charges)
  - Average occupancy rate (%)
  - Average number of rooms
  - Number of accommodations

#### Marine park net revenues

- (a) Visitor fees
- General entrance (US\$)
  - Scuba diving (US\$)
  - Snorkelling and other recreational activities (US\$)
  - Concessions (US\$) (e.g. souvenir items)
- (b) Marine vessel fees
- Entry (US\$)
  - Mooring (US\$)
- (c) Other fees
- Licence/research permits (US\$)
  - Fishing permits (US\$)
  - Total taxes collected from each marine protected area (US\$)
  - Collection costs (US\$) (e.g. patrolling, fines and penalties)

#### Dive revenue inputs

- (a) Tax rate (%)
- (b) Service charge (%)
- (c) Annual number of divers
- Percentage of visitors who dive (US\$) or Total number of divers per year
  - Average number of dives per diver per trip
  - Number of dive certifications issued
  - Percentage of dives taken at all-inclusive resorts

- (d) Dive price
  - Average dive price (US\$)
  - Average price for dive certification (US\$)
- (e) Equipment price
  - Average price of equipment rental per dive (excluding taxes and service charges) (US\$)
  - Percentage of all dives with equipment rentals (US\$)
- (f) Costs incurred by dive operations
  - Labour costs in dive operations (as percentage of revenue)
  - Other costs (as a percentage of revenue)

Snorkel and boating revenue inputs

- (a) Tax rate (%)
- (b) Service charge (%)
- (c) Annual number of snorkelers
  - Percentage of visitors snorkelling (US\$) or Total number of snorkelers per year
  - Average number of trips per snorkeler
  - Percentage of trips taken at all-inclusive resorts (%)
- (d) Price
  - Average price of a snorkel trip (US\$)
  - Average price of a boat trip (US\$)
- (e) Equipment price
  - Average price of equipment rental per snorkel trip (excluding taxes and service charges) (US\$)
  - Percentage of all snorkelers that require equipment (%)
  - Percentage of trips charging for equipment rental (%)
  - Number of independent snorkel rentals per year (outside of organized trips)
- (f) Costs incurred by snorkel and boating operations
  - Labour costs in snorkel and boating operations (as percentage of revenue)
  - Other costs (as a percentage of revenue)

Local (non-visitor) user valuation

- (a) Average hourly wage (US\$)
- (b) Beach environment benefits
  - Percentage of local population using beach environment for pleasure (%)
  - Average number of visits per year (per person)
  - Average duration of visit (hours)
- (c) 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 (hours)
- (d) Coastal wetland benefits
- Percentage of local population engaging in coastal wetland recreation (outside of organized tours)
  - Average number of visits per year (per person)
  - Average duration of visit (hours)

#### Other values

- (a) Consumer surplus (what consumers would be willing to pay for a resource above and beyond what they actually pay for the resource) for:
- Diving (%)
  - Snorkelling and boating (%)
  - Use of beaches (%)

Tourism multiplier (measures indirect impacts coming from direct expenditure) (%)

#### Fisheries profile

- (a) Fishermen
- Number of full-time fishermen
  - Number of part-time fishermen
- (b) Boats
- Number of small boats (< 15 feet)
  - Number of large boats (> 15 feet)
- (c) Facilities and landing sites
- Number of landing sites
  - Number of established fish processing facilities

#### Fisheries cost values

- (a) Full-time fish harvesting costs (per trip)
- Labour costs (as a percentage of total cost)
  - Energy cost (as percentage of total cost)
  - Energy use (quantity of fuel)
  - Water/ice cost (as percentage of total cost)
  - Water/ice use (quantity)
  - All other operating costs (as a percentage of total cost)
- (b) Fish processing costs (per month)
- Labour costs (as a percentage of total cost)
  - Energy cost (as percentage of total cost)
  - Energy use (quantity of fuel)

- Water/ice cost (as percentage of total cost)
- Water/ice use (quantity)
- All other operating costs (as a percentage of total cost)

#### Commercial fisheries data

- (a) Annual Reef Productivity
  - Minimum catch (in tonnes per hectare)
  - Maximum catch (in tonnes per hectare)
- (b) Price
  - Average price (US\$) of each fish species caught per pound or kg

