

Regulatory Office's Non-Decision to Business Plan and its Subsequent Implications for a Water Concessionaire

Mark Franklin P. Manalang¹, Wilfredo L. Infante², Vivian E. Gutierre³, Rex Mervin P. Ramos⁴, Jaypee Pajarillaga ⁵

1,2,5 Mechanical Engineering Department , Holy Angel University, Angeles City, Philippines
3,4 Graduate School of Engineering , Nueva Ecija University of Science and Technology, Cabanatuan City, Philippines

Article Info Volume 83

Page Number: 4776 - 4783

Publication Issue: March - April 2020

Article History

Article Received: 24 July 2019 Revised: 12 September 2019 Accepted: 15 February 2020 Publication: 27 March 2020

Abstract

The Company under study is currently on its 3rd year of its Rate Rebasing (RR) process. Considering the time stretch, one may think the process would be skewed towards resolution, however, the Regulatory Office (RO) is mum on the topic and haven't released a decision on tariff adjustments. Water rates have been put in status quo. The Company was forced to operate in bare minimum OPEX. CAPEX was also put on hold. To show the subsequent implications, the researcher gathered data from the Company's Key Departments. This provided a glimpse on what the Company's service quality be like in the next 5 years along with its forecasted financial position.

The study has shown the challenges faced by the private concessionaire. Given the circumstance, it cannot sustain excellent performance and its services will eventually deteriorate: Water pressure, water quality, water security, power efficiency, including Non-Revenue Water (NRW) are expected to drop as early as 2021. There will also be noncompliance for the new wastewater standards. For financials: Gross Profit and EBITDA margins will decrease in percentages. Amortization will increase in value due to the existence of increasing loans payable. Cash and cash equivalents will not be enough to support the direct cost and direct labor as well as the loans payable. The Company will not be liquid to pay for liabilities. After 2025, the Company may operate at a loss unless some costs are cut down or some assets be sold. Status quo will eventually translate to deteriorated service and possible bankruptcy.

Index Terms: Arbitration, Public Private Partnership, PPP, Rate Rebasing, Water

Tariff, Water Concessionaire

I. INTRODUCTION

Due to limited funding in infrastructure and development projects, the Philippine Government started entering to Private Public Partnership (PPP's) [1]. Through PPPs the government enter Concessional Concession contracts or Agreements (CA) with the private sector. Under this scheme, the private sector can build, operate and maintain public infrastructure facilities and provide services traditionally delivered by the government. Electric power distribution, public markets. slaughterhouse, and water supply and sanitation projects [2] are traditional examples of PPPs. Under CA's the Government would retain ownership of these assets upon expiry/termination of the contract. In the water sector, deals were borne mainly because of water crisis i.e. quality and security issues experienced.

PPPs operate under the "users must pay" [3] principle or the idea that consumers must pay for the full economic cost of the goods and services they consume. Expenditures of the private company will



eventually be recovered from consumers. To protect the interest of the investor and of the public, any increase in payment or tariff adjustments for the services will not be immediate, rather it will undergo rate rebasing (RR) and must be approved by the Government or Regulating Office (RO) before implemented.

Disputes with the Water Regulating Body

Major disputes continually plague PPP's especially the rebasing process. The two (2) largest water concessionaires in the country had a fair share of arbitration cases with the RO. [4] The 1st Concessionaire requested to the RO a tariff increase only one (1) year upon its operations [5]. The request was initially denied but was eventually granted after The Company escalated the case to an international arbitration panel. On the other hand, the 2nd Concessionaire filed for bankruptcy in 2003 and underwent change in management [6].

Another dispute happened during the 2013 – 2017 RR cycle where both concessionaires requested for tariff increases via their submitted business plans. Both pleas were again denied by the RO and instead ordered the reduction of tariffs [7]. Concessionaires appealed against the decision to the International Chamber of Commerce to demand compensation for lost revenues. By end of 2014, the Appeals Panel rendered its final award via a split decision – the panel denied the 1st Concessionaire of any tariff adjustment while it made a ruling in favor of the 2nd Concessionaire for higher water rates but with a caveat of staggered implementation [8]. Another disagreement between the RO and Concessionaires surfaced during the same RR cycle, this time for the issue of corporate income taxes. For this case, it was the RO that escalated the case to the Supreme Court of the Philippines [8]. The case reached the SC since the lower courts have already sided with the Concessionaires. As of writing, the SC hasn't issued a decision on the matter.

By the 2018 – 2020 RR cycle, the 2nd Concessionaire filed its third arbitration case to the Supreme Court of Singapore against the RO. Arbitral decision sided with the former telling the Company must be compensated by the Philippine Government for non-implementation of rate hikes. To date, arbitration cases were filled by the RO and the Concessionaires every time a RR ensues.

