



TRANSPORTATION SECTOR ENERGY AUDIT, BARTICA, GUYANA

Contract #30/2017/Italian Government/CCCCC

INCEPTION REPORT

R114A.18-18/06.05
replaces R114.18-18/06.05

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Project: Transportation Sector Energy Audit, Bartica, Guyana

Inception Report

July 12, 2018

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TABLE OF CONTENTS

1 INTRODUCTION	5
2 METHODOLOGY	6
2.1 DATA COLLECTION AND ANALYSIS	6
2.2 AUDIT RESULTS.....	12
3 FINAL SCHEDULE AND WORKPLAN	15
4 FINAL REMARKS	16

1 Introduction

The objective of this assignment is to conduct an audit of the energy use of the transport sector in Bartica, Guyana. The focus on the transport sector is justified by the fact that estimates show that in 2012 this sector was Guyana's largest energy user, consuming about 38% of the total imported petroleum products.

This assignment is part of a major project titled "Transitioning to National Energy Security (TNES): Bartica as a Model Green Town". In parallel to the transport energy audit similar studies will be developed focused on energy consumption in households and in public buildings. A dedicated website and public awareness campaigns will be developed.

The auditing process will determine and assess any wasteful and energy conserving practices, operations and practices. Findings of the consultancy will be used to develop specific energy saving guidelines and applications for the various modes of transport.

Present inception report contains the necessary information for the client to evaluate the methodology adopted for the implementation of the project and the respect of the work plan. The final list of stakeholders and planning of the consultation activities is described.

The last chapter of the inception report includes an assessment as to whether the initial project objectives are still valid. Any constraints for the project to achieve its initial objectives, or serious delays and/or obstacles are identified.

2 Methodology

An energy audit is an important step for a city, whatever its size, wanting to improve its energy efficiency, reduce energy consumption and bring related environmental benefits.

The methodology for this assignment will be based in the principles of the European standard EN 16247-1:2012 (Part 1: General Requirements) and EN 16247-4:2014 (Part 4: Transport). These standards define the attributes of a good quality energy audit stating the requirements for energy audits and corresponding obligations within the energy auditing process. The standards recognize that there are differences in approach to energy auditing in terms of scope, aims and thoroughness, and the need to adapt the methodology to the local circumstances but seek to harmonize common aspects of energy auditing in order to bring more clarity and transparency to the energy auditing services.

EN 16247-4:2014 defines the procedures to apply to the different modes of transport (road, rail, marine and aviation) as well as the different ranges (local to long distances) and what is transported (basically, goods and people).

The location to be studied is the town of Bartica, in Guyana, which is located in the confluence of the Cuyuni and Mazaruni rivers with the Essequibo river (Figure 1).



Figure 1 - Map of the Guyana with the location of Bartica.

2.1 Data collection and analysis

2.1.1 Stakeholder's consultation

Stakeholder's engagement is a crucial aspect in this assignment enabling the consolidation and validation of priorities and help to maintain focus on the root causes of problems. Thus, the success of the assignment will depend to a large extent on its ability to understand and integrate into the process other perspectives as well as supporting and conflicting interests.

A good way to involve stakeholders is to carry out **Focus Groups Discussions (FGDs)** with key stakeholders: public administration, private sector, NGOs, community leaders and general public, possible focal groups and opinion leaders, at the appropriate geographical and administrative scales. Additionally, it may be useful to also conduct one on one interviews with key individuals and/or policy makers. Format of the FGDs and interviews will vary according to the specific objectives specified in this consultancy.

The diversity of stakeholders to be involved will ensure that different perspectives are incorporated into the project, taking into account the various sensitivities involved.

At the present stage of knowledge the following stakeholders were identified:

- In Georgetown
 - *Ministry of Presidency*
 - *Office of Climate Change, Ministry of Presidency*
 - *Department of the Environment, Ministry of the Presidency*
 - Transport and Harbours Department, Ministry of Public Infrastructure
 - Maritime administration department, Ministry of Public Infrastructure
 - *Guyana Revenue Authority*
 - GuyOil Company
 - Guyana Energy Agency
- In Bartica/Parika
 - *Regional Democratic Council*
 - *Bartica Municipality*
 - Local gas stations
 - Speedboat operators
 - BK Aviation Inc
 - Transport Service Providers including Trucking Services
 - Local miners

Engagement with institutions in italic will be coordinated with other teams involved in the auditing of other relevant components such as household and public building energy consumption.