#### Reef and coastal fish processing data

- (a) For each species
- (b) Weight (pounds)
- (c) Purchase price per pound
- (d) Sale price per pound
- (e) For each landing site (not at processing plant):
- (f) Number of cleaners
- (g) Average number of days per year
- (h) Average number of hours per day
- (i) Average revenue per hour

#### Local fishing data (this data excludes fishermen)

- (a) Number of persons fishing
  - As a source of income
  - For consumption
  - For enjoyment
- (b) Sale of fish
  - Average catch per trip (pounds)
  - Average sale price per unit (US\$/pound)
  - Average annual days in activity (days)
- (c) Consumption of fish
  - Average catch per trip (pounds)
  - Value of average unit of catch (\$/pound)
  - Average annual days in activity (days)
- (d) Local fishing for enjoyment

- Average time spent fishing (hours per day)
- Average annual days in activity (days)
- Average hourly wage

#### Other values

#### Fisheries multiplier (measures indirect impacts coming from direct expenditure)

#### Extreme events

- (a) Damage estimates per event from hurricanes, floods, landslides, drought, storm surge etc. from 1960 onward.

#### GIS

- (a) GIS maps with details of the shoreline and coastline, e.g., sandy beaches, rocky beaches, mangroves, reef area and other marine substrata, coastal elevation etc.
- (b) Vulnerable infrastructure, such as government offices and buildings, police and fire stations, airports and sea ports, power generating companies, radio and TV stations, hotels, residences, within 5-10 miles of the coastline
- (c) Estimate of per unit cost of coastal land, e.g., US\$/sq. foot
- (d) Rate of erosion for different types of coastline, i.e., rate for sandy beaches vs. rocky beaches

#### **(c) Energy**

In discussing the issue of welfare it was noted that this was a whole new arena, which included how to assess GDP figures. However, if welfare implications were considered it would be necessary to reassess the calculations of indicators such as GDP.

One of the participants shared that the GE modeling would be most appropriate for the energy sector. It was also noted that annual data should be avoided as much as possible (daily, monthly or quarterly preferable).

The final list of data requirements for this sector was as follows:

#### Monthly series (if not available quarterly, biannually or annually series)

#### Official series, series from reports and any other sources

#### Series at current prices

#### There must be consistency (frequency and length of data set) between series

#### The series must be submitted in EXCEL (version to be determined) in the requested order with the notes in Word (version to be determined)

Each series must include the reference to its source.

Series

- (a) National consumption of energy (primary: [includes agriculture, mining], secondary: [manufacturing, construction, transportation] and total).
- (b) Consumption of energy by sectors:
  - Consumption of energy in the agricultural energy.
  - Consumption of energy in the industrial energy.
  - Consumption of energy in the transport sector.
  - Consumption of energy in the residential sector.
  - Consumption of energy in the sector that generates energy.
  - Consumption of energy in the service sector: services other than tourism and the public sector e.g. banking, insurance, health, education
  - Consumption of energy in tourism sector
  - Consumption of energy in public sector
  - Consumption of energy in other sectors (residual).

Sectoral GDP according to the classification of the consumption of energy and estimation of energy intensity by sector (Official series, series from reports and any other sources).

Consumption of alternative sources of energy e.g. biofuels, solar, wind, bagasse, hydroelectricity (Official series, series from reports and any other sources).

- (a) National consumption of alternative sources of energy and by sector (Official series, series from reports and any other sources).
- (b) Consumption of gasoline and diesel in litres (total and by grade).