Case Study

This single case study was conducted in a local waterworks. The name of the company is kept anonymous in conformity with the requirements of research ethics and is referred to as either "waterworks, "Concessionaire" or "the Company". Whereas the Regulating Body shall simply be referred to as "regulator", or the "regulating office (RO)".

The Waterworks

The Company is a private concessionaire and a subsidiary of known conglomerate. The waterworks is an exclusive provider of water and wastewater services within its concession area.

Concession Agreement (CA)

The Company and the Regulating Office (RO) entered in a Concession Agreement (CA) for the development of water and sewage system within the franchise area [9]. The RO granted the Company the sole right to manage, operate, repair, decommission and refurbish all assets required to provide water and wastewater services in its franchise area for an extended period of 40 years[10].

Rate Rebasing (RR)

One salient feature of the CA is the Rate Rebasing exercise (RR) [11]. RR is a process that determines the tariff adjustments or tariff rates for water and wastewater services that permits the Concessionaire to recover its operating, capital maintenance and investment expenditures over the life of the concession.



Per CA, RR is mandatory every four (4) years and the Concessionaire must submit a Business Plan to the RO. The Business Plan shall contain details of the Company's planned service commitments and capital expenditure projects. The RO shall either a) approve the Business Plan; or b) raise any objection or make any comments in relation to any item in the Business Plan and request the Company to implement any amendments proposed. It is also explicitly stated that: In the event RO does not object or have any comments on the Business Plan within (2) months after receipt of the Business Plan, the Business Plan submitted by the Company shall be deemed to be approved.

2014–2017 (RR14) First ever RR that resulted in Reduced Water Rates

As per the Business Plan approved by both parties in 2014: The Company tariff rebasing will be based on the premise that a one-time reduction shall be implemented immediately without any fare hike throughout the rest of 2014-2017 period. Annual increase shall start on 2018 (next RR cycle) with four equal tranches over a period of four years. In turn, the CA will be extended by another 15 years bringing the total length of CA to 40 years.

2018-2022 (RR18) RR - Status Quo

As early as 2017, the Company has already submitted its newest Business Plan for the Regulatory Period 2018 until 2022. However, despite the affirmation from the 2014-2017 cycle of having increased water fares by 2018, the RO is yet to deliver its decision on the matter. Per RO, they are quite surgical with the submitted business plan and water tariff adjustments were put on status quo. Despite the delays in implementation of adjusted tariffs, the Company still managed to exceed its service obligations.

The non-decision of RO with the Business Plan will take its toll via losses not only in finances but also in deterioration in the Company's service obligations. Another dilemma for the Company is that, unlike the

country's major water concessionaires, it does not want -in as much as possible- to file a dispute notice against the RO.

Objectives

This research paper will provide a glimpse on what the Company's service quality be like in the next five (5) years along with its forecasted financial position if RO remains mum on the RR dispute. Its focus is to check the year on year impact of the RO's non-decision and delays in the implementation of new tariff to the company's:

- a) Service Obligations
- a. Whether it manage to maintain its current Service Connection e.g. water supply and wastewater coverage
- b. Whether it maintain/improve its Service Quality e.g. minimum pressure of water supply, potable water and treated wastewater quality, supply security
- c. Whether it maintain/improve its Efficiency e.g. Non-revenue water, energy efficiency and finally its consequent effects on

b) The Company's Financial Position

The rest of the paper is structured as follows; Section 2 describes the method used for collecting data. Section 3 is divided into two (2) subsections: (i) discuss the potential effects to the service obligations while (ii) discuss the financial consequence of the non-decision. Section 4 synthesizes the results and draw conclusions therefrom.

II. RESEARCH METHODOLOGY

A. Primary Data Collection

In this single case descriptive research, forecast financial statements and balance sheets were collected firsthand thru the Company's Finance Department. As for the service obligations, data and other relevant information was gathered through



interview and tabletop discussions with the Company's Business and Operations Teams (OPS) along with its Planning Department. The former is in charge of the customer requirements (water demand forecasts) while the latter manages the facilities (operating expenses) required for the provision of water and wastewater services. Planning on the other hand tell the required additional assets (capital expenditures) for upcoming customers.

B. Significance

"Collective Discourse can Lead to Greater Truths". The researcher believes that by providing the forecasts, readers and critics of PPP's will have a different perspective to the RR process. Thus, this paper may serve as supplement to online texts and trigger healthy debates among readers as well as educators for their lectures regarding the importance of decision making. This may also aid and provide information for other entities (RO's and the Private Sector) entering PPP's of the possible challenges of the RR process.

