

**GREENHOUSE GASES
AND
AIR POLLUTANT
EMISSION REPORT
2018**



Maynilad

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ACKNOWLEDGEMENT

This report was prepared on behalf of Maynilad Water Services Incorporated by the Green Team.

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This project was headed by Enrique de Guzman, Head of the Integrated Management Department under the management of Roel Espiritu, the Head of Corporate QESH Division during the establishment of 2018 GHG Inventory. They greatly acknowledge the input provided by the other members of the Green Team as data contributors: Juan Joselito Jalandoni of Human Resources, Lolita Lota of Finance, Vilma Villacarillo of CXRO and, John Emmanuel Martinez and Rose Ann E. Eugenio 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 2018. 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 last revised in 2013. 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.

Starting 2019, water produced and treated from water treatment plants and water reclamation facilities will be incorporated in the calculations of GHG concentrations.

The total GHG emission for Maynilad for 2018¹ is 80,169.67 of carbon dioxide equivalent (tCO₂e). The direct emissions comprise 5.95% (4,768.50 t CO₂e) while indirect emissions from purchased electricity is 94.05% of the total (75,401.18 tCO₂e). This means that for every liter of water and wastewater treated, Maynilad emitted 0.0856 grams of CO₂.

¹ Scope 1 and 2



98.55% of Scope 1 and 2 GHG emissions is Carbon Dioxide (79,003.91 tons), 0.99% is Methane Gas (791.90 tons) and 0.47% is Nitrous Oxide Gas (373.86 tons). For Business Areas 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. Large amount of the GHG emissions of Maynilad are Scope 2 emissions in which Water Network (51,002.97 tCO₂e) is the highest contributor. The largest contributor to the purchased electricity consumption is from La Mesa Pump Station including North A and C Annex having a total of 36,931,271.66 KWh. The 2018 results have increased by 5.67% from the 2017 results of GHG Emission (tCO₂e) due to increase in the number of new facilities such as pump stations, water reclamation facilities and expansion of pipe network to deliver Maynilad's water and wastewater services to the increasing number of customers.

In pursuant to the aim of Maynilad to decrease its carbon footprint, emission reduction programs are continuously implemented. This includes the following:

- Establishment of District Metered Areas (DMA) to efficiently monitor and manage the supply and distribution within the network
- Installation Variable Frequency Drives (VFD) and Highly Efficient Motors to control the speed and torque of motors to meet specified pressure and flow
- Using soft-starter controls to minimize abrupt power consumption when switching pumps
- Facilities and Process Optimization and Improvement of Water Production
- Process Optimization and Improvement of the Wastewater Treatment Plants and facilities
- GPS vehicle tracking system used for the Vacuum Truck Units (VTU's) and for fleet vehicles to monitor vehicle location, distance traveled and time against fuel consumption
- Continuous implementation of Integrated Management System (IMS)
- Implementation of ISO 50001 Energy Management Systems which includes the efficient usage of fuel and power for each facility
- Fleet Management Programs such as eco driving and "FLEETMALU" a driver incentive reward program
- Use of LED lamps instead of fluorescent bulbs, motion detector lighting systems and solar-powered lamp posts
- Programs in switching off of lightings and regulating Air conditioned Units (ACU) usage.
- Power management systems and on-going automation projects for water and wastewater facilities

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 September, 2019³.

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

Office / Business Unit	NAME
CQESH-IMS	Chester Y. Del Rosario
CQESH-IMS	Merliza P. Masiglat
CQESH-ENVI	Rose Ann E. Eugenio
CQESH-SHD	Rogelio V. Mendoza Jr.
WSO – WNET	Ginny Vivien T. Calaycay
WSO – WNET	Digna C. Tesalona
CXRO	Stephanie Joyce Burda-Martinez
CXRO	Gracelyn F. Dinglasan
CXRO	Vilma T. Vilalcarillo
WSO - LMTP 2	Kenji Michael D. P. Kusaka
WSO - LMTP 2	Roxanne R. Madarang
WSO - LMTP 1	Darlene G. Yu
WSO - LMTP 1	Marlon A. Araracap
WSO - TPM	Fher Bryan H. Binuya
WSO - PWTP	Mark Vincent Q. Talosig
WSO - PWTP	Rommel D.C. Sarsonas
Water Source	Marvin M. Villanueva
Water Source	Alvin L. Sarita
CNRW	Mary Dominique R. Calanoc
CNRW	Carmela Louisa A. Maleficio
CORPORATE	Grace A. Laguardia
CORPORATE	Glenneth S. Magtalas
CORPORATE	Samuel Gerald T. Saludez II
WMD	Benerly D. S. Ampo
WMD	Dirk Jan Dinno B. Coligado
WMD	Kharren Mae C. Rosario
FINANCE	Lolita M. Lota
HR	Juan Joselito A. Jalandoni

² See Annex 2A for the memorandum

³ See Annex 2C 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, Maynilad is aspiring to establish its carbon sink or carbon credit.

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 2018 Inventory Project:

➤ Main objectives:

- Calculate the GHG emissions of the company for the year 2018.
- Compare 2018 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) and ISO 50001 (Energy 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 2018 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.

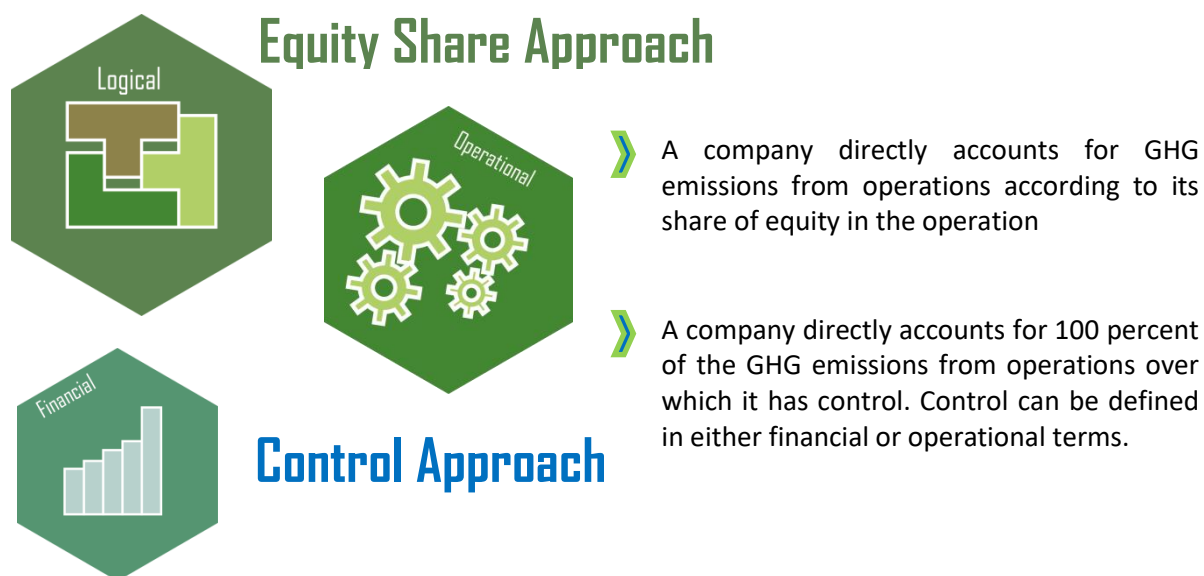


Figure 1: Approaches for Defining Organizational Boundaries

➤ 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 ³	✓	✓	✓		✓			✓

³ 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, Maynilad Safety Center, Central Depot, Arroceros and Quirino-Roosevelt Satellite Depot

BUSINESS AREAS



12 Business Area offices of Maynilad⁴

CENTRAL NON-REVENUE WATER



CNRW Offices i.e. Leak Detection Management (Arroceros), and IMM Office (Pasay)

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, and Common Purpose Facilities (CPF)

WASTEWATER MANAGEMENT



Water Reclamation Facilities, Septage Treatment Plants, Lift Stations and Pump Stations

⁴ 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 2018, same with the previous years, was done on a single-year data, where period coverage is from January 1 to December 31, 2018. As done in the establishment of the baseline year, the data for the fuel consumption will be from January 1, 2018 to December 31, 2018. 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 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.

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 2018 GHG EMISSIONS

INTRODUCTION

The calculation for 2018 inventory followed the revised IMP with additional revisions, such as the update of the members of the Green Team, revision on the emission factor for power and inclusion of wastewater treated in the total water produced for the computation of this year's total GHG emission.

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 2018 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.

2018 EMISSIONS

Maynilad's GHG and air pollutant emissions for 2018 are detailed below.

GREENHOUSE GAS EMISSIONS

Maynilad released 80,169.67 tonnes of CO₂ equivalent for Scope 1 and 2. For every liter of water and wastewater treated, Maynilad emitted 0.0856 grams of CO₂.



DIRECT AND INDIRECT EMISSIONS

The total GHG emission of Maynilad for the year 2018 is equivalent to 80,169.67 tons of carbon dioxide equivalent (tCO₂e) for Scope 1 and Scope 2 emissions. The direct emissions (Scope 1) comprise 4,768.50. tCO₂e (5.95 %) while indirect emissions from Scope 2 pertaining to purchased electricity is 75,401.18 tCO₂e (94.05 %). 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, increase use of gensets, and expanding number of customers of the company that increase energy consumption such as fuel and electricity. The details in the increase of emissions will be discussed in the succeeding sections.

MAYNILAD'S 2018 GHG

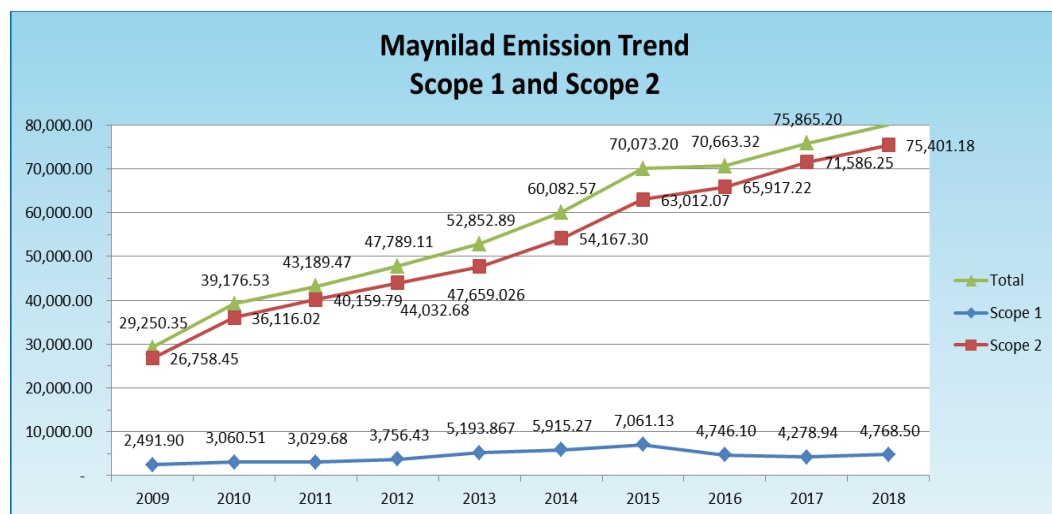


Figure 3: Scope 1 and Scope 2 Emission Trend

In terms of the types of GHG gases emitted (**Figure 4**), 98.55 % of GHG emissions is carbon dioxide (79,003.91 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.

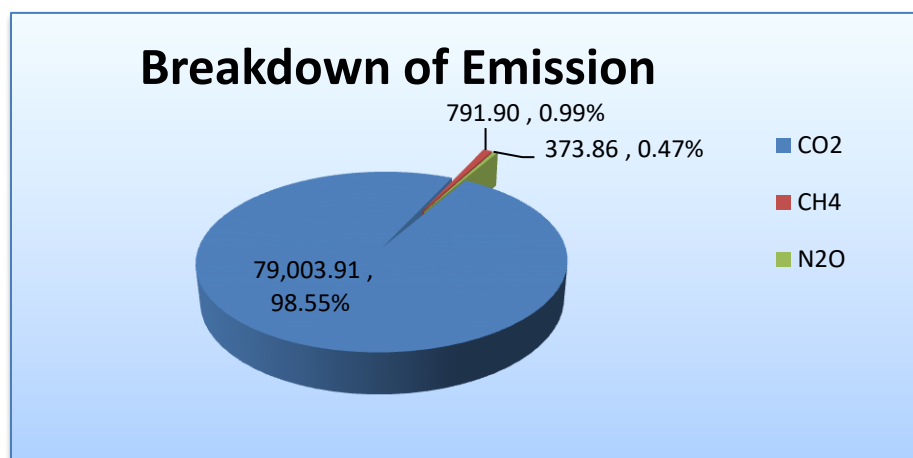


Figure 4: 2018 Breakdown of GHG Emissions

MAYNILAD'S 2018 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 71.65% of the GHG emission of Maynilad emissions are emissions of Water Network only

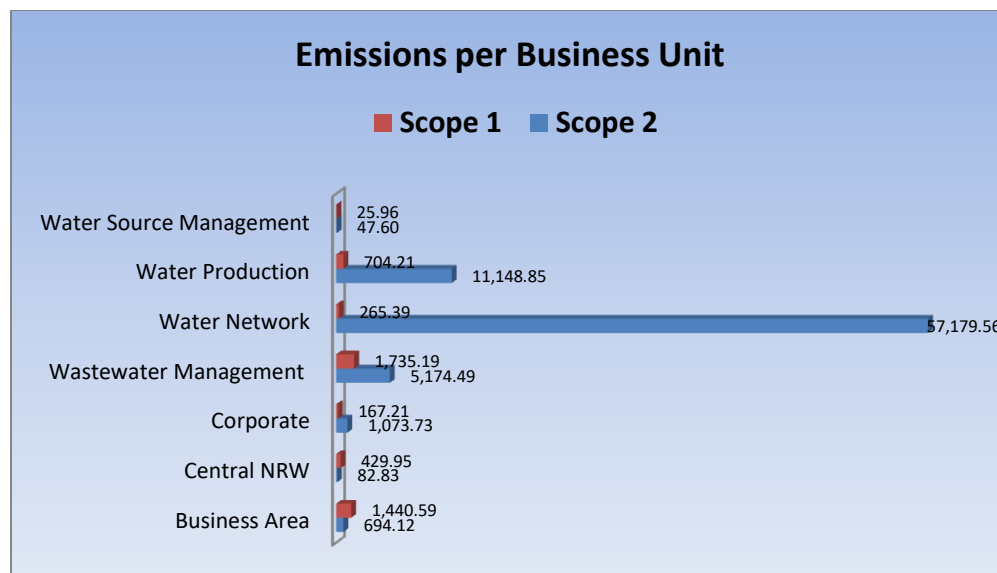


Figure 5: 2018 Emissions of the Different Groups

COMPARISON OF EMISSIONS WITH THE PREVIOUS YEAR

The total CO₂e emission for 2018 has increased by 5.67% (Scope1 & Scope2) compared from the 2017 total emission and this can be attributed to the following:

- Significant increase in power consumption of Villamor Pump Station (PS), Pasay PS, and Pagcor PS by 3.64%, 4.62%, 4.52% respectively compared with CY 2017.
- Additional 8% volume of treated wastewater compared with CY 2017.
- New facility like Victoria Pump Station and Reservoir became operational in 2018.

Table 3 shows the top facilities which have high electricity consumption for the year 2018 comparing to 2017. The largest single-site contributor to Maynilad purchased electricity consumed is the La Mesa Pump Station including La Mesa North "A" Annex and La Mesa North "C" Annex, which is 36,931,271.66 KWH. It decreases by 11.54% compared to 2017 consumption of 41,748,722.81 KWH. Savings in power cost is mainly attributed to the purchase of Retail Electricity Supply (RES) from MPower starting December 2017.

MAYNILAD'S 2018 GHG EMISSIONS

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

Business Unit	2017	2018	% increase
La Mesa PS (Including North A & C Annex)	41,748,722.81	36,931,271.66	-11.54
Putatan Water Treatment Plant	15,652,217.60	15,903,919.40	1.61
Pagcor PS	14,347,678.08	14,996,366.43	4.52
Putatan PS	11,057,037.00	10,765,520.00	-2.64
Villamor PS	9,566,469.13	9,903,039.83	3.52
Pasay PS	7,110,203.45	7,438,718.63	4.62
La Mesa Treatment Plant 1	2,409,371.97	2,347,680.14	-2.56
Tondo Pumping Plant	2,226,000.00	1,986,250.00	-10.77
Alazap PS	1,600,200.00	1,692,633.04	5.78
La Mesa Treatment Plant 2	1,257,692.31	1,171,493.04	-6.85

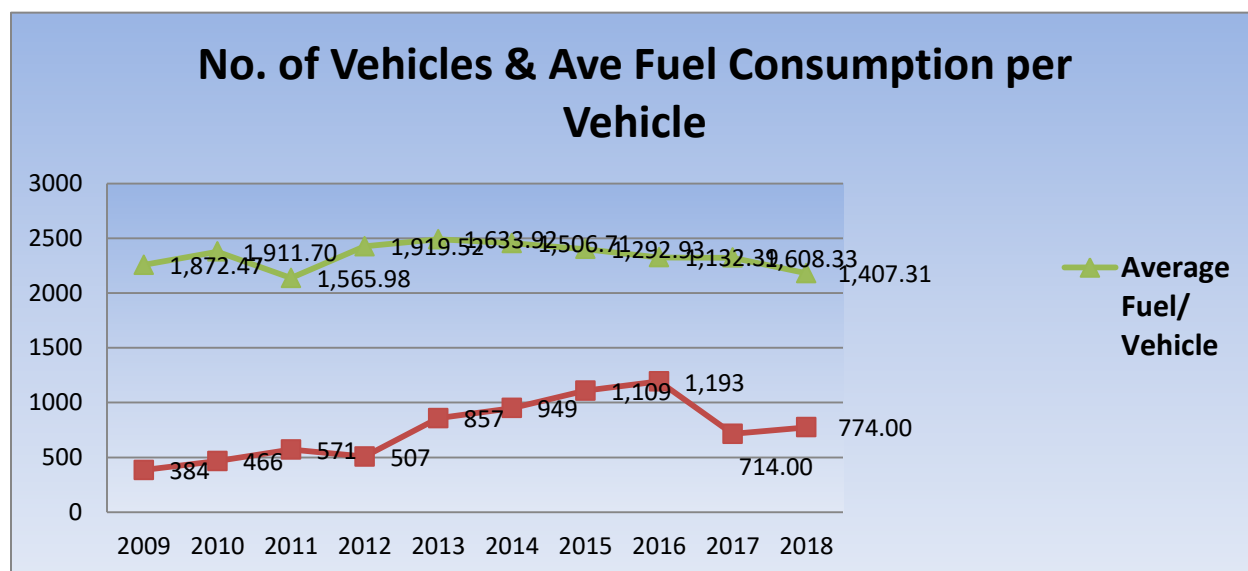
In Table 4 the comparison of average fuel consumption per vehicle shows a decrease of 12.5% having 1,407.31 liters of fuel/ vehicle versus 1,608.33 liters of fuel/ vehicle in 2017.

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

Average Fuel	2017			2018		
	Fuel Consumed	No. of Vehicle	Fuel / Vehicle	Fuel Consumed	No. of Vehicle	Fuel / Vehicle
Scope 1 Vehicle	1,148,344.76	714.00	1,608.33	1,089,255.83	774.00	1,407.31
Business Area	527,074.00	315	1,673.25	542,658.15	378	1435.60
Central – NRW	139,558.68	85	1,641.87	160,837.19	86	1870.20
Corporate	236,100.90	147	1,606.13	62,602.63	138	453.64
Wastewater	130,023.62	87	1,494.52	219,634.08	97	2264.27
Water Network	92,217.36	62	1,487.38	85,398.83	59	1447.44
Water Production	23,370.21	18	1,298.35	18,124.96	16	1132.81

MAYNILAD'S 2018 GHG EMISSIONS

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



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 release of GHG emission of Maynilad, we used the previous power statistics which was released in 2017.

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

Emission Factors for Scope 2	2014	2015	2016	2017 & 2018
CO ₂	0.56119146	0.55886573	0.56729962	0.57910000
CH ₄	0.00000754	0.00000727	0.00000743	0.00000739
N ₂ O	0.00000660	0.00000668	0.00000683	0.00000692
PM	0.00001313	0.00001154	0.00001205	0.00001186
NO _x	0.00168951	0.00168729	0.00171400	0.00172955
SO _x	0.01350700	0.01372687	0.01403386	0.01426286
CO	0.00013238	0.00013109	0.00013236	0.00013328
VOC	0.00003361	0.00003317	0.00003354	0.00003372

MAYNILAD'S 2018 GHG EMISSIONS

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. The total Scope 3 emission of Maynilad in 2018 is 174.45 tCO₂e. Table 6 shows the emission trend of Scope 3 emissions from the base year (2009) up to 2018 per business units.

Table 6: Scope 3 Emissions in tons of CO₂ équivalent

Scope 3 Emissions (tCO ₂ e) from Business Travel										
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Business Area	43.32	10.79	0.68	11.88	-	1.10	11.19	4.80	0.75	7.16
Corporate		48.33	53.73	59.87	48.28	47.30	4.49	49.01	28.90	113.53
Central NRW		22.59	9.08	3.53	2.84	5.14	7.18	2.38	1.35	10.54
Water Network	0.61	17.64	3.38	8.41	12.33	1.88	4.08	2.26	0.17	4.57
Water Production	0.86	5.15	0.72	0.78	0.20	1.04	2.82	3.67	0.62	13.28
Wastewater Management	0.14	6.00	5.14	1.80	5.70	0.84	10.21	1.31	0.67	7.93
Water Source Management	0	0	0	0	0	0	0	0.78	1.85	17.45
TOTAL	44.92	110.5	72.73	86.27	69.36	57.31	39.97	64.21	34.31	174.45

AIR POLLUTANT EMISSIONS

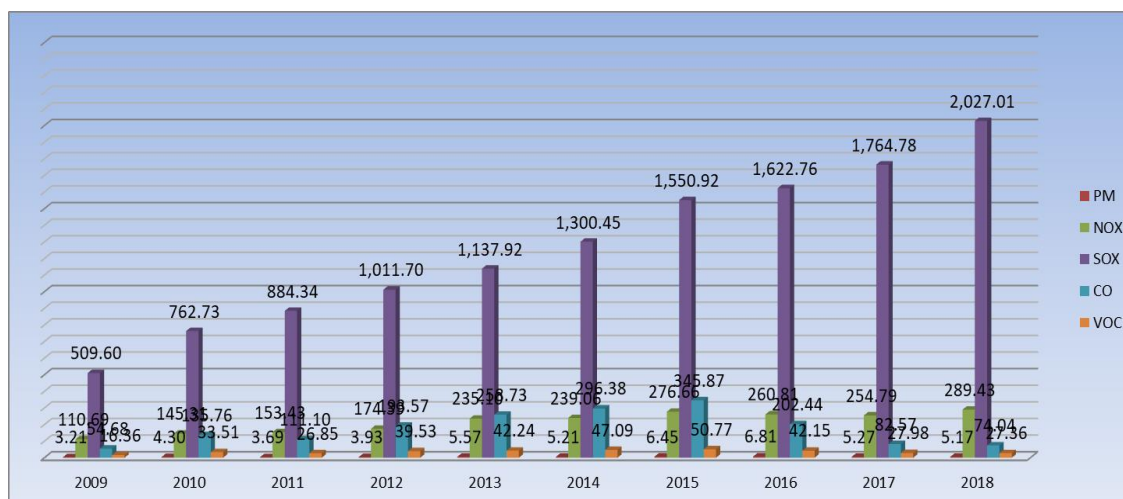
Maynilad's air pollutant emissions are summarized in the **Table 7**. Scope 1 accounted for most of the emission for particulate matter (67.37%), Carbon Monoxide (74.43%) and Volatile Organic Compounds (82.49%) while Scope 2 accounted for most of the emission for NO_x (84.85%) and SO_x (99.83%). The air pollutants emission for 2018 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: 2018 Air Pollutant Emissions (tons)

	PM	NO _x	SO _x	CO	VOC
Scope 1	3.49	43.84	3.37	55.10	22.57
Scope 2	1.69	245.59	2,023.64	18.94	4.79

MAYNILAD'S 2018 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 2018 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
UK	Anglian Water	366,000	2018	1,180,645	310 kg CO ₂ e / MI
Philippines	Manila Water	167,650	2018	864,770	195 t CO ₂ e / mcm
Australia	Sydney Water	342,381	2018	593,069	0.5773
Australia	Water Corporation	771,000	2018	363,000	2.1239
New Zealand	Water Care	36,404	2018	153,784	0.2367
Australia	Melbourne Water Corporation	453,477	2018	449,000	1.0100
United Kingdom	Thames Water	277,900	2018	985,500	0.2819
Philippines	Maynilad	80,169.67	2018	872,077.09 + 63,998.75 = 936,075.84*	0.0856
Philippines	Maynilad	80,169.67	2018	527,150**	0.1521

From the table above, Maynilad have the lowest CO₂ emissions intensity in per unit of water produced among the different companies having 0.0856 tCO₂e/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 0.1521 tCO₂e/ML.

*volume of water + wastewater treated

**billed volume

CONCLUSIONS

The project for accounting the GHG emissions for the year 2018 was successful in taking into account all the GHG emissions of Maynilad. This even though there was an increase of 5.67% from the previous year (2017) 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 0.0833 tCO₂e/ML for 2017 to 0.0856 tCO₂e/MLD for 2018 considering the total volume of water (872,077.09 ML) and wastewater (63,998.75 ML) treated, having a total of 936,075.84 million liters. Volume of wastewater treated was only considered in 2018 GHG report.

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 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.

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. To increase the efficiency and reliability, they installed new flow meters to measure accurately the treated water of La Mesa Treatment Plant 1 & 2. They also implemented reduction of filter backwashing from eight (8) units to four (4) units once the raw water turbidity is less than ten (10) NTU (Nephelometric Turbidity Units) as well as rotational shutdown of three (3) vacuum pumps per stream equivalent to six (6) vacuum pumps off per day. On top of these initiatives, shutting off four (4) flash mixers of north and south stream were also done so that there will be no flash mixer operation since hydraulic mixing will suffice its requirement for the velocity gradient resulting to a 11.54% decrease in power consumption. While PWTP uses bicycle instead of e-tricycle or service vehicle during water sampling within the plant premises.

Other future plans include (1) Installation of LMTP-1 solar panel (2) Replacement of LMTP-1 mechanical equipment to hydraulic mixing (3) Replacement of significant energy user equipment to high efficiency equipment.

- For Water Distribution Network the following initiatives to reduced GHG emissions of their pumping stations (P.S.) are: (1) Conversion of ATS to Soft Closed Transition switches at Pasay P.S. (2) Conversion of motor control to Variable Frequency Drive and Soft Starter at Pasay P.S. (3) Pump refurbishment of North B Pumps including installation of mechanical seals. (4) Installation of new pump at North C (on-going) (5) Conversion of North A, North B and North C motors to high efficiency motors (6) Installation of 1 Megawatt Solar Panel at La Mesa P.S (7) Installation of 1 unit Torishima Pump at La Mesa P.S. (7) establishment of Remote Real-time Monitoring and Control of Water Network thru the Central Control covering a total 1,399 Pressure Monitoring Points (PMP) with alarm settings.
- For Wastewater Management Division, aligned with its goal to provide sustainable water solutions, it aims to manage its GHG emissions especially during these years of rapid growth and operational expansion. Two (2) new Water Reclamation Facilities (WRFs) and 27 additional pump/lift stations were declared operational in 2018. The following operational efficiency initiatives were carried out in 2018: (1) Reduction of aeration time for Congressional WRF from 120 mins to 90 mins, reducing the power consumption from 105,000 kWh in 2017 to 96,000 kWh;
 - Reduction of blower usage from two (2) blowers to one (1) for Bahay Toro Water Reclamation Facility (WRF), operating 16 hours per day;

CONCLUSIONS

- Altering blower operations in Veterans WRF by reducing aeration phase to one (1) hour and installing Variable Frequency Drives (VFDs) in blowers, achieving 38% reduction in operational expense;
- Implementation of Power-Volume Ratio (P/V) Optimization Study of the pumps in Tondo Sewage Pumping Plant, resulting to replacement of less inefficient pumps;
- Monitoring and reduction of P/V for all other operational WRFs; and
- Automation of Bahay Toro and Tandang Sora conveyance systems, reducing power consumption through attaining remote PS control – resulting to a total of Php580,000 savings for Bahay Toro WRF and Php72,154 savings for Tandang Sora WRF from July to December.
- Creation of dosing matrix for an efficient chlorine dosing system
- Practicing water reuse in the dewatering operations in Kapiligan WRF, reducing water consumption by 53%

➤ FLEET MANAGEMENT PROGRAMS

The Re-fleeting Program, one of the major projects of the Fleet Management which is done every five years. The company plans to conduct its next re-fleeting by 2020. The previous program, fleet management had the replacement of service vehicles from Toyota Avanza (gasoline) to Mitsubishi Adventure (diesel). This was due to expiration of service contract that also affect GHG emissions. Continuing installation of GPS vehicle tracking was implemented by the Fleet Management to monitor vehicle utilization and the unauthorized use of Maynilad vehicles. In August 2018, Maynilad established a fleet driver incentive program that promoted eco driving and increased awareness of safety habits on the road, resulting in fewer traffic violations and vehicular accidents.

➤ For all Maynilad facilities programs implemented:

- Switch off lights during lunch breaks and other rooms if not in use.
- Replacement of lighting bulbs from fluorescent bulbs to LED lamps.
- 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.
- Scheduled maintenance of ACU and lighting.

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

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)

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. Glorlane	-	Central NRW
4. Junielyn E. Rodriguez	-	Central NRW
5. Grace A. Laguardia	-	Logistics
6. Glenneth S. Magtalas	-	Logistics
7. Samuel Gerald T. Saludez II	-	Logistics
8. Kris G. Catangcatang	-	Corporate QESH-IMS
9. Marionne 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)

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

As of September 09, 2019

Maynilad Greenhouse Gases (GHG) Team	
DESIGNATION / OFFICE	NAME
Program Head – CQESH	Roel S. Espiritu
Deputy Program Head – CQESH-IMS	Enrique G. De Guzman
Members:	
CQESH-IMS	Chester Y. Del Rosario
CQESH-IMS	Merliza P. Masiglat
CQESH-ENVI	Rose Ann E. Eugenio
CQESH-SHD	Rogelio V. Mendoza Jr.
WSO – WNET	Ginny Vivien T. Calaycay
WSO – WNET	Digna C. Tesalona
CXRO	Stephanie Joyce Burda-Martinez
CXRO	Gracelyn F. Dinglasan
CXRO	Vilma T. Vilalcarillo
WSO - LMTP 2	Kenji Michael D. P. Kusaka
WSO - LMTP 2	Roxanne R. Madarang
WSO - LMTP 1	Darlene G. Yu
WSO - LMTP 1	Marlon A. Araracap
WSO - TPM	Fher Bryan H. Binuya
WSO - PWTP	Mark Vincent Q. Talosig
WSO - PWTP	Rommel D.C. Sarsonas
Water Source	Marvin M. Villanueva
Water Source	Alvin L. Sarita
CNRW	Mary Dominique R. Calanoc
CNRW	Carmela Louisa A. Maleficio
CORPORATE	Grace A. Laguardia
CORPORATE	Glenneth S. Magtalas
CORPORATE	Samuel Gerald T. Saludez II
WMD	Benerly D. S. Ampo
WMD	Dirk Jan Dinno B. Coligado
WMD	Kharren Mae C. Rosario
FINANCE	Lolita M. Lota
HR	Juan Joselito A. Jalandoni

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)	2,829.84	2.68	90.70	2,923.22	2.91	29.12	2.99	51.26	21.75
	Internal Combustion Engines (company-owned)	729.26	0.66	1.94	731.86	0.57	14.73	0.38	3.85	0.82
	Other Emissions (Scope 1)	345.24	768.18	-	1,113.42	-	-	-	-	-
	LPG									
	Acetylene									
	Others									
	Sub-total	3,904.34	771.52	92.64	4,768.50	3.49	43.84	3.37	55.10	22.57
Scope 2	Electricity Sub-total	75,099.57	20.38	281.22	75,401.18	1.69	245.59	2,023.64	18.94	4.79
TOTAL (Scope 1 and 2)		79,003.91	791.90	373.86	80,169.67	5.17	289.43	2,027.01	74.04	27.36
Scope 3	Vehicles (contracted-out)	15.19	0.01	0.36	15.56	0.01	0.10	0.01	0.21	0.11
	Business travel	157.22	0.00	1.67	158.90	-	10.25	-	9.00	-
	Internal Combustion Engines (contracted-out)									
	Other Emissions (Scope 3)									
	LPG									
	Acetylene									
	Others									
	Sub-total	172.41	0.02	2.03	174.45	0.01	10.34	0.01	9.21	0.11
TOTAL		79,176.32	791.92	375.89	80,344.13	5.19	299.77	2,027.02	83.25	27.47

Business Area

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	NO2 (CO2e)	Total GHGs (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	1,412.50	1.14	26.95	1,440.59	1.51	15.63	1.51	23.71	11.19
	Internal Combustion Engines (company-owned)	-	-	-	-	-	-	-	-	-
	Other Emissions (scope 1)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	Sub-total	1,412.50	1.14	26.95	1,440.59	1.51	15.63	1.51	23.71	11.19
Scope 2	Electricity Sub-total	691.34	0.19	2.59	694.12	0.01	2.09	17.24	0.16	0.04
TOTAL (Scope 1 and 2)		2,103.84	1.33	29.54	2,134.71	1.52	17.72	18.75	23.87	11.23
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	7.09	0.00	0.08	7.16	-	0.63	-	0.15	-
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (scope 3)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	Sub-total	7.09	0.00	0.08	7.16	-	0.63	-	0.15	-
TOTAL		2,110.93	1.33	29.61	2,141.87	1.52	18.35	18.75	24.03	11.23

Central Non-Revenue

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	NO2 (CO2e)	Total GHGs (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	416.36	0.36	8.89	425.61	0.46	3.52	0.46	8.35	3.91
	Internal Combustion Engines (company-owned)	4.32	0.00	0.01	4.34	0.01	0.12	0.01	0.03	0.01
	Other Emissions (scope 1)	-	-	-	-	-	-	-	-	-
	Sub-total	420.68	0.37	8.90	429.95	0.46	3.63	0.47	8.37	3.92
Scope 2	Electricity Sub-total	82.50	0.02	0.31	82.83	0.00	0.25	2.06	0.02	0.00
TOTAL (Scope 1 and 2)		503.18	0.39	9.21	512.78	0.47	3.88	2.52	8.39	3.92
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	10.43	0.00	0.11	10.54	-	4.59	-	4.52	-
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (scope 3)	-	-	-	-	-	-	-	-	-
	Sub-total	10.43	0.00	0.11	10.54	-	4.59	-	4.52	-
TOTAL		513.61	0.39	9.32	523.32	0.47	8.48	2.52	12.92	3.92

Corporate

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	NO2 (CO2e)	Total GHGs (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	159.13	0.17	5.01	164.31	0.17	1.55	0.16	4.04	1.33
	Internal Combustion Engines (company-owned)	2.86	0.01	0.03	2.90	0.01	0.08	0.00	0.02	0.01
	Other Emissions (scope 1)	-	-	-	-	-	-	-	-	-
	Sub-total	161.99	0.18	5.04	167.21	0.18	1.63	0.17	4.06	1.34
Scope 2	Electricity Sub-total	1,069.43	0.29	4.01	1,073.73	0.02	3.23	26.67	0.25	0.06
TOTAL (Scope 1 and 2)		1,231.42	0.47	9.05	1,240.94	0.20	4.86	26.84	4.30	1.40
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	112.33	0.00	1.19	113.53		0.18		0.11	
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (scope 3)	-	-	-	-	-	-	-	-	-
	Sub-total	112.33	0.00	1.19	113.53	-	0.18	-	0.11	-
TOTAL		1,343.75	0.47	10.24	1,354.47	0.20	5.04	26.84	4.42	1.40

Wastewater Management

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	NO2 (CO2e)	Total GHGs (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	569.12	0.62	44.60	614.34	0.44	5.72	0.57	7.72	1.81
	Internal Combustion Engines (company-owned)	7.40	0.01	0.02	7.43	0.01	0.17	0.01	0.04	0.03
	Other Emissions (scope 1)	345.24	768.18	-	1,113.42	-	-	-	-	-
	Sub-total	921.77	768.80	44.62	1,735.19	0.45	5.89	0.58	7.76	1.84
Scope 2	Electricity Sub-total	5,153.77	1.40	19.32	5,174.49	0.11	15.59	128.53	1.20	0.30
TOTAL (Scope 1 and 2)		6,075.54	770.20	63.95	6,909.69	0.56	21.47	129.11	8.97	2.15
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	7.84	0.00	0.08	7.93	-	1.49	-	0.71	-
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (scope 3)	-	-	-	-	-	-	-	-	-
	Sub-total	7.84	0.00	0.08	7.93	-	1.49	-	0.71	-
TOTAL		6,083.38	770.20	64.03	6,917.61	0.56	22.96	129.11	9.68	2.15

Water Network

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	NO2 (CO2e)	Total GHGs (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	221.06	0.34	4.10	225.50	0.27	1.84	0.24	6.46	3.26
	Internal Combustion Engines (company-owned)	39.74	0.04	0.11	39.89	0.02	0.63	0.02	0.22	0.22
	Other Emissions (scope 1)	-	-	-	-	-	-	-	-	-
	Sub-total	260.80	0.38	4.21	265.39	0.29	2.47	0.25	6.69	3.49
Scope 2	Electricity Sub-total	56,950.57	15.46	213.54	57,179.56	1.18	172.23	1,420.27	13.27	3.36
TOTAL (Scope 1 and 2)		57,211.37	15.83	217.74	57,444.95	1.48	174.70	1,420.52	19.96	6.85
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	4.52	-	0.05	4.57		1.10		0.67	
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (scope 3)	-	-	-	-	-	-	-	-	-
	Sub-total	4.52	-	0.05	4.57	-	1.10	-	0.67	-
TOTAL		57,215.89	15.83	217.79	57,449.52	1.48	175.79	1,420.52	20.63	6.85

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)	47.38	0.04	0.89	48.32	0.07	0.84	0.05	0.77	0.24
	Internal Combustion Engines (company-owned)	653.60	0.58	1.72	655.90	0.48	13.16	0.30	3.41	0.49
	Other Emissions (Scope 1)	-	-	-	-	-	-	-	-	-
	LPG	-	-	-	-	-	-	-	-	-
	Acetylene	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-
	Sub-total	700.98	0.62	2.61	704.21	0.55	14.00	0.35	4.18	0.73
Scope 2	Electricity Sub-total	11,104.55	3.02	41.28	11,148.85	0.23	33.46	274.33	2.59	0.66
TOTAL (Scope 1 and 2)		11,805.54	3.64	43.89	11,853.06	0.79	47.46	274.68	6.77	1.38
Scope 3	Vehicles (contracted-out)	-	-	-	-	-	-	-	-	-
	Business travel	13.13	-	0.00	13.28	-	1.27	-	1.08	-
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (Scope 3)	-	-	-	-	-	-	-	-	-
	LPG									
	Acetylene									
	Others									
	Sub-total	13.13	-	0.00	13.28	-	1.27	-	1.08	-
TOTAL		11,818.67	3.64	43.89	11,866.34	0.79	48.74	274.68	7.85	1.38

Water Source Management

Sources		GHG Emissions (tons)				Criteria Air Pollutants (tons)				
		CO2	CH4 (CO2e)	NO2 (CO2e)	Total GHGs (CO2e)	PM	NOx	SOx	CO	VOC
Scope 1	Vehicles (company-owned)	4.28	0.01	0.26	4.55	0.00	0.03	0.00	0.21	0.01
	Internal Combustion Engines (company-owned)	21.33	0.02	0.06	21.41	0.04	0.57	0.04	0.12	0.05
	Other Emissions (scope 1)	-	-	-	-	-	-	-	-	-
	Sub-total	25.61	0.03	0.31	25.96	0.04	0.59	0.04	0.33	0.06
Scope 2	Electricity Sub-total	47.41	0.01	0.17	47.60	0.00	0.14	1.12	0.01	0.00
TOTAL (Scope 1 and 2)		73.03	0.04	0.48	73.55	0.04	0.73	1.16	0.34	0.07
Scope 3	Vehicles (contracted-out)	15.19	0.01	0.36	15.56	0.01	0.10	0.01	0.21	0.11
	Business travel	1.87	-	0.02	1.89		0.98		1.75	
	Internal Combustion Engines (contracted-out)	-	-	-	-	-	-	-	-	-
	Other Emissions (scope 3)	-	-	-	-	-	-	-	-	-
	Sub-total	17.06	0.01	0.38	17.45	0.01	1.07	0.01	1.95	0.11
TOTAL		90.09	0.05	0.86	91.00	0.05	1.81	1.17	2.30	0.18