Prices

- (a) Price of electricity to the consumer (the bands/tiers used) (currency per unit)
- (b) Index of electricity prices to the consumer from national statistical agency
- (c) Index of electricity prices to the producer from national statistical agency
- (d) Energy price index from the retail or consumer price index.
- (e) Prices of all fuels
- (f) Unit cost of generating each alternative source of energy

Energy generators

- (a) Sources of different types of energy e.g. diesel, fuel oil, bagasse, wind, hydro, solar
- (b) Prices of different types of energy e.g. diesel, fuel oil, bagasse, wind, hydro, solar



- (c) Type of generators used (e.g. low speed diesel generator)
- (d) Efficiency indicators
- (e) Replacement cost of generators
- (f) Location of power generating facilities relative to the coastline and height

**Note: (check DFID Climate Change Risk Atlas)**

Reference variables

- (a) Number of vehicles (classifying by year, engine capacity, fuel type, class of vehicle)
- (b) Number of domestic flights, and ferry/water taxis trips
- (c) Imports of new vehicles (values and quantities).
- (d) Imports of used vehicles (values and quantities).
- (e) All taxes and levies inclusive of import duties, excise taxes, environmental levy, vat, custom service charges among on new vehicles
- (f) All taxes and levies inclusive of import duties, excise taxes, environmental levy, vat, custom service charges among on used vehicles
- (g) Prices of public transport
- (h) Estimates of average vehicular efficiency or by kilometre per hour
- (i) Estimates of length of road network
- (j) Number of businesses in urban locations

Rules and regulations to encourage energy efficiency (e.g. transport, industry, tourism, building codes). These include the rules and the date of start.

Synthesis of the prospects for energy. These include development of new investments, support for alternative sources of energy, etc.

Energy security

- (a) Imports of energy by source and type
- (b) Energy intensity
- (c) Mode of transport (how is it delivered)

Social indicators

- (a) Employment in energy generation

- (b) Percentage of household budget spent on energy (by income percentile)
- (c) Percentage of households with access to electricity

Energy innovation

- (a) Data and information on innovation in the energy sector

**Note: The analysis should be supported by metadata**

**(d) Health sector**

General

- (a) Income Distribution (income by percentiles)

Climate data

- (a) Temperature
- (b) Precipitation
- (c) Humidity

Morbidity/Mortality data for a range of climate-related diseases and illnesses (national, regional, by age, by health facility - primary and secondary)

- (a) Dengue fever
- (b) Malaria
- (c) Yellow fever
- (d) Typhoid fever
- (e) Leptospirosis
- (f) Food-borne/ water-borne illnesses e.g. salmonellosis, *E. coli* - induced illnesses
- (g) Gastroenteritis (total and under 5)
- (h) Asthma and other chronic respiratory disorders
- (i) Heat-related mortality/morbidity
- (j) Cholera
- (k) Salmonellosis

- (l) Shigellosis
- (m) Escherichia coli
- (n) Hepatitis A

Non-climate data

- (a) Access to potable water by region within the country
  - Percentage of population having access to potable water
  - Percentage of population using rivers as their main source of water for household purposes
  - Percentage of population having access to 24 hour supply of water
  - Studies on water quality (e.g. surface water, potable water)
- (b) Access to sanitation
  - Percentage of population having access to improved sanitation facilities (urban, rural)
  - Information on the type of sanitation facilities (e.g. disposal of fecal matter), by number of households
  - Number of households connected to sewerage services
  - Vegetation cover by type (percentage cover), land use
  - Studies on air quality and air pollution
  - Fiscal allocation to:
    - ❖ vector or disease control divisions / units
    - ❖ disease prevention initiatives
    - ❖ environmental management organizations
    - ❖ institutions responsible for improving sanitation
    - ❖ water authority, in particular fiscal allocation for improving access to safe drinking water
  - Unit costs of treating diseases / illnesses identified
  - Health system capacity measured by:
    - ❖ Number of health personnel
    - ❖ Cost by category of all personnel
    - ❖ Number of beds
    - ❖ Value of resources over time
    - ❖ Buildings/infrastructure
    - ❖ Consumables (e.g. pharmaceuticals)
    - ❖ Equipment
  - Treatment protocols for diseases
    - ❖ Identification of drugs by disease (as listed above)
    - ❖ Prices of each type of pharmaceutical
    - ❖ Cost per doctor's visit
    - ❖ Cost per bed day (public health facility)
    - ❖ Cost per bed day in Intensive Care Unit (ICU) and Intensive Dependency Unit (IDU)

- Percentage and value of total government expenditure allocated to the health system
- Health expenditure by income percentile
  