C. Scope and Limitation

All financial related data from this report will be coming straight from the Company's Finance Department. How they came up with the figures are beyond the realm of this study. As for the service obligations and corresponding impact of the RO's stand, the researcher is limited to the information received in terms of visual and auditory. Moreover, sensitive data are concealed and only the bare minimum of information are shown to protect confidentiality.

III. RESULTS AND DISCUSSION

A. Service Obligations

The CA obliges the Concessionaire to achieve and maintain uninterrupted water supply at a minimum pressure of 1 Bar. The CA also requires compliance with the drinking water standards (PNSDW) [11] and effluent standards (DENR DAO2016-08) [12]. As for operational efficiencies, the Company is

limited to the given efficiency ratios for the production, treatment and distribution of water and given ratios for the treatment of wastewater. Non-Revenue Water (NRW) must be in single digit. The Company is also required to have 20% supply buffer to handle peaks in demand. Table 1 shows the summary of the Company's service obligations visà-vis the implications of zero tariff adjustment for RR18 and RR22.

Table 1: The Company's Service Obligations per CA

Service Obligation	202 0	202 1	202 2	202 3	202 4	202 5			
Water Service Connection	Co mpl iant	Co mpl iant	Co mpl iant	Co mpl iant	Co mpl iant	Co mpl iant			
XX% Water Supply Coverage	Co mpl iant	Co mpl iant	Co mpl iant	Co mpl iant	Co mpl iant	Co mpl iant			
XX% Wastewater Supply Coverage	Co mpl iant	Co mpl iant	Co mpl iant	Co mpl iant	Co mpl iant	Co mpl iant			
1 Bar Minimum Pressure of Water Supply	Co mpl iant	Co mpl iant	May deteriorate and lead to Non-Compliance because of zero capital maintenance projects						
100% Compliance with PNSDW Requirements	Co mpl iant	Co mpl iant	May deteriorate and lead to Non-Compliance because of zero capital maintenance projects						
XX% Wastewater Effluent Compliance with DENR Standards	Co mpl iant	Co mpl iant	Co mpl iant Risk of Non-Compliance to new Standards because of delay in the approval of the wastewater treatment plant upgrade						
Customer Complaints responded w/in 24hrs	Co mpl iant	Co mpl iant	Co mpl iant	Co mpl iant	Co mpl iant	Co mpl iant			
XX Energy Efficiency for Water (kWh/m3)	Co mpl iant	Co mpl iant	May deteriorate because of zero capital maintenance projects						
XX Energy Efficiency for Wastewater (kWh/m3)	Co mpl iant	Co mpl iant	May deteriorate because of zero capital maintenance projects						
20% Supply Security (w/o bulk)	Co mpl iant	Co mpl iant	Lower than 20% but greater than XX%						
XX% NRW	Co mpl iant	Co mpl iant	Greater than X% but lower than XX%						



Some data were left blank to safeguard confidentiality

B. Implications

According to the Company's OPs Department, the planned replacement of critical assets near or at the end of their useful life was disallowed by RO. Having no budget, OPs foretells that identified equipment will start having performance issues and eventually stop functioning despite preventive maintenance (PM) conducted. **OPs** compared the equipment similar with cars. "We buy cars and have them undergo PM every 5,000 or so kilometers. However, when cars reach the 200,000 km mark then you will start to see performance and reliability issues. Issues like these can even manifest before it even reached this mileage". current setup, the Company will shift back to a reactive maintenance strategy and deal with frequent and unpredictable equipment failures. According to OPs, failure had already manifested as early as 2018. Other critical assets are soon to follow and RO's disallowance will be felt thru extended downtime. First one to be hit is the Company's core business: Pumps, once failed will start a domino effect. It will result in the lack of water supply which in turn will affect supply security and the required water pressure will not be met. Water quality/Treatment facilities will also suffer due to reduced OPEX and timed replacement of filter media. Also, asset performance is less efficient thru time. Power needed to produce/treat a similar volume of water/wastewater will be higher.

The same is true for the underground assets, the Company's aging pipelines will translate into more frequent pipe bursts, leaks, service interruptions and risks of water quality issues. Pipe bursts and leaks increase the nonrevenue water. In 2017 the Company already achieved a single digit NRW (figure worthy of acclaim) but this figure will increase by 2021 and range between single to double digits. Supply security on the other hand will be affected due to bare minimum CAPEX. According

to Planning, CAPEX for additional water source were put on hold because of the RR negotiation. This coupled with the increasing water demand in the franchise area will leave supply security in the 10 to 20% range. As per conversation with the Company, exact figures for each service obligation for the next five (5) years are difficult to quantify since they will be adjusting their operations and realign budget depending on future needs and criticality of projects.