Meetings with relevant stakeholders are scheduled for the period between June 18 and 21 2018.

2.1.2 Collecting data

Traffic Data Collection is a basic requirement for a transport energy audit. Traffic flow pattern appears to be random in distribution, as it reflects people's motivation in terms of different composition of vehicles on different types of roads under varying environmental conditions. It follows then that data being collected is a methodological statistic, because traffic flow pattern follows a random distribution. Despite such complexities, it does follow fairly and clearly defined patterns that are possible to classify and analyse. Thus, traffic data collection and analysis follow varying trends and play an important role in the preparation of a transport energy audit.

The data collection process will focus on the main transportation hubs in Bartica (see Figure 2).



Figure 2 - Main Transportation Hubs in Bartica.

It is essential to know the magnitude of traffic data required or to be collected, which will then determine its quality and type of vehicle classification to be adopted. In the first stage of the project IDAD will, in cooperation with the client, collect the following (where available):

- list of transport subsystems to be audited (road, river, air);
- detailed characteristics of the audited objects including known adjustment factors (such as weather conditions, road maintenance, driving behaviour, etc.) and how the organisation believes they influence energy consumption;
- historical data:
 - energy consumption;
 - adjustment factors;
 - relevant related measurements;
- local urban development history and past events that could have affected energy consumption in the period covered by the data collected;
- energy audits or previous studies related to energy, energy efficiency and transport sector in Guyana;
- Guyana Second National Communication to the UNFCCC;
- other relevant economic data;

The following hard data is needed to prepare the energy audit:

- Road mode:
 - Number of circulating vehicles
 - Category of vehicles: light duty (passengers, hired and private, freight), heavy duty (passengers, freight), motorcycles
 - Vehicles age distribution (if not at city level, at least at country level)
 - Type of engine (petrol, diesel) by vehicle category
 - Cylinder size of light duty vehicles (if not at city level, at least at the country level)
 - Gross weight of heavy duty vehicles

- Fuel consumption (at monthly or annual level), by type of fuel used
- Average monthly or annual mileage by vehicle category
- Type of infrastructure (urban or rural roads, national roads) and posted speed allowed
- River mode:
 - Number of boats
 - Category of Boats
 - Gross Tonnage by boat category
 - Passenger Capacity
 - Type of Engine by boat category
 - Power by boat category
 - Fuel Consumption by boat category and engine fuel
 - Number of daily trips by boat category
 - Operating time by boat category

In relation to air transportation mode, there is the need to get information on number and type of planes as well as the number of movements and origin-destination pairs. This should be done through contacts with the airfield authority.

2.1.3 Field work

The most common method of collecting traffic flow data is the manual method, which consists of assigning a person to record circulating traffic. This method of data collection can be labour intensive, but it is nonetheless necessary in most cases where there is no reliable and detailed statistical information or where vehicles are to be classified with a number of movements recorded separately, such as at intersections. At intersection sites, the traffic on each entry should be counted and recorded separately for each movement. It is of paramount importance that traffic on roads with more than one lane are counted and classified by direction of traffic flow.

The team will include a field coordinator and 5 enumerators. The team coordinator will:

- ensure that measurements and observations are made in a reliable fashion and in situations which are representative of normal conditions and, where relevant, under appropriate weather conditions;
- promptly inform the client of any unexpected difficulties encountered during the field work.

All enumerators will undergo a brief training programme before being assigned to work alone in the field. If possible field work will be publicly announced through local media such as radio, television and flyers.

In terms of logistics for data collection on road and river modes, and since the opening hours of the main activity points of the city (Scotiabank, Citizens Bank, Texico Gas Station, Municipal Market, Supermarket Dino's Investment, Thunders Enterprise Inc.) are 7:30-8:00 AM and the closing hours are between 4:30-7:00 PM, measurements should be conducted in:

- 1) morning peak 7:00-9:00AM;
- 2) off-peak 12:00-2:00PM; and
- 3) afternoon peak 5:00-7:00 PM;

The general procedure for the field campaigns is described as follows:

- Manual counting: the enumerators should count traffic volumes by approach and by lane on the main city entries and intersections. Ideally, 6h of data should be collected on above mentioned periods;
- Local surveys will also be needed, in order to characterize the mobility of the city, both in terms of origin-destination pairs and type/number of trips. Roadside survey of drivers should be performed (the collaboration with the local police can be needed, to stop the vehicles and reinforce the collaboration of the drivers in these surveys) as well as face to face interviews, of the crew of the boats as well as drivers in city crowded areas (such as the market or a grocery). In order to manage existing human resources and the quantity of information, traffic counts and local surveys will be conducted in turn during weekdays (not in the same day);

The monitoring points and the description of tasks that should be undertaken in each point are identified on Figure 3 and Table 1, respectively. Since Google Maps and Bing Maps do not match regarding the name of some roads (for instance, there are some roads in Google Maps without name), the GPS coordinates of the monitoring points are also provided in Table 1 to avoid wrong locations.

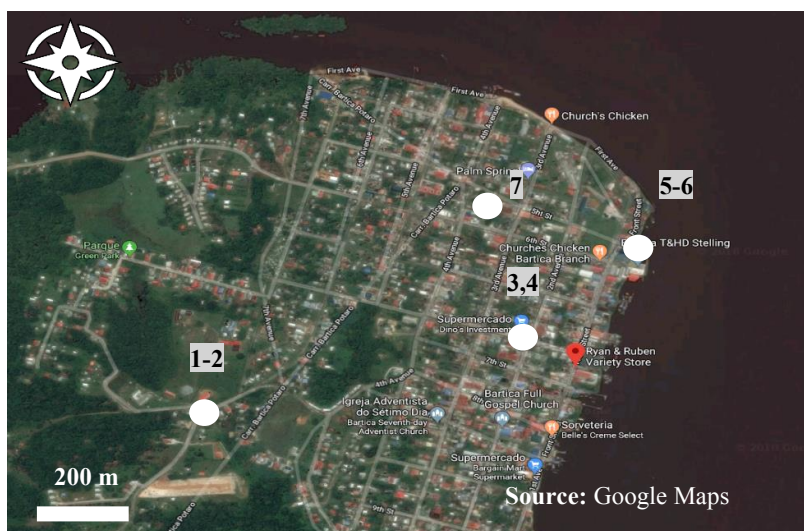


Figure 3 - Identification of monitoring points (1 to 7) using the existing plan.

Table 1 - Characterization of tasks for the candidate points using the existing plan.

Point	Task	Description	GPS ¹ Coordinates	Human Resources
1	Road Traffic Counts	VII-2 Mazaruni/L. B. E. Rive, Guyana – South to North Movements	6°24'3.16"N 58°37'40.18"W	1 Enumerator
2	Road Side Surveys – Stopping Cars	Surveys conducted in some drivers who enter to the city center from VII-2 Mazaruni/L. B. E. Rive, Guyana	6°24'3.16"N 58°37'40.18"W	1 Enumerator
3	Face to face Interview	Surveys conducted in some drivers and pedestrians near the Four leg intersection – 6 th Street with Second Avenue	6°24'10.97"N 58°37'12.56"W	3 Enumerators
4	Road Traffic Counts	Four leg intersection – 6 th Street with Second Avenue	6°24'10.97"N 58°37'12.56"W	1 Enumerator
5	Boat Traffic Counts	Boat Departures and Arrivals at the Parika – Bartica Ferry Stelling	6°24'17.96"N 58°37'2.64"W	1 Enumerator
6	Face to face Surveys	Surveys conducted in some crew boat near the Parika – Bartica Ferry Stelling area	6°24'17.96"N 58°37'2.64"W	1 Enumerator
7	Road Traffic Counts	Four leg intersection – 3 rd Street with Fourth Avenue	6°24'21.73"N 58°37'14.22"W	1 Enumerator

¹Coordinates from Google Earth

The campaign for experimental measurements is planned for one week, Monday to Saturday. Table 2 describes in detail the desired days / hours to perform traffic counts and local surveys.

Table 2 - Proposed timeline for traffic counts (road and boat) and surveys.

Day/Hour	7 h	8 h	9 h	10 h	11 h	12 h	13 h	14 h	15 h	16 h	17 h	18 h	19 h
Monday	Green	Green			Green	Green					Green	Green	
Tuesday	Yellow	Yellow			Yellow	Yellow					Yellow	Yellow	
Wednesday	Green	Green			Green	Green					Green	Green	
Thursday	Yellow	Yellow			Yellow	Yellow					Yellow	Yellow	
Friday	Green	Green			Green	Green					Green	Green	
Saturday	Green	Green			Green	Green					Green	Green	

- Traffic Counts – Points 1, 4, 5 and 7
- Local Surveys – Points 2, 3 and 6

Besides the traffic counts, the surveys are essential to understand the mobility of people in the city. Regarding the road mode, the questions that should be addressed to the drivers are:

- What is your origin? destination?
- What is your vehicle type?
- What is your vehicle engine size (in case it is a passenger car / light duty vehicle)?
- What is the gross weight of your vehicle (in case it is a heavy-duty vehicle / bus)?
- What is your vehicle fuel type?
- How old is your vehicle?
- What is your vehicle mileage monthly?
- How much do you spend a fuel per week/month?
- How many kilometres do you make daily/weekly?
- Where do you usually refuel?
- How many passengers do you usually carry?

Regarding the river mode, some questions should be addressed to the crew of the boats, namely:

- What is your boat engine size?
- What is your boat type?
- What is your boat power?
- What is your boat gross tonnage?
- How old is your boat?
- How much do you spend a fuel per day (week)?
- How many kilometres do you make daily (weekly)?
- How many trips do you make daily (weekly)?
- How many hours does the boat operate (daily/weekly)?

2.1.4 Data Analysis

During this phase, the energy auditing team will establish the existing energy performance situation of Bartica transport system. The existing energy performance situation will become a reference against which improvements can be measured. It shall include:

- a breakdown of the energy consumption by mode, use and type of vehicle;
- energy flows and an energy balance of Bartica township;
- pattern of energy demand through time;
- relationships between energy consumption and adjustment factors;
- one or more energy performance indicators suitable to evaluate the audited object will be defined at a later stage of the project.

Based on the existing energy performance situation of the audited object, the assignment will identify energy efficiency improvement opportunities. The team will evaluate the impacts of energy efficiency improvement opportunities on the existing energy performance situation, including recommendations on reduction of inefficiencies in this sector in Bartica. Whenever adequate economically feasible proposals will be evaluated through costs, savings and payback period. Analysis will include estimates of greenhouse gases emissions.

2.2 Audit results

When reporting the results of the energy audit, the energy auditor will:

- ensure that the energy audit requirements agreed with the client have been met;

- check the quality of the report before submission to the client;
- summarize relevant measurements made during the energy audit, commenting on:
 - consistency and quality of data;
 - rationale for the measurements and how they contribute to analysis;
 - difficulties encountered in data collection and field work;
- state whether the results of the analysis are on the basis of calculations, simulations or estimates;
- summarize the analyses detailing any assumptions;
- state the limits of accuracy of estimates of savings and costs;
- report the ranking of the energy efficiency improvement opportunities.

A set of three technical reports (other than the current inception report) will be prepared under this assignment. The exact content of each report shall be appropriate for the scope, aim and thoroughness of the energy audit.

▪ **Localized Study Report:**

- Background:
 - general information of audited town and motivations for the assignment, strategic framework.
- Methodology;
 - energy auditor and energy audit approach;
 - context of the energy audit;
 - description of audited object(s);
 - relevant standards and regulations.
- Energy audit:
 - energy audit description, scope, aim and thoroughness, timeframe and boundaries;
 - information on data collection;
 - i. metering setup (current situation);
 - ii. statement about which data was used (and which is measured and which is estimated);
 - iii. copy of key data used;
 - analysis of energy data.
- Conclusions.

▪ **Recommendations Report:**

- Background:
 - general information of audited town;
 - summary of audit results.
- Methodology;
 - context of the energy audit;
 - description of audited object(s);
 - relevant standards and regulations.
- Energy efficiency improvement opportunities:
 - criteria for ranking energy efficiency improvement measures.
 - proposed actions, recommendations, plan and implementation schedule;
 - potential interactions with other proposed recommendations;
 - measurement and verification methods to be used for post-implementation assessment of the recommended opportunities.

- Conclusions.

- **Final report:** the final report will be compiled following the review by the client of the previous two reports. This report will include all information about the assignment:
 - Background:
 - general information of audited town and motivations for the assignment, strategic framework.
 - Methodology;
 - energy auditor and energy audit approach;
 - context of the energy audit;
 - description of audited object(s);
 - relevant standards and regulations.
 - Energy audit:
 - energy audit description, scope, aim and thoroughness, timeframe and boundaries;
 - information on data collection;
 - i. metering setup (current situation);
 - ii. statement about which data was used (and which is measured and which is estimated);
 - iii. copy of key data used;
 - analysis of energy consumption.
 - Energy efficiency improvement opportunities:
 - criteria for ranking energy efficiency improvement measures.
 - proposed actions, recommendations, costs and paybacks, plan and implementation schedule;
 - potential interactions with other proposed recommendations;
 - measurement and verification methods to be used for post-implementation assessment of the recommended opportunities.
 - Conclusions.

IDAD will provide a digital copy of each report containing the overall information collected and produced in this study. Reports will be prepared in English.

Information and outcome of the project are strictly confidential and any result will only be sent to the client.

3 Final schedule and workplan

It is expected that this assignment will be completed over the period of 5 months starting on May 4th 2018. The project timetable is presented in Table 8.1 with the specification of each task and its duration.

Table 8.1- General schedule in weeks.

Nº	Activity/task	May				June				July				August			September			Oct				
		7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	1	
1	PROJECT INCEPTION	█	█	█	█																			
1.1	INCEPTION MEETING	█																						
1.2	FINAL INCEPTION REPORT DELIVERY				█																			
2	DATA COLLECTION AND ANALYSIS				█	█	█	█	█	█	█	█	█											
2.1	STAKEHOLDER'S CONSULTATION						█																	
2.2	DATA COLLECTION				█	█	█	█	█	█	█													
2.3	FIELD WORK AND SURVEY						█	█	█	█														
2.4	DATA ANALYSIS								█	█	█	█	█											
2.5	LOCALIZED STUDY REPORT DELIVERY												█											
2.6	REPORT REVIEW												█	█	█	█	█							
3	AUDIT INTERPRETATION												█	█	█	█	█	█	█	█	█	█	█	█
3.1	RECOMMENDATIONS REPORT DELIVERY																	█						
3.2	REPORTS REVIEW																	█	█	█	█	█	█	
3.3	PREPARATION FINAL REPORT																	█	█	█	█	█	█	
3.4	FINAL REPORT DELIVERY																						█	
3.5	FINAL NATIONAL WORKSHOP																							█

Report deliveries are highlighted in red. The exact dates for delivery of the reports are the following:

- Inception Report: May 30th 2018;
- Localized Study Report: July 31st 2018;
- Recommendations Report: August 31st 2018;
- Final Report: October 4th 2018.

The client is responsible for tasks highlighted in orange.

Exact date for the final National Workshop will be defined with the client at a later stage.

4 Final Remarks

At present stage of the assignment and after several contacts with the client there are all the reasons to believe that the initial project objectives stated in the original Terms of Reference are still valid.

The reliability and thoroughness of any audit process depends on the quality and level of uncertainty of the data used. As a result of this, it is necessary to create the right conditions that will allow the open involvement of the institutions that have, at national and local level, the preliminary and secondary data required for the transport energy audit. Availability of this baseline data is essential to develop top-down approaches that will disaggregate the total energy consumption in different subtopics.

This perspective will be complemented by the bottom-up information acquired through the field surveys. For the full success of the surveys it is important to raise local public awareness about this initiative and encourage the participation of inquired citizens.