- Public and private sector medical and life insurance
  - ❖ Coverage (percentage of population; by age group)
  - ❖ Benefits (description of policy coverage)
  - ❖ Cost of premiums (US\$)
  
- Private health costs
- Plans for improving health infrastructure (e.g. water, monitoring air and water quality, improve sanitation facilities, landfills, incinerators)
- Plans for improving health system capacity over time (e.g. more health care facilities, personnel expansion, improvement in treatment and care, improve prophylactic measures)
- Information on health extension services

**(e) Tourism sector**

Arrivals

- (a) Long-stay by source market (e.g. Canada, Caribbean countries, United Kingdom and other European countries and the United States of America) and purpose (e.g. business, leisure, health)
- (b) Cruise by source market
- (c) Average visitor expenditure by type of tourist (long-stay or cruise), source market and purpose

Accommodation establishments

- (a) Occupancy rates by type of accommodation establishment
- (b) Number of rooms by type of accommodation (e.g. hotel, cottage, villa, guest house, or private)
  - Number of rooms by class (e.g. standard, luxury, superior)
- (c) Number of accommodations with green certification and/or policy
- (d) Average room rates by:
  - Type of accommodation
  - Class of room
- (e) Amenities offered by accommodation (e.g. pool, golf course, tennis courts, spa and other facilities)
- (f) Distance of accommodation within 10km of the coastline (GIS database)
- (g) Electricity consumption (Kwh) by type of establishments

- (h) Water consumption (m<sup>3</sup>) by type of establishments
- (i) Proportion of establishments that recycle water
- (j) Proportion of establishments with energy saving programmes
- (k) Tax revenues from establishments
  - Room tax
  - Corporate income tax revenues
  - Number of establishments receiving a tax holiday
- (l) Government subsidies to establishments by type
- (m) Number employed (managerial and non-managerial staff) in establishments in high and low seasons
- (n) Average wages of employees in establishments (managerial and non-managerial staff)
- (o) Number of all-inclusive hotels and total number of rooms
- (p) Value of purchases of agricultural commodities by
  - type of accommodation establishment
  - type of commodities bought
  - source (domestic and imported) by accommodation establishment type

#### Transportation

- (a) Distance of ports from the coastline
- (b) Elevation of ports from sea level
- (c) Number of cruise ship calls (monthly)
- (d) Berthing fees for cruise ships, yachts, etc. (US\$)
- (e) Value of food and other local inputs purchased by cruise ships and airlines (US\$)
- (f) Volume of waste collected from cruise ships (tonnes)
- (g) Number of planes landing at airport (monthly)
- (h) Landing fees for commercial and private planes (US\$)
- (i) Total number of registered taxis
- (j) Characteristics of taxi vehicle fleet (age, engine size and taxi vehicle class)
- (k) Average taxi fare from airport to city (US\$)

- (l) Number of inland flights
- (m) Average rates of inland flights (US\$)

#### Food and beverage

- (a) Number of food and beverage establishments
  - based at accommodation establishments
  - independent
- (b) Distance of food and beverage establishments from coastline
- (c) Proportion of sales (US\$) to visitors as compared with locals
- (d) Average expenditure of tourists on food and beverages (US\$)
- (e) Employment in food and beverage industry (managerial and non-managerial staff)
- (f) Average wages (managerial and non-managerial staff) in food and beverage industry (US\$)
- (g) Total water consumption (m<sup>3</sup>)
- (h) Total energy consumption (Kwh)

#### Recreation and Entertainment

- (a) Entrance fees for tourists at each major tourist attraction (US\$)
- (b) Average number of local and foreign visitors at each major tourist attraction
- (c) Distance of each major tourist attraction from coastline
- (d) Water consumption at each major tourist attractions (m<sup>3</sup>)
- (e) Energy consumption at each major tourist attractions (Kwh)
- (f) Employment (managerial and non-managerial staff) at major tourist attractions
- (g) Average wage (managerial and non-managerial staff) at major tourist attractions

#### Travel services

- (a) Return airfare between country and major international cities
- (b) Number of outbound tourists by destination
- (c) Average expenditure of outbound tourists by destination (US\$)
- (d) Number of travel agents

- (e) Employment (managerial and non-managerial staff) in travel services industry
- (f) Average wages (managerial and non-managerial staff) in travel services industry (US\$)

#### Environment

- (a) Number of building permits issued for new accommodation establishment
- (b) Legislation (incentives) to encourage resource use efficiency within tourism
- (c) Legislation (incentives) to support ecotourism
- (d) Value of coral reef damage due to tourist activities (US\$)
- (e) Volume of discharge of sewage into water bodies (m<sup>3</sup> )

#### **(f) Water sector**

Weekly series (if not available monthly, quarterly, biannually or annually series) [1970-2010]

Official series, series from reports and any other sources

Series at current prices

There must be consistency (frequency and length of data set) between series

All data by region within the country

National water availability in terms of:

- (a) Surface
  - Run-off rates
  - Water quality
  - Number of reservoirs and capacity
- (b) Ground
  - Water quality
- (c) Desalinated water (cubic meters per person)
  - Plant capacity
  - Type of plant
  - Supply

#### Rainfall

Evaporation-transpiration and filtering – average data

- (a) Recharge rates for aquifers

- (b) Studies on run-off and pollution impacts on the coastal areas

Water availability by region within the country. This should include Rainfall, Evaporation-transpiration, filtering and run-off

Water demand

- (a) National water demand
- (b) Water demand by sectors: For example: residential, agriculture, industrial, commercial and tourism
- (c) Water demand by regions within the country
- (d) Number of households connected to the main water supply

National and regional water prices by sector for all tiers/bands

- (a) Water fees e.g. abstraction fees
- (b) Water costs e.g. cost for treatment, storage and distribution.

Wastewater treatment

- (a) Cost of treatment of wastewater

Information on income and prices by regions within the country

Growth rates for water use by sector

- (a) Agriculture
- Land availability, level of irrigation, production technology (e.g. protected agriculture, intensive/extensive livestock)
- (b) Tourism
- Visitor arrivals/ expenditure
  - Type of visitor
  - Type of amenities (golf courses, water recreation etc)
- (c) Industrial/commercial sector
- Projected growth rates
  - Type of future development
- (d) Residential
- Household characteristics for water amenities e.g. pools, water saving devices, number of bathrooms, dish washers, washing machines
  - Percentage of households with pipe borne and potable water by region within the country



- Percentage of households with access to sanitation facilities by category (in-house or out-house)

#### Water quality

- Consumption of bottled water (a shift in water use)
- Water quality studies. Studies on emerging pollution issues

#### Social indicators

- Employment in water generation
- Percentage of household budget spent on water (by income percentile)
- Percentage of households with access to potable water

#### Energy use by the water sector

- Sources of different types of energy in pumping water e.g. electricity, diesel, fuel oil, bagasse, wind, hydro, solar
- Prices of different types of energy e.g. electricity, diesel, fuel oil, bagasse, wind, hydro, solar
- Type of generators used (e.g. low speed diesel generator)
- Efficiency indicators
- Replacement cost of generators
- Location of water generating and distributing facilities relative to the coastline and height
- (check DFID Climate Change Risk Atlas)

#### Quantity of river inflow and outflow at national boundaries with specific reference to Belize, Haiti, Dominican Republic, Guyana and Suriname.

#### Government plans for desalination, Integrated Water Resource Management (IWRM)

#### Proposed plans for a change in water pricing and metering

#### Proposed plans for reduction in water losses e.g. reducing leakage

#### Proposed plans for provision of more surface water (e.g. dams) or groundwater (e.g. wells) and water harvesting

#### General data requirements – all studies

- Total Gross Domestic Product (GDP) and GDP by sector

- (b) Average annual GDP growth rate, previous 5 years
- (c) GDP per capita
- (d) Series of data from 1970-2010
- (e) Rainfall, temperature (including sea surface and air), average wind speed, sea level rise and humidity data
- (f) Population of country
  - Region
  - Age group
- (g) The series must be submitted in EXCEL (version to be determined) in the requested order with the notes in Word (version to be determined)
- (h) Each series must include the reference to its source.