



GREENHOUSE GASES AND AIR POLLUTANT EMISSION REPORT 2017

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The coordinating authors were Justine G. Madlangsakay and Chester Del Rosario of the IMS Department (CQESH). The members of the Green Team who calculated the GHG emissions: Stephanie Burda of Business Area Operations; Erwin Nico C. Caparas and Carmela Louisa A. Maleficio of Central Non-Revenue Water; Grace A. Laguardia, Glenneth S. Magtalas and Samuel Gerald T. Saludez II of Administrative-Logistics; Ginny Vivien Calaycay and Digna C. Tesalona of Water Network; Marlon Araracap, Anne Marie Matubis and Darlene G. Yu of Water Production (LMTP1); Roxanne R. Madarang and Kenji Michael D.P. Kusaka of Water Production (LMTP2); Mark Vincent Q. Talosig and Rommel D.C. Sarsonas of Water Production (PWTP) and Fher Bryan H. Binuya for TPM; Bob S. Castrence, Dirk Jan Dinno B. Coligado and Allen Jerry P. Aries of Wastewater Management Division; Stephanie Joyce B. Martinez and Gracelyn F. Dinglasan for CXRO.

This project was headed by Enrique de Guzman, Head of the Integrated Management Department under the supervision of Roel S. Espiritu, the Head of Corporate QESH Division during establishing 2017 GHG Inventory. They greatly acknowledge the input provided by the other members of the Green Team as data contributors: Jaleena Daphne D. Aquino and Juan Joselito Jalandoni of Human Resources, Lolita M. Lota and Loverizza E. Nadado of Finance, Vilma T. Villacarillo and John Emmanuel B. Martinez of Environment Management Department.

The Green Team also acknowledges the Department of Energy for providing the power statistics report, which was the basis of the emission factor for calculating the emissions from power usage.

LIST OF ABBREVIATIONS

AP	Air Pollution
CAI-Asia	Clean Air Initiative for Asian Cities
CDM	Clean Development Mechanism
CH ₄	Methane
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CO ₂ e	CO ₂ Equivalent
DENR	Department of Environment and Natural Resources
EF/s	Emission Factor/s
Gen sets	Generator Sets
GHG	Greenhouse Gas/es
GJ	Giga Joules
HC	Hydrocarbons
HFCs	Hydrofluorocarbons
IMP	Inventory Management Plan
kWh	Kilowatt-Hours
LPG	Liquefied Petroleum Gas
MLD	Million Liters per day
NCIP	National Commission on Indigenous People
NRW	Non-Revenue Water
N ₂ O	Nitrous Oxide
NO _x	Nitrogen Oxides
O ₃	Ozone
PBE	Philippine Business for the Environment
PFCs	Perfluorocarbons
PM	Particulate matter
SF ₆	Sulphur Hexafluoride
SO _x	Sulfur Oxides
SRA	Sugar Regulatory Authority
VOCs	Volatile Organic Compounds
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute



This report summarizes Maynilad's greenhouse gas emissions for the year 2017. This inventory done by the "Green Team" quantified the environmental impact of the company's operation relative to greenhouse gas emissions. This inventory serves as a guide for future reduction strategies as the company moves toward the long-term goal of carbon neutrality.

Maynilad's GHG inventory reports the emission from three (3) greenhouse gases under the Kyoto Protocol namely: Carbon Dioxide (CO₂), Methane (CH₄), and Nitrous Oxide (N₂O). The other gases that are considered by the Kyoto Protocol (HFCs, PFCs and SF₆) are not considered in the inventory since these are specific to certain types of industries and are not relevant to the operations of Maynilad.

An Inventory Management Plan (IMP) was updated under this project because it is essential in ensuring the sustainability of the inventory in the future. It lays out the details of the inventory such as the boundaries, calculation methodologies, data management process flows, management roles, auditing and verification and other important details.

Maynilad established the 2009 data as its base year with a total emission of 30,213.57 tons of carbon dioxide equivalent (tCO₂e). The yearly increases are mainly due to the expansion of the company's service within its concession area that requires installation of new facilities and purchase of additional vehicles. Yearly increase in the emission factor for electricity consumed (as given by the Department of Energy) also had an effect in the said increase.

Since 2009, there were some revisions in the emission factors used in the inventory. Aside from the yearly emission factor update for power coming from the Department of Energy, the emission factors for vehicles and business travel were also revised. The reference used for the emission factor for vehicles, Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry was revised on August 2009 while the emission factor for business travel was last updated on June 2013. The updates on the emission factors of vehicles were incorporated in the calculations starting 2010 while the updates on the emission factor for business travels were applied starting 2013.

The total GHG emission for Maynilad for 2017¹ is 75,765.97 of carbon dioxide equivalent (tCO₂e). The direct emissions comprise 5.65% (4,278.94 tCO₂e) while indirect emissions from purchased electricity is 94.35% of the total (71,487.03 tCO₂e). This means that for every liter of water treated, Maynilad emitted 0.0832 grams of CO₂.

¹ Scope 1 and 2

EXECUTIVE SUMMARY



98.77% of Scope 1 and 2 GHG emissions is Carbon Dioxide (74,830.33 tons). 0.74% is Methane Gas (564.33 tons) and 0.49% is Nitrous Oxide Gas (371.3 tons). For Business Area and Central NRW their direct emission is higher than the indirect emission purchased from electricity while other group's direct emission is lower than the indirect. Scope 2 emissions of Water Network (52,934.32 tCO₂e) is the highest contributor. The largest contributor to the purchased electricity consumption is from La Mesa Pump Station having 41,748,722.81 Kwh for 2017.

The 2017 results have increased by 7.22% from the 2016 results of GHG Emission (tCO₂e).

In pursuant to the aim of Maynilad to decrease its carbon footprint, emission reduction programs are continuously implemented. This includes the following: (1) Establishment of District Metered Areas (DMA) to efficiently monitor and control the supply and distribution within the network; (2) Installation Variable Frequency Drives (VFD) and Highly Efficient Motors to control the speed and torque of motors to meet specified pressure and flow; (3) Facilities and Process Optimization and Improvement of Water Production (4) Process Optimization and Improvement of the Wastewater Treatment Plants and facilities and GPS vehicle tracking system used for the Vacuum Truck Units (VTU's) and for fleet vehicles to monitor travel location. (5) Continuous implementation of Integrated Management System (IMS) (6) Implementation of Energy Management Systems which includes the efficient usage of fuel and power for each facility (7) Fleet Management Programs, (8) Replacement of lightings into LED light bulbs, (9) Programs in switching off of lightings and regulating Air conditioned Units (ACU) usage.

THE GREEN TEAM

The “Green Team” handles the process in preparing the GHG inventory management plan and report annually. This team was first organized through a memorandum from the President dated March 10, 2010² and latest update February 18, 2018³.

The key contacts for the project are:

ROEL S. ESPIRITU

Project Head

Head – Corporate Quality, Environment, Safety and Health

ENRIQUE G. DE GUZMAN

Deputy Project Head

Head, Integrated Management System



The members of the Maynilad Green Team are listed below in **Table 1:**

Table 1: Green Team Members

GREENHOUSE GASES (GHG) TEAM		
DESIGNATION	NAME	OFFICE
Program Head	Roel S. Espiritu	CQESH
Deputy Program Head	Enrique G. De Guzman	CQESH-IMS
Members	Justine G. Madlangakay	CQESH-IMS
	Chester Y. Del Rosario	CQESH-IMS
	Ginny Vivien T. Calaycay	WNET
	Digna C. Tesalona	WNET
	Joan R. Floresca	WNET
	Stephanie Joyce Burda-Martinez	CXRO
	Gracelyn F. Dinglasan	CXRO
	Kenji Michael D. P. Kusaka	LMTP 2
	Roxanne R. Madarang	LMTP 2
	Darlene G. Yu	LMTP 1
	Anne Marie M. Matubis	LMTP 1
	Marlon A. Araracap	LMTP 1
	Fher Bryan H. Binuya	TPM
	Mark Vincent Q. Talosig	PWTP
	Rommel D.C. Sarsonas	PWTP
	Marvin M. Villanueva	WSM-CPF
	Erwin Nico C. Caparas	CNRW
	Carmela Louisa A. Maleficio	CNRW
	Grace A. Laguardia	CORPORATE
	Glenneth S. Magtalas	CORPORATE
	Samuel Gerald T. Saludez III	CORPORATE
	Bob S. Castrence	WMD
	Dirk Jan Dinno B. Coligado	WMD
	Allen Jerry P. Aries	WMD
	Lolita M. Lota	FINANCE
	Loverizza E. Nadado	FINANCE
	Juan Joselito A. Jalandoni	HR
	John Emmanuel B. Martinez	CQESH-ENVI
	Vilma T. Vilalcarillo	CXRO-TDO

² See Annex 2A for the memorandum

³ See Annex 2B for the memorandum (updated)



BACKGROUND

Maynilad is a company with a strong commitment to the protection and preservation of the environment. It has established programs in managing its resources and as well as its effect to the environment. Among these is the establishment of Integrated Management System which not only focuses on the quality of service but as well as the environment, and the safety and health of its personnel. Another is the partnership with DENR, Local Government Units (LGU), and other private groups in spreading the awareness of people in taking care of the environment, such programs were the tree planting activities in Ipo Watershed, participation in Coastal Clean-up Activities and Mangrove Tree Planting in the province of Cavite.

Despite all these, the company recognizes that there is still much to do as concerns for mitigating climate change and air pollutions increase globally and locally. The acceleration of climate change is caused by the increasing GHG concentrations which causes rise in the Earth's temperature, thus increasing its climate variability. Human activities generate GHG emissions, mostly through energy use by industry, transport and households that is generated from burning of coal, oil and gas.

For Maynilad to be able to manage its GHG emissions, it has to be measured first. This led to the creation of a project called **"Greenhouse Gases and Air Pollutant Emissions Inventory and Accounting for Maynilad"** in 2009. This project was implemented in partnership with PBE and CAI-Asia to establish an integrated GHG and air pollutant emissions accounting system. With the success of this project, the company has established the 2009 inventory as its baseline data.

Maynilad has registered its 2009 to 2015 GHG inventory and has obtained verification from an international certification body (TUV Rheinland). And in the future, apply for carbon credits from the international market for the emission reductions that can be achieved.

Maynilad Green Team has been conducting annual GHG inventory since the establishment of 2009 base year data.



OBJECTIVES

The following are the objectives of Maynilad in undertaking the Greenhouse Gases (GHG) and Air Emissions 2017 Inventory Project:

➤ Main objectives:

- Calculate the GHG emissions of the company for the year 2017.
- Compare 2017 report with the previous years, starting from the baseline year.
- Recommend ways on how the inventory process can be improved in the future, as well as how Maynilad can move towards reducing its emissions

➤ Specific Objectives:

- Monitor the GHG emissions of the company.
 - Minimize and manage the adverse impacts of our operations on the environment by optimizing the use of our resources, reducing the generation of waste and controlling the emission of pollutants to air, water and land.
 - Provide the company with information that can be used to yield an effective corporate environment strategy or program to manage and reduce these emissions and possibly participate in the carbon market.
 - Foster awareness of employees on environmental protection, particularly with respect to water resources and enhance employee participation in company environmental programs.
 - Complement the company's integrated management system particularly ISO 14001 (Environmental Management Systems).
 - Contribute to the reduction of environmental risks.
 - Enhance the company's environmental and sustainability performance.
 - Strengthen corporate social responsibility adherence.
 - Contribute to the cost savings endeavor of the company.
-

WORKING SESSIONS

As stated in the IMP, the green team shall meet at least thrice a year to discuss calculation concerns as well as updates on emission factors and other GHG matters.

The main activities done for the calculation of the 2017 GHG emissions for Maynilad are detailed in the subsequent sections. The details of the emissions and the recommendations on how Maynilad can move forward in emissions management were also discussed.

The preparation of an Inventory Management Plan (IMP) is essential for the sustainability of the inventory process. It lays out the details of the inventory such as the boundaries, calculation methodologies, data management process flows, management roles, auditing and verification and other important details. It is the blueprint of the inventory and would serve as a guide for anyone who would want to understand the details of Maynilad's GHG and air pollutant inventory.

REPORT FORMAT

Maynilad's GHG report was prepared in accordance with the content requirements of the ISO 14064-1. The Inventory Management Plan, however, was based on the standard format that the World Resources Institute is promoting. For the details of the items that are discussed below, please refer to the final version of the IMP.

SETTING THE BOUNDARIES

SETTING THE ORGANIZATIONAL AND OPERATIONAL BOUNDARIES

Defining the organizational and operational boundaries is critical in developing a GHG and air pollutant inventory of a company. Organizational boundaries pertain to boundaries defined by the organizational structures and the relationships among the parties involved. Operational boundaries are set to distinguish which emissions from the operations of the company it emits directly and indirectly. Detailed scoping exercises were done during the initial meetings in order to properly set the boundaries for the inventory.

➤ Organizational Boundaries

Maynilad has adopted the use of the operational control approach for defining its organizational boundaries. This means that Maynilad shall account for emissions from sources that it controls operationally.

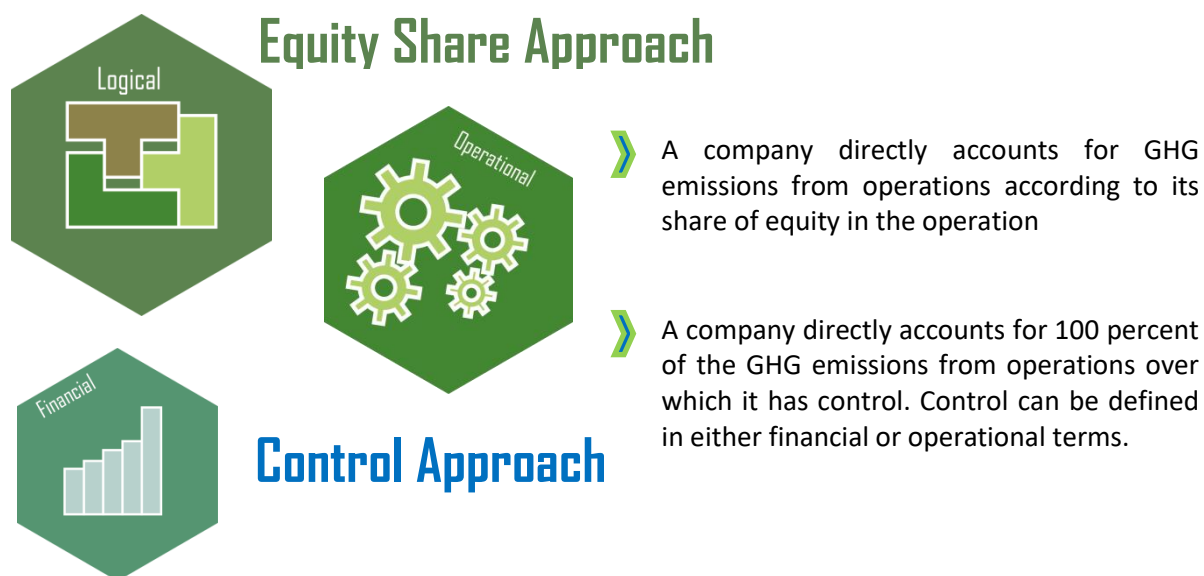


Figure 1: Approaches for Defining Organizational Boundaries

➤ Operational Boundaries

The representatives of these groups were tasked to update the previous years' scoping data which contains the identified emission sources of their groups for any inclusion or deletion of sources.

SETTING THE BOUNDARIES

In order to be consistent with the global standard on GHG accounting, the GHG Protocol, the GHG and air pollutant emissions are classified into the following scopes:

Scope 1: Direct emissions

Maynilad's scope 1 emissions are emissions that are from the sources that it controls operationally. The main sources of direct emissions in Maynilad's operations are the company-owned vehicles. Included in the calculation of emission for the Corporate Office is the Car Plan of executives and managers. Emissions from other equipment such as forklifts, water pumps, generator sets and grass cutters are also considered scope 1 emissions. Process emissions from the wastewater treatment systems and biosolids are also included in this scope.

Scope 2: Indirect emissions from Purchased Electricity

Scope 2 emissions are indirect emissions from the generation of the electricity that is consumed by the company

Scope 3: Other indirect emissions

Scope 3 emissions refer to emissions generated by activities which are not operationally controlled by Maynilad but are considered important to their operations (e.g. activities of contractors, business travel and rental vehicles). For Maynilad's inventory, Scope 3 emissions from different activities are included where reliable data is available.

Table 2 lays out the emissions that are covered by Maynilad's GHG and air pollutant inventory for the most notable emission sources in its operations.

Table 2: List of Emissions by Major Sources in Maynilad

Activity/Equipment	Greenhouse Gases			Air Pollutants				
	CO ₂	CH ₄	N ₂ O	PM	CO	VOC	SO _x	NO _x
Electricity consumption	✓	✓	✓	✓	✓	✓	✓	✓
Vehicles	✓	✓	✓	✓	✓	✓	✓	✓
Internal Combustion Engines (Equipment)	✓	✓	✓	✓	✓	✓	✓	✓
Wastewater treatment process-related emissions	✓	✓						
Business Flights ⁶	✓	✓	✓		✓			✓

⁶ Hydrocarbon (HC) emissions are included in the calculations as the emission factors are available.

SETTING THE BOUNDARIES

CORPORATE



Balara Head Office, Fleet and Motor Pool, Central Laboratory, Central Warehouse (Socea Bonna), Arroceros and Cordillera Warehouse.⁷

BUSINESS AREAS



12 Business Area offices of Maynilad.⁷

CENTRAL NON-REVENUE WATER



CNRW Main Office (Bangkal), CNRW Office (Arroceros), IMM Office (Pasay), Meter Laboratory⁷

WATER NETWORK



Reservoirs, Pump Stations, Mini Boosters, Deep Well Stations, In-line Boosters and other Special Equipment, Training Facility

WATER PRODUCTION & WATER SOURCE



La Mesa Water Treatment Plants 1 & 2, Putatan Water Treatment Plant, Common Purpose Facilities (CPF), Ipo Office Building and Bicti Desilting Basin.

WASTEWATER MANAGEMENT



Sewage and Septage Treatment Plants, Sewage Treatment Plants, Lift Stations and Pump Stations and Vitas Desludging Office

⁷ Satellite warehouses are included in the corresponding business areas.

SELECTION AND ESTABLISHMENT OF BASE YEAR

Base year selection is important in enabling companies to consistently compare their emissions over time. Since there is no sufficient information for the calculation of historical GHG emissions, the 2009 being the first inventory was selected by Maynilad as the base year for emissions accounting. This is also in consideration of the effects of the transition and re-organization within the company which took place in 2008.

REPORTING PERIOD

The quantification of year 2017, same with the previous years, was done on a single-year data, where period coverage is from January 1 to December 31, 2017. As done in the establishment of the baseline year, the data for the fuel consumption will be from January 2, 2017 to December 31, 2017. The data for the fuel consumption is given by the service provider, Chevron, through fleet cards, which acts as prepaid cards used by service vehicles.

For electricity consumption, since different cut-off billing periods are received from Meralco (Power Service Provider), the bill-month is being established by the Finance Group of Maynilad through the Power Consumption or Meralco Billing data being issued by GHG member from Finance to all GHG members on a monthly basis. Hence, there is uniform reporting period and there is an assurance that power consumption per month is accounted by each GHG group for a particular year.

Maynilad made this GHG and air emissions accounting on a regular basis annually and subsequently establish their own database.

The selection of base year and its reporting period was developed consistent with the provisions of ISO 14064-1, clause 5.3.1

RECALCULATION OF BASE YEAR EMISSIONS

➤ Structural Changes

In the event of an acquisition or subsequent divestiture, the base year and subsequent years will be adjusted to include or exclude the applicable emissions from each acquisition or divestiture, respectively. If the acquisition or divestiture did not exist in the base years, the base years emissions will not be recalculated and adjustments to the inventory will be made as far back as the data is available.

REPORTING PERIOD

Methodology Changes

If any changes to emission factors or calculation methodologies were found to result in significant differences, adjustments will be made to the calculations for the years affected. Likewise, a base year adjustment will be made if changes in calculations for the corresponding time frame or improvements in data accuracy lead to significant differences in emissions. If the change is not significant that is not more than 5% or the data is not available for all past years, the new methodology or calculation will be addressed in the report without recalculation to enhance transparency.

MAYNILAD'S 2017 GHG EMISSIONS

INTRODUCTION

The calculation for 2017 inventory followed the revised IMP of 2017 inventory with additional revisions, such as the update of the members of the Green Team and revision on the emission factor for power.

TOOLS

The calculation tools for data collection and emissions estimation are Microsoft Excel-based spreadsheet tools (**Figure 2**) which were developed by CAI-Asia with support from PBE and subsequently modified to suit the needs of Maynilad. The spreadsheet tools utilized globally-accepted methodologies and data (e.g. emission factors) from sources such as the GHG Protocol, the AP-42 of the United States Environment Agency and the Clean Fleet Management Toolkit of the United Nations Environment Programme.

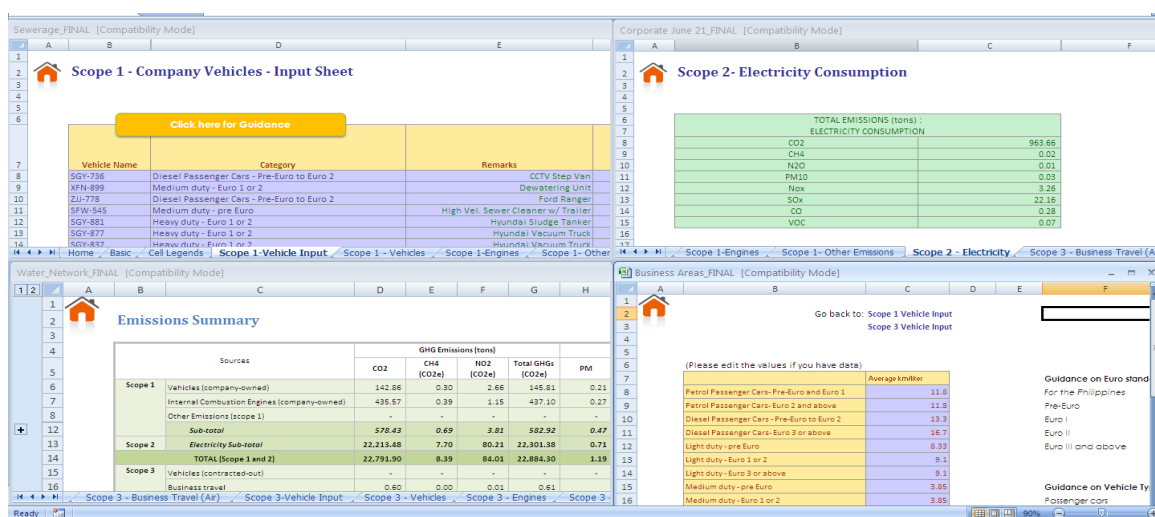


Figure 2: Snapshot of the GHG and air pollutant estimation spreadsheet tools

METHODOLOGY

The GHG and air pollutant emissions of Maynilad are estimated using the emission factor approach. Published emission factors from globally-accepted emissions quantification tools and guidance materials are also used. The basic formula used in the emission factor approach is:

$$A \times EF \times (1 - ER/100) = E$$

Wherein:

A = activity data ER = emission reduction efficiency¹⁰
EF = emission factor E = emissions

¹⁰ Calculations for the emissions of the equipment assume that there are no emissions controls installed due to the lack of information and to be able to achieve conservativeness in the calculations.

MAYNILAD'S 2017 GHG EMISSIONS

The activity data is the measure of extent of the activities which emit emissions. An emission factor is a representative value that attempts to relate the quantity of a pollutant released into the atmosphere with an activity associated with the release of the pollutant. Ideally, emission factors applied are those specific for the fuel used (based on analysis of e.g. fuel oil) or the equipment (based emission analysis of e.g. boilers), provided analyses are conducted frequently enough to reflect the variability of emissions over time. The details of the calculation methodologies can be found in the IMP.

2017 EMISSIONS

Maynilad's GHG and air pollutant emissions for 2017 are detailed below.

GREENHOUSE GAS EMISSIONS

Maynilad released 75,765.97 tonnes of CO₂ equivalent for Scope 1 and 2. For every liter of water distributed, Maynilad emitted 0.0832 grams of CO₂.



DIRECT AND INDIRECT EMISSIONS

The total GHG emission of Maynilad for the year 2017 is equivalent to 75,765.97 tonnes of carbon dioxide equivalent (tCO₂e) for Scope 1 and Scope 2 emissions. The direct emissions (Scope 1) comprise 4,278.94. tCO₂e (5.65%) while indirect emissions from Scope 2 pertaining to purchased electricity is 71,487.03 tCO₂e (94.35%). The graph in **Figure 3** shows the trend of the GHG emissions for Scope 1 and Scope 2 of the company since the baseline year (2009).

It was observed that the emissions are increasing every year. This is due to number of new facilities, operating hours, and number of vehicles to be able to serve the expanding number of customers of the company that causes the increased in energy sources such as fuel and electricity consumption. The details in the increase of emissions will be discussed in the succeeding sections.

MAYNILAD'S 2017 GHG EMISSIONS

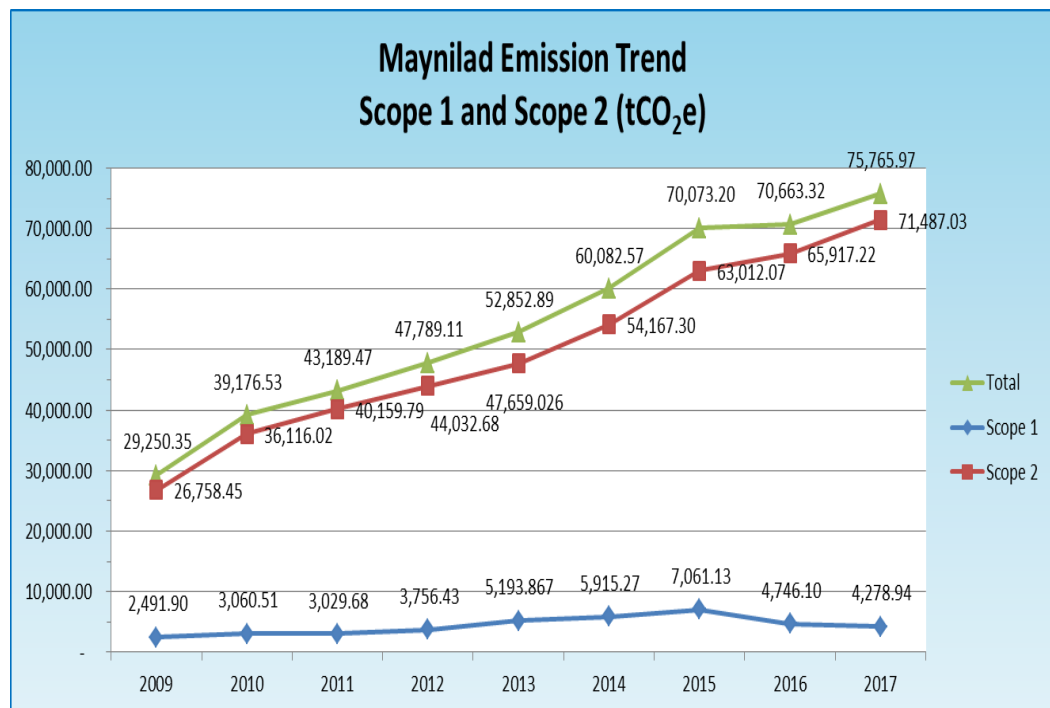


Figure 3: Scope 1 and Scope 2 Emission Trend

In terms of the types of GHG gases emitted (**Figure 4**), 98.76% of GHG emissions is carbon dioxide (74,830.33 tCO₂e). The other gases that are considered by the Kyoto Protocol (HFCs, PFCs and SF₆) are not considered in the inventory since these are specific to certain types of industries and are not relevant to the operations of Maynilad.

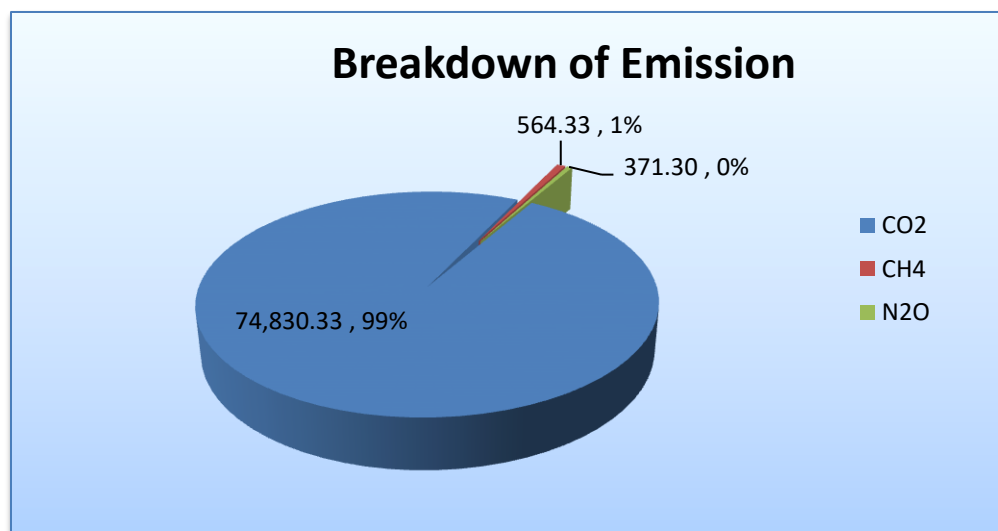


Figure 4: 2017 Breakdown of GHG Emissions

MAYNILAD'S 2017 GHG EMISSIONS

As seen in **Figure 5**, for Business Area and Central NRW direct emission is higher than the indirect emission purchased from electricity while other group's direct emission is lower than the indirect. A total of 70.60% of the GHG emission of Maynilad emissions are emissions of Water Network only. The largest single-site contributor to Maynilad purchased electricity consumed is the La Mesa Pump Station including La Mesa Maintenance shop, La Mesa North A Annex and La Mesa North C Annex, which is 41,748,722.81KwH.

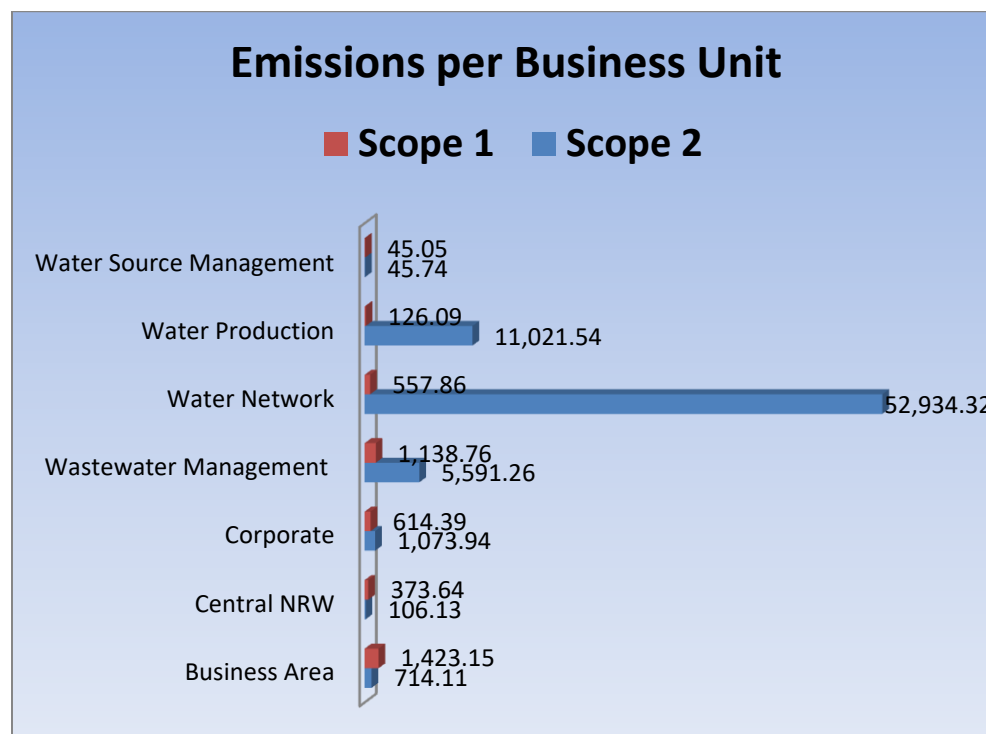


Figure 5: Emissions of the Different Groups

COMPARISON OF EMISSIONS WITH THE PREVIOUS YEAR

The total CO₂e emission for 2017 has increased by 7.22% (Scope1 & Scope2) compared from the 2016 total emission and this can be attributed to the following:

- Significant increase in power consumption of Wastewater facilities which increased its power consumption from 8,979,416Kwh for 2016 to 9,990,787Kwh for 2017, Water Production Facilities from 17,708,284.23KwH to 19,391,388.23KwH and Water Network Facilities from 2016 having 85,565,595.38KwH comparing to 2017 consumption .
- Turnover to Maynilad and full operation of Alabang - Zapote Septage Treatment Plant which contributes 187,924KwH to the total electricity of WMD 9,990,787KwH.

MAYNILAD'S 2017 GHG EMISSIONS

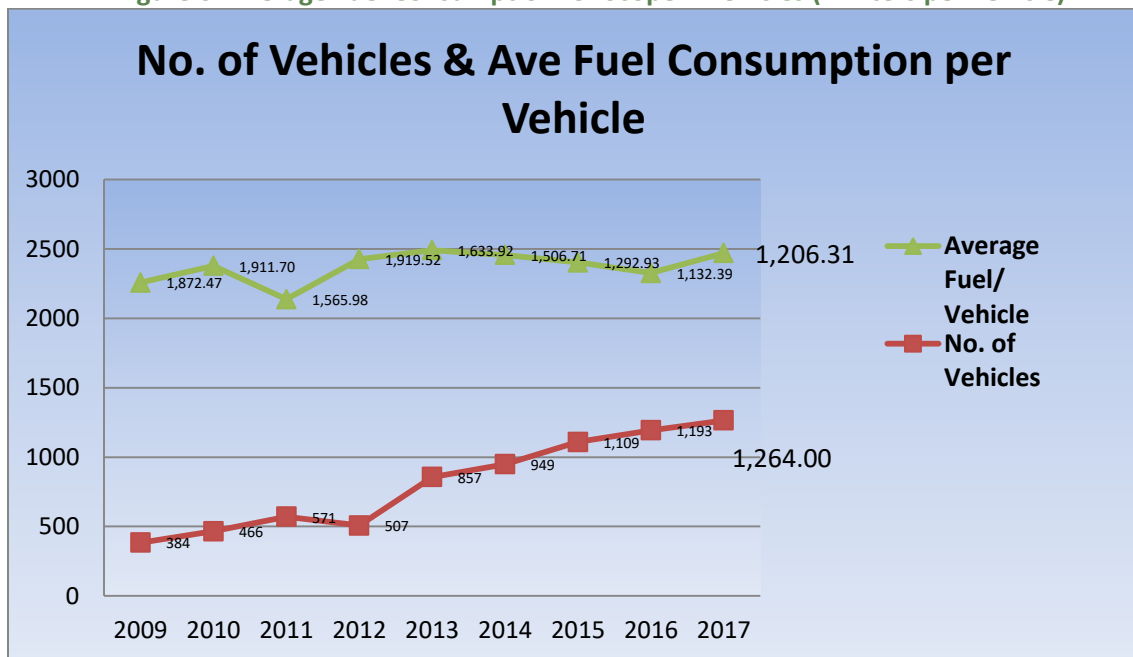
Table 3: Power consumption of facilities that has the greatest impact on the emissions of Maynilad

Business Unit	2016	2017	% increase
La Mesa PS (North A & C Annex & Maint. Shop)	34,810,268.64	41,748,722.81	19.93
Pasay PS	6,874,823.90	7,110,203.45	3.42
Pagcor	16,213,625.05	14,347,678.08	-11.51
Villamor	9,230,416.56	9,566,469.13	3.64

Table 3 shows the top facilities which have high electricity consumption for the year 2017 comparing to 2016. For La Mesa Pump Station, North A Annex was established and included having 3,790,500Kwh electricity consumption.

Table 4 shows the comparison of average fuel consumption per vehicle with such increase of 6.53% having 1,132.39 liters of fuel/ vehicle versus 1,206.31 liters of fuel/ vehicle in 2017.

Figure 6: Average Fuel Consumption for Scope 1 Vehicles (in Liters per vehicle)



MAYNILAD'S 2017 GHG EMISSIONS

Table 4: Average Fuel Consumption for Scope 1 Vehicles (in Liters per vehicle) per group

Average Fuel	2016			2017		
	Fuel Consumed	No. of Vehicle	Fuel / Vehicle	Fuel Consumed	No. of Vehicle	Fuel / Vehicle
Scope 1 Vehicle	1,350,941.87	1,193	1,132.39	1,524,773.44	1,264	1,206.31
Business Area	361,822.74	370	977.90	529,290.02	699	465.29
Central – NRW	152,151.60	138	1,102.55	141,194.82	72	1,961.04
Corporate	409,429.26	502	815.60	325,237.77	328	991.58
Wastewater	146,014.67	71	2,056.54	134,404.41	86	1,562.84
Water Network	232,880.80	87	2,676.79	328,250.16	60	5,470.84
WProd	43,897.16	20	2,194.86	48,196.23	13	3,707.40
Water Source Mgt.	4,745.64	5	949.13	18,200.04	6	3,033.34

For the calculation of Scope 2 emissions, data obtained from the Department of Energy is used as the basis for the calculation of the emission factors (amount of GHG released per kWh). In terms of emission of GHG, coal-fired power plants have the greatest amount of gases released per kilowatt-hour it produces. The emission factors for each gas and air pollutants for the past 3 years are summarized below (**Table 5**). Due to early released of GHG emission of Maynilad we used the previous power statistics which released in 2016.

Table 5: Emission Factors for Scope 2 (in tons/MWh)

Emission Factors for Scope 2	2014	2015	2016 & 2017
CO ₂	0.56119146	0.55886573	0.56729962
CH ₄	0.00000754	0.00000727	0.00000743
N ₂ O	0.00000660	0.00000668	0.00000683
PM	0.00001313	0.00001154	0.00001205
NO _x	0.00168951	0.00168729	0.00171400
SO _x	0.01350700	0.01372687	0.01403386
CO	0.00013238	0.00013109	0.00013236
VOC	0.00003361	0.00003317	0.00003354

SCOPE 3 EMISSIONS

Scope 3 emissions are indirect emissions other than those from purchased electricity. These are emissions from sources that are deemed important to the operations of the company but are not owned or controlled by the company. Accounting and reporting of Scope 3 emissions are optional. These are usually reported separately from the sum of Scope 1 and 2 emissions.

MAYNILAD'S 2017 GHG EMISSIONS

The total Scope 3 emission of Maynilad in 2017 is 33.69 tCO₂e. Table 6 shows the emission trend of Scope 3 emissions from the base year (2009) up to 2017 per business units.

Table 6: Scope 3 Emissions in tons of CO₂ equivalent

Scope 3 Emissions (tCO ₂ e) from Business Travel									
	2009	2010	2011	2012	2013	2014	2015	2016	2017
Business Area	43.32	10.79	0.68	11.88	-	1.10	11.19	4.80	0.75
Corporate		48.33	53.73	59.87	48.28	47.30	4.49	49.01	28.90
Central NRW		22.59	9.08	3.53	2.84	5.14	7.18	2.38	1.35
Water Network	0.61	17.64	3.38	8.41	12.33	1.88	4.08	2.26	0.17
Water Production	0.86	5.15	0.72	0.78	0.20	1.04	2.82	3.67	0.00
Wastewater Management	0.14	6.00	5.14	1.80	5.70	0.84	10.21	1.31	0.67
Water Source Management	0	0	0	0	0	0	0	0.78	1.85
TOTAL	44.92	110.5	72.73	86.27	69.36	57.31	39.97	64.21	33.69

AIR POLLUTANT EMISSIONS

Maynilad's air pollutant emissions are summarized in the **Table 7**. Scope 1 accounted for most of the emission for particulate matter (71.12%), Carbon Monoxide (79.87%) and Volatile Organic Compounds (84.95%) while Scope 2 accounted for most of the emission for NO_x (84.48%) and SO_x (99.81%). The air pollutants emission for 2017 for SO_x saw an increase due to increase in consumption of purchased electricity and also attributed to the same factors as that of the increase in CO₂e emissions (increase in operation of the major pumps stations and operation of additional sewage treatment plants and fuel consumption of vehicles).

Table 7: 2017 Air Pollutant Emissions (tons)

	PM	NO _x	SO _x	CO	VOC
Scope 1	3.76	39.49	3.28	65.93	23.77
Scope 2	1.52	215.00	1759.05	16.61	4.21

MAYNILAD'S 2017 GHG EMISSIONS

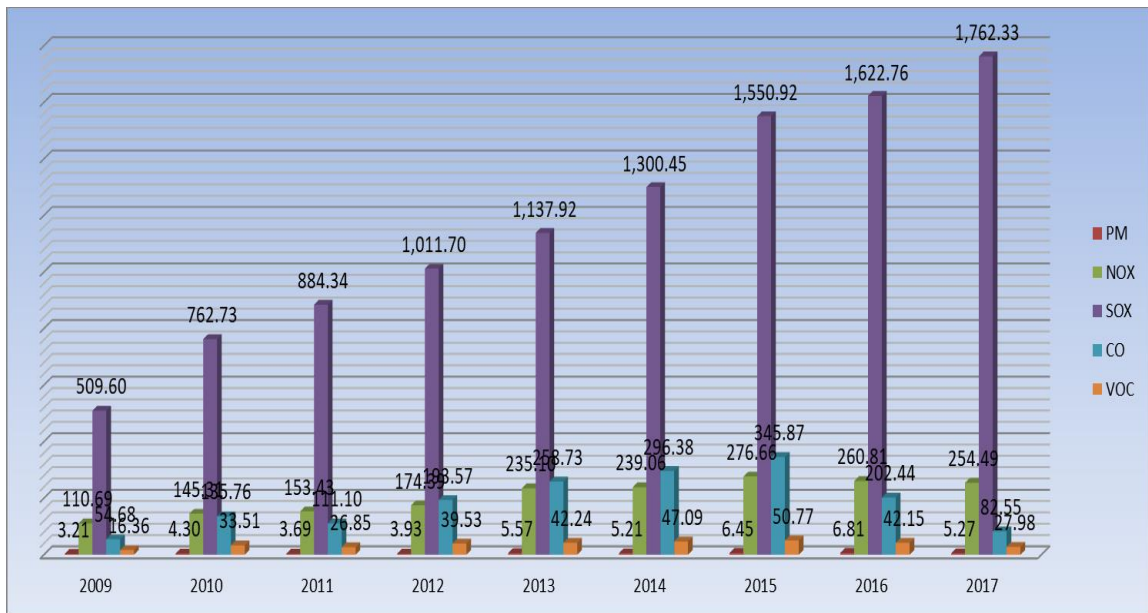


Figure 6: Air Pollutant Emissions Comparison for Scope 1 and 2

BENCHMARKING EMISSIONS WITH OTHER WATER UTILITIES

There are two principal aspects in GHG accounting that are of interest - the absolute quantity of GHG emissions as well as the value of the normalized emissions or the quantity of emissions relative to a measure of output.

Normalization of emissions is important as this allows for companies to:

- Track their emissions performance over time.
- Compare their own emissions with similar business operations within the company.
- And benchmark with other companies with similar businesses.

Water utilities around the world normally use water production statistics or final billed volume as the factor for normalizing their emissions. **Table 8** benchmarks Maynilad emissions against other companies engaged in water production and distribution. The differences from the figures may be attributed to differences in accounting techniques (e.g. what sources are included), and operational characteristics such as geography and technology (i.e., the level of difficulty in extracting water and the choice of technologies).

MAYNILAD'S 2017 GHG EMISSIONS

Table 8: Benchmarking Maynilad emissions with other water distribution/utility companies worldwide

Country	Company	GHG Emissions (tCO ₂ e)	Year	Water Production (million Liters unless specified)	CO ₂ /water produced (tCO ₂ e/unit of production)
UK	Anglian Water	403,099	2017	183,000	2.20
Philippines	Manila Water	226,193	2017		176tCo2e/mcm
Australia	Sydney Water	340,011	2017	551,406	0.617
Australia	Water Corporation	806,000	2017	241,000	3.34
New Zealand	Water Care	38,890	2017	149,488	0.2602
Australia	Melbourne Water Corporation	438,332	2017	428*	1024.14**
United Kingdom	Thames Water		2016-2017		0.1412
Philippines	Maynilad	75,765.97	2017	910,961.11	0.0832
Philippines	Maynilad	75,765.97	2017	512,870.63	0.1477

From the table above, Maynilad have the lowest CO₂ emissions intensity in per unit of water produced among the different companies having 0.0832tCO₂e/ML. However, due to the losses from the non-revenue water, the emissions efficiency of Maynilad deteriorates if the losses from water distribution are accounted for. Using the billed volume, the emissions intensity of Maynilad becomes 0.1477 tons/ million liters.

*million cubic meter

**billion liter; tCO₂e/ billion liter

CONCLUSIONS

The project for accounting the GHG emissions for the year 2017 was successful in taking into account all the GHG emissions of Maynilad. This even though there was an increase of 7.22% from the previous year (2016) due mainly to the continuing expansion of the company to serve its expanding customer base. Maynilad emission intensity that includes emissions from Scope 1 and Scope 2 from 0.0817tCO₂e/MLD for 2016 to 0.0832tCO₂e/MLD for 2017 considering the total water treated (million liters).

In the aim of the company to reduce or minimize its GHG emissions despite its expanding operation, this GHG inventory has been a tool in identifying areas in the operation where programs can be implemented to help reduce the emissions of the company.

CONTINUOUS PROGRAMS IMPLEMENTED:

➤ INSTALLATION OF VARIABLE FREQUENCY DRIVES (VFD) AND HIGHLY EFFICIENT MOTORS

To enhance the efficiency of the operations of pump stations, Maynilad equipped the new pump stations with variable frequency drives and highly efficient motors. The VFD is a type of adjustable speed-drive used to control the speed and torque of motors to meet the specified pressure and flow. The speed of the motor is directly proportional to its power consumption, thus the lower the speed, the lesser the power consumption. Therefore the use of VFD is very applicable in the system of Maynilad since the discharge pressure of pump stations are specific and not all the motors need not to run at its full speed.

➤ INCORPORATING ENERGY MANAGEMENT SYSTEM ON EXISTING MANAGEMENT SYSTEMS

The implementation of an energy conservation program using the energy management system framework (ISO 50001) has contributed in establishing a more structured approach in targeting improvement plans for the facilities with the highest electricity consumption in terms of reduction in energy consumption. Considering most of the energy conservation practices are applicable to most of the facilities, best practices have been shared across sites and has been the normal procedure. One such example is the implementation of standard procedure in turning on/off for the water pumps of pump stations which lead to lower spike in voltage reading.

➤ FACILITIES AND PROCESS IMPROVEMENT AND OPTIMIZATION

Water Production aims to reduce its GHG emissions thru process improvements and optimization. (1)The team optimized the usage of their rapid mixer considering the water turbidity level considering the daily water volume treated (1,250-1,500MLD) as of their

CONCLUSIONS

parameters in setting rapid mixer operation, (2) Establishing of master schedule in using of flood lights for non-critical areas, (3) Establishing KW Demand Management program which monitor analyze energy usage, (4) Provision of soft starter for recovery pumps, (5) Optimization of vacuum pump usage for North and South stream for every shifts.

Improvement in the Efficiency of the Water Distribution Network:

- Energization of **50ML Sacred Heart Reservoir, North A Annex and Victoria Pumping Station (110ML combined reserved capacity)**
- Partial commissioning of **Toclong PS**
- Introduction of **Automatic blow-off line**
- Refurbished pumps at **Commonwealth, Pasay and Novaliches**
- Completed the requirement to increase Availability of Pagcor PS by purchasing 2 new spare pumps and energized the spare Soft Starter. The spare motors are also available.
- **Daang Hari PS – Saved 893 Kwhr** of Energy that translates to **Php 197,385 per month** because of replacing the old Pump impeller.
- Established Maintenance Planning and Condition-Based Maintenance Units to help improve Reliability of plant equipment.

For Central Control and Monitoring (CCM), establishment of Remote Real-time Monitoring and Control of Water Network thru the Central Control Room for the 26 facilities including 7 Pump Stations with Reservoir, 4 Pump Stations and 15 Inline Boosters. CCM also installed 1132 Pressure Monitoring Points (PMP) with automatic alarm setting.

LMTP1

- During period where raw water turbidity is less than 5NTU, use only one (1) rapid mixer per stream.

LMTP2

- Reduction of filter backwashing from eight units to six units and reduction of backwashing time from 14 minutes to 12 minutes.
 - Turning off of 2 units of vacuum pump @ North and South Stream in sequence every shift.
 - Turning off of another 2 units of vacuum pump @ North and South Stream in sequence every shift.
 - Only one (1) flash mixer is being used at South stream. Reduced number of filter backwashing from 8 units to 6 units and reduced backwashing time from 14mins to 12mins. Rotational shutdown of one (1) vacuum pump per stream equivalent to two (2) vacuum pumps off per day started February 2017 and another additional 1 vacuum pump per stream equivalent to four (4) vacuum pumps off per day.
-

CONCLUSIONS

PWTP

- Usage of bicycle instead of e-tricycle or service vehicle during water sampling within the plant premises.

WMD

List of the STP's which are currently under construction:

1. Valenzuela STP
2. Pasay STP
3. Paranaque STP
4. Cupang STP and;
5. Tunasan STP
6. Cavite City STP (under time suspension)
7. Ayala Southvale STP (under time suspension)
8. Las Pinas STP (on going site mobilization)

For all Maynilad facilities programs implemented:

- Switch off lights during lunch breaks and other rooms if not in use.
- Regulate usage of air-condition units.
 - Setting temperature at 22 – 25°C
 - Turning off ACU 30mins before the end of working hours(5pm)
 - Limiting ACU operation during Saturdays or in case of Sunday/Holiday operation.
- Replacement of lighting bulbs from fluorescent bulbs to LED lamps.
- Scheduled maintenance of ACU and lighting.

➤ FLEET MANAGEMENT PROGRAMS

The Re-fleeting Program was one of the major projects of the Fleet Management that started on June 2015 until 2017. It is the replacement service vehicles from Avanza service vehicles (gasoline) changed to Mitsubishi adventure (diesel) this is due to expiration of service contract that also affect GHG emissions. Continuing installation of GPS vehicle tracking was implemented by the Fleet Management this is used to monitor vehicle utilization and the unauthorized use of Maynilad vehicles.

➤ ESTABLISHMENT OF INTEGRATED MANAGEMENT SYSTEM (IMS)

The establishment of IMS of facilities will benefit the goal of the company in reducing its GHG emissions. It played a vital role in spreading the awareness of the impacts of our activities to the environment. The targets established in IMS, specifically under the Environmental Management System (ISO 14001) will affect and have a great impact in reducing the GHG emissions if met.

Annex

Annex 1 – Maynilad’s Quality, Environment, Energy, Safety and Health Policy



QUALITY, ENVIRONMENT, ENERGY, SAFETY AND HEALTH POLICY

Maynilad Water Services, Inc. (Maynilad), the country's leading water solutions company, is committed to provide quality, safe, and continuous water supply, service excellence, environmental protection, energy efficiency, and personnel safety and health in the workplace.

We shall continually improve the resilience, water quality and reliability, cost-effectiveness, energy performance, and environmental sustainability of our operations and services by implementing an integrated management system (IMS) compliant with legal, regulatory, contractual, and other requirements to which Maynilad subscribes.

In pursuing our business objectives, we shall:

- provide reliable and high-quality water treatment and distribution, sewerage and sanitation services at a fair price to meet the needs and expectations of interested parties;
- minimize and manage the adverse impacts of our operations on the environment by optimizing the use of energy and our resources, reducing the generation of waste, and controlling the emission of pollutants to air, water, and land;
- optimize the ownership and operation of our assets through proper life cycle management with focus on performance, cost, and risk in order to derive value for Maynilad and its stakeholders;
- ensure the availability of information and necessary resources;
- purchase energy-efficient products and services including energy-efficient designs to improve energy performance;
- enhance the personal and professional well-being of our employees by providing training and support to maintain a competent workforce that is conscious of what the organization wants to achieve;
- protect the health and safety of our employees, contractors, visitors, and neighboring communities by designing and executing systematic programs that will prevent work-related injuries, illnesses, and emergencies;
- promote a systematic risk management framework;
- create and embrace a culture that encourages employees, contractors, suppliers and stakeholders to conduct activities in a responsible manner including the management of risks; and
- review regularly our IMS to ensure its continuing suitability, adequacy, and effectiveness.


RAMONCITO S. FERNANDEZ
President and CEO

Revision No.: B
Date: February 23, 2018

Maynilad Water Services, Inc.
MWSS Complex, Katipunan Avenue, Balara, Quezon City 1105 Philippines
Head Office Trunkline: +63 2 561-3333
www.mayniladwater.com.ph

Annex 2A – Memorandum Re: Greenhouse Gases (GHG) Team



MEMORANDUM

REF. No. EMD-IOM-011-10

DATE : 10 March 2010
TO : All Concerned
FROM : Rogelio L. Singson
President
SUBJECT: Greenhouse Gases ("GHG") Team

Following the launch of, and seminar on, the *GHG and Air Emissions Inventory Development Project* on 2 and 3 February 2010, we wish to inform you of the creation of *GHG Team* a.k.a. *Maynilad Green Team*.

The *Maynilad Green Team* will be working with the other members coming from the different operational units and support groups to establish the 2009 baseline data of greenhouse gases and air emissions of our business operations. The *Maynilad Green Team* is composed of the following:

Francisco A. Arellano	-	Project Head
Enrique G. De Guzman	-	Deputy Project Head

Members:

1.	Xandra Mae B. Borais	-	Sewerage & Sanitation
2.	Abigail Corazon R. Atienza	-	Sewerage and Sanitation
3.	Freda P. Boleyley	-	Water Network
4.	Nathaniel P. Gueco	-	Water Network
5.	Pamela Maye C. Andres	-	Water Production
6.	Romer Jumawan	-	Water Production
7.	Grace A. Laguardia	-	Fleet & Premises Management
8.	Joseph R. Revatoris	-	Fairview-Commonwealth Business Area
9.	Orlando T. Tabula	-	Cavite Business Area

Secretariat:

Vilma S. Cembrano	Cristina G. Talanay	Aden Angelo G. Manalo
Richard B. Garcia	Rex Lucius D. Dueñas	

A series of working sessions will be held in the coming days together with The Philippine Business for the Environment (PBE) and Clean Air Initiatives for Asian Cities for the establishment of the baseline data. Thereafter, the GHG Team will set reduction targets, identify measures that will help the company reduce its GHG emissions, and measure regularly the company's carbon footprint. The GHG Team will also explore the possibility of having the company's carbon footprint certified to by a third party.

Let us extend our support to the GHG Team. Thank you.

Cc: Herbert M. Consunji
Lourdes Marivic P. Espiritu
Roy Agustin K. Evalle

Fn: ims/letters&memo/ GHG Team (031010)

Annex 2B – Memorandum Re: Greenhouse Gases (GHG) Team (Updated)



MEMORANDUM

DATE : **30 SEPTEMBER 2014**

TO : **ALL CONCERNED**

FROM : **VICTORICO P. VARGAS**
President and Chief Executive Officer

SUBJECT: **UPDATE ON GREENHOUSE GASES (GHG) TEAM**

In support of the company's sustainability goals, we would like to inform you on the update of the composition of the *GHG Team* a.k.a. *Maynilad Green Team*. The *Maynilad Green Team* will continually identify and recommend measures that will help the company reduce its GHG and air pollutant emissions. The Maynilad Green Team is composed of the following:

Francisco A. Arellano	-	Project Head
Enrique G. De Guzman	-	Deputy Project Head

Members:

1. Jeric Daniel M. Axalan	-	Business Area Operations
2. Teresita L. Hapal	-	Business Area Operations
3. Renson D. Gloriane	-	Central NRW
4. Junielyn E. Rodriguez	-	Central NRW
5. Grace A. Laguardia	-	Logistics
6. Glenneth S. Magtala	-	Logistics
7. Samuel Gerald T. Saludez II	-	Logistics
8. Kris G. Catangatang	-	Corporate QESH-IMS
9. Marianne Kristel U. Mariano	-	Corporate QESH-IMS
10. John Emmanuel B. Martinez	-	Corporate QESH-EMD
11. Michael M. Sablas	-	Corporate QESH-EMD
12. Lolita M. Lota	-	Finance
13. Mae Liza S. Velasquez	-	HR
14. Jessica H. Agarap	-	Water Network
15. Ressie D. Vicente	-	Water Network
16. Jan Jerald De Jesus	-	Water Production
17. Juvelene C. Ydia	-	Water Production (LMTP 1)

Annex 2B – Memorandum Re: Greenhouse Gases (GHG) Team (Updated)

*Updated Greenhouse Gases (GHG) Team
Page 2*

18. Marlon Araracap	-	Water Production (LMTP 1)
19. Roxanne Reyes	-	Water Production (LMTP 2)
20. Adrienne Rose Castillo	-	Water Production (LMTP2)
21. Romer S. Jumawan	-	Water Production (PWTP)
22. Mark Vincent Q. Talosig	-	Water Production (PWTP)
23. Adrienne M. Andres	-	Wastewater Management
24. Abigail Corazon R. Atienza	-	Wastewater Management
25. Xandra Mae B. Borais	-	Wastewater Management

Let us extend our full support and cooperation to the team as we affirm our commitment to the quality of our systems and services, protection of the environment, and the health and safety of our employees.

Thank you.

Annex 2C – Memorandum Re: Greenhouse Gases (GHG) Team (Updated)

ANNEX K
Maynilad Greenhouse Gases (GHG) Team
February 20, 2018

GREENHOUSE GASES (GHG) TEAM		
DESIGNATION	NAME	OFFICE
Program Head	Roel S. Espiritu	CQESH
Deputy Program Head	Enrique G. De Guzman	CQESH-IMS
Members	Justine G. Madlangakay	CQESH-IMS
	Chester Y. Del Rosario	CQESH-IMS
	Ginny Vivien T. Calaycay	WNET
	Digna C. Tesalona	WNET
	Joan R. Floresca	WNET
	Stephanie Joyce Burda-Martinez	CXRO
	Gracelyn F. Dinglasan	CXRO
	Kenji Michael D. P. Kusaka	LMTTP 2
	Roxanne R. Madarang	LMTTP 2
	Darlene G. Yu	LMTTP 1
	Anne Marie M. Matubis	LMTTP 1
	Marlon A. Araracap	LMTTP 1
	Fher Bryan H. Binuya	TPM
	Mark Vincent Q. Talosig	PWTP
	Rommel D.C. Sarsonas	PWTP
	Marvin M. Villanueva	WSM-CPF
	Erwin Nico C. Caparas	CNRW
	Carmela Louisa A. Maleficio	CNRW
	Grace A. Laguardia	CORPORATE
	Glenneth S. Magtalas	CORPORATE
	Samuel Gerald T. Saludez III	CORPORATE
	Bob S. Castrence	WMD
	Dirk Jan Dinno B. Coligado	WMD
	Allen Jerry P. Aries	WMD
	Lolita M. Lota	FINANCE
	Loverizza E. Nadado	FINANCE
	Juan Josefito A. Jalandoni	HR
	John Emmanuel B. Martinez	CQESH-ENVI
	Vilma T. Vilacarlillo	CXRO-TDO

Annex 3

Emission Summary Tables

Summary

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	N2O (CO2e)	Total GHG (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	2,959.80	3.08	104.43	3,067.30	3.38	30.53	3.02	63.60	23.13
	Internal Combustion Engines (company-owned)	437.58	0.51	1.51	439.60	0.38	8.97	0.27	2.34	0.63
	Other Emissions (Scope 1)	230.86	541.17	-	772.03	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	230.86	541.17	-	772.03	-	-	-	-	-
	Sub-total	3,628.25	544.76	105.94	4,278.94	3.76	39.49	3.28	65.93	23.77
Scope 2	Electricity Sub-total	71,202.09	19.57	265.37	71,487.03	1.51	215.00	1,759.05	16.61	4.21
TOTAL (Scope 1 and 2)		74,830.33	564.33	371.30	75,765.97	5.27	254.49	1,762.33	82.55	27.98
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	33.33	0.00	0.35	33.69	-	2.67	-	4.39	-
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (Scope 3)	-	-	-	-	-	-	-	-	-
	LPG									
	Acetylene									
	Others									
	Sub-total	33.33	0.00	0.35	33.69	-	2.67	-	4.39	-
TOTAL		74,863.67	564.33	371.66	75,799.66	5.27	257.16	1,762.33	86.94	27.98

Business Area

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	N2O (CO2e)	Total GHG (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	1,361.29	1.40	54.82	1,417.52	1.77	16.44	1.38	27.92	9.80
	Internal Combustion Engines (company-owned)	5.62	0.01	0.01	5.64	0.01	0.15	0.01	0.03	0.01
	Other Emissions (Scope 1)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	<i>Sub-total</i>	<i>1,366.91</i>	<i>1.40</i>	<i>54.84</i>	<i>1,423.15</i>	<i>1.78</i>	<i>16.59</i>	<i>1.39</i>	<i>27.95</i>	<i>9.81</i>
Scope 2	<i>Electricity Sub-total</i>	<i>711.26</i>	<i>0.20</i>	<i>2.65</i>	<i>714.11</i>	<i>0.02</i>	<i>2.15</i>	<i>17.60</i>	<i>0.17</i>	<i>0.04</i>
TOTAL (Scope 1 and 2)		2,078.17	1.60	57.49	2,137.26	1.79	18.74	18.98	28.11	9.85
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	0.74	-	0.01	0.75	-	0.37	-	0.81	-
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (Scope 3)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	<i>Sub-total</i>	<i>0.74</i>	<i>-</i>	<i>0.01</i>	<i>0.75</i>	<i>-</i>	<i>0.37</i>	<i>-</i>	<i>0.81</i>	<i>-</i>
TOTAL		2,078.91	1.60	57.50	2,138.01	1.79	19.11	18.98	28.92	9.85

Central Non-Revenue

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	N2O (CO2e)	Total GHG (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	361.46	0.32	7.81	369.58	0.39	3.04	0.39	7.60	3.37
	Internal Combustion Engines (company-owned)	4.04	0.00	0.01	4.05	0.01	0.10	0.01	0.02	0.02
	Other Emissions (Scope 1)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	<i>Sub-total</i>	<i>365.49</i>	<i>0.32</i>	<i>7.82</i>	<i>373.64</i>	<i>0.40</i>	<i>3.14</i>	<i>0.40</i>	<i>7.62</i>	<i>3.38</i>
Scope 2	<i>Electricity Sub-total</i>	<i>105.71</i>	<i>0.03</i>	<i>0.39</i>	<i>106.13</i>	<i>0.00</i>	<i>0.32</i>	<i>2.61</i>	<i>0.02</i>	<i>0.01</i>
TOTAL (Scope 1 and 2)		471.20	0.35	8.22	479.76	0.40	3.46	3.02	7.65	3.39
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	1.34	-	0.01	1.35	-	0.83	-	1.74	-
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (Scope 3)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	<i>Sub-total</i>	<i>1.34</i>	<i>-</i>	<i>0.01</i>	<i>1.35</i>	<i>-</i>	<i>0.83</i>	<i>-</i>	<i>1.74</i>	<i>-</i>
TOTAL		472.54	0.35	8.23	481.12	0.40	4.29	3.02	9.38	3.39

Corporate

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	N2O (CO2e)	Total GHG (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	597.17	0.61	15.75	613.53	0.57	4.91	0.59	14.60	4.98
	Internal Combustion Engines (company-owned)	0.39	0.12	0.36	0.87	0.00	0.00	0.00	0.00	0.01
	Other Emissions (Scope 1)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	Sub-total	597.56	0.73	16.10	614.39	0.57	4.92	0.59	14.60	4.99
Scope 2	Electricity Sub-total	1,069.66	0.29	3.99	1,073.94	0.02	3.23	26.46	0.25	0.06
TOTAL (Scope 1 and 2)		1,667.22	1.02	20.10	1,688.34	0.60	8.15	27.05	14.85	5.05
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	28.59	0.00	0.30	28.90	-	0.05	-	0.03	-
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (Scope 3)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	Sub-total	28.59	0.00	0.30	28.90	-	0.05	-	0.03	-
TOTAL		1,695.81	1.02	20.40	1,717.23	0.60	8.20	27.05	14.88	5.05

Wastewater Management

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	N2O (CO2e)	Total GHG (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	336.03	0.40	19.90	356.34	0.29	3.31	0.32	6.40	1.64
	Internal Combustion Engines (company-owned)	10.34	0.01	0.03	10.38	0.01	0.21	0.01	0.06	0.06
	Other Emissions (Scope 1)	230.86	541.17	-	772.03	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	230.86	541.17	-	772.03	-	-	-	-	-
	Sub-total	577.24	541.58	19.93	1,138.76	0.31	3.52	0.34	6.46	1.71
Scope 2	Electricity Sub-total	5,568.94	1.53	20.78	5,591.26	0.12	16.83	137.76	1.30	0.33
TOTAL (Scope 1 and 2)		6,146.18	543.11	40.71	6,730.01	0.42	20.35	138.10	7.76	2.04
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	0.66	-	0.01	0.67	-	0.29	-	0.44	-
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (Scope 3)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	Sub-total	0.66	-	0.01	0.67	-	0.29	-	0.44	-
TOTAL		6,146.84	543.11	40.72	6,730.68	0.42	20.64	138.10	8.20	2.04

Water Network

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	N2O (CO2e)	Total GHG (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	240.07	0.29	4.52	244.89	0.28	1.98	0.26	5.73	2.96
	Internal Combustion Engines (company-owned)	311.88	0.28	0.82	312.97	0.19	6.05	0.10	1.61	0.18
	Other Emissions (Scope 1)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	Sub-total	551.95	0.57	5.34	557.86	0.47	8.04	0.36	7.34	3.14
Scope 2	Electricity Sub-total	52,723.07	14.50	196.75	52,934.32	1.12	159.29	1,304.26	12.30	3.12
TOTAL (Scope 1 and 2)		53,275.02	15.06	202.09	53,492.17	1.59	167.33	1,304.62	19.64	6.25
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	0.17	-	0.00	0.17	-	0.10	-	0.38	-
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (Scope 3)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	Sub-total	0.17	-	0.00	0.17	-	0.10	-	0.38	-
TOTAL		53,275.19	15.06	202.09	53,492.34	1.59	167.43	1,304.62	20.02	6.25

Water Production

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	N2O (CO2e)	Total GHG (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	49.67	0.04	1.02	50.74	0.06	0.71	0.05	0.89	0.27
	Internal Combustion Engines (company-owned)	75.09	0.07	0.20	75.36	0.11	1.78	0.10	0.43	0.19
	Other Emissions (Scope 1)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	Sub-total	124.76	0.11	1.22	126.09	0.17	2.49	0.15	1.31	0.47
Scope 2	Electricity Sub-total	10,977.89	3.01	40.63	11,021.54	0.24	33.04	269.27	2.56	0.65
TOTAL (Scope 1 and 2)		11,102.65	3.12	41.85	11,147.63	0.41	35.53	269.42	3.87	1.12
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	0.61	-	0.01	0.62	-	0.34	-	0.83	-
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (Scope 3)	-	-	-	-	-	-	-	-	-
	LPG									
	Acetylene									
	Others									
	Sub-total	0.61	-	0.01	0.62	-	0.34	-	0.83	-
TOTAL		11,103.27	3.12	41.86	11,148.25	0.41	35.87	269.42	4.71	1.12

Water Source Management

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	N2O (CO2e)	Total GHG (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	14.10	0.02	0.60	14.71	0.01	0.13	0.01	0.47	0.11
	Internal Combustion Engines (company-owned)	30.23	0.03	0.08	30.34	0.05	0.67	0.04	0.18	0.16
	Other Emissions (Scope 1)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	Sub-total	44.33	0.05	0.68	45.05	0.06	0.80	0.06	0.65	0.27
Scope 2	Electricity Sub-total	45.56	0.01	0.16	45.74	0.00	0.13	1.08	0.01	0.00
TOTAL (Scope 1 and 2)		89.89	0.06	0.84	90.79	0.06	0.94	1.13	0.66	0.27
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	1.83	-	0.02	1.85	-	0.69	-	0.16	-
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (Scope 3)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	Sub-total	1.83	-	0.02	1.85	-	0.69	-	0.16	-
TOTAL		91.73	0.06	0.86	92.64	0.06	1.63	1.13	0.82	0.27