Finally, the business plan also contains the upgrading of the Company's centralized wastewater treatment plant. This is to comply with the new effluent standard by the DENR (DAO2016-08). RO is silent about this as the new law requires removal of nutrients and this will incur heavy investments. RO tried conversing with DENR to delay its implementation, but the latter released a memo circular saying all establishments in the country must comply by year end 2022.

C. Financial Position

Assuming zero tariff adjustment for RR18 and RR22, bare minimum CAPEX and reduced OPEX. Net income (NI) is foreseen to diminish. Gross Profit and EBITDA margins will decrease in percentages. Projected earnings will not be as profitable as year 2019F. Furthermore, amortization will increase in value which is attributable to the loans that needs to be paid in succeeding years. This will have an effect to NI as amortizations are outright expense that needs to be paid. Cash and cash equivalents will not be enough to support the direct cost and direct labor as well as current loans payable thus, affecting the liquidity of the Company to pay for its current and future liabilities and expenses. The company's non-current Loans Payable continues to increase come 2025 which entails more cash outflow for the company in the succeeding years in order to pay its loans. Debt to Equity (DE) Ratio will almost breach in 2025 at 2.86.



To summarize, the Company is not liquid to pay for current liabilities. Non-current loans payable continues to increase. After 2025, the Company will

go bankrupt unless some costs are cut down or some assets are to be sold.

Table 2: 5-year Income Statement Assuming zero tariff adjustment for RR18 and RR22

In Million Php	2019F ¹	2020B ²	2021	2022	2023	2024	2025
TOTAL REVENUES	XX2.10	XX1.63	XX9.18	XX5.93	XX8.66	XX3.66	XX1.73
Water	XX3.49	XX2.24	XX5.06	XX2.05	XX6.11	XX4.5	XX7.83
Wastewater	XX5.69	XX3.17	XX4.12	XX3.88	XX2.55	XX9.15	XX3.90
Other Income	XX2.92	XX6.21	XX0.00	XX0.00	XX0.00	XX0.00	XX0.00
COST OF SALES	XX6.00	XX3.37	XX9.53	XX3.89	XX7.94	XX2.48	XX5.82
Direct Cost	XX0.33	XX7.12	XX0.97	XX2.90	XX4.4	XX6.26	XX6.79
Direct Labor	XX5.67	XX6.25	XX8.56	XX0.99	XX3.54	XX6.21	XX9.03
GROSS PROFIT	XX6.10	XX8.26	XX9.65	XX2.04	XX0.72	XX1.18	XX5.91
TOTAL COST & EXPENSES	XX8.86	XX5.71	XX9.36	XX3.36	XX7.53	XX1.27	XX4.59
Indirect Cost	XX8.70	XX8.81	XX9.25	XX9.71	XX0.20	XX0.71	XX1.24
Premises	XX7.48	XX8.52	XX0.29	XX1.15	XX2.22	XX3.09	XX3.74
Management & Prof. Fees	XX2.70	XX1.78	XX1.84	XX1.90	XX1.96	XX2.02	XX2.09
Systems Cost	XX1.40	XX3.61	XX4.29	XX5.00	XX5.75	XX6.54	XX7.37
Technical Services Fees	XX8.90	XX9.70	XX9.57	XX1.04	XX2.35	XX3.35	XX4.07
Overhead Cost	XX9.69	XX3.33	XX4.14	XX4.56	XX5.05	XX5.56	XX6.08
EBITDA	XX7.24	XX2.55	XX0.29	XX8.67	XX3.19	XX9.91	XX1.32
Depr. & Amortization	(XX8.71)	(XX0.36)	(XX8.90)	(XX9.94)	(XX8.99)	(XX1.81)	(XX5.35)
Interest Income (Expense)	(XX5.99)	(XX0.16)	(XX3.69)	(XX8.75)	(XX7.82)	(XX3.32)	(XX7.55)
INCOME BEFORE TAX	XX2.54	XX2.02	XX7.70	XX9.98	XX6.38	XX4.79	XX8.42
Income Tax	(XX2.56)	(XX1.79)	(XX1.64)	(XX2.83)	(XX3.12)	(XX3.56)	(XX3.65)
NET INCOME/(LOSS)	XX9.98	XX0.24	XX6.06	XX7.15	XX3.26	XX1.23	(XX.22)
Gross Profit Margin	55%	53%	53%	54%	52%	52%	51%
EBITDA Margin	41%	37%	37%	38%	36%	36%	35%
Net Income Margin	9%	6%	5%	7%	4%	4%	-1%

Some data were covered to safeguard confidentiality 2020Budget

2019Forecast

Table 3:5-year Balance Sheet Assuming zero tariff adjustment for RR18 and RR22

In Million Php	2019F ¹	$2020B^{2}$	2021	2022	2023	2024	2025
CURRENT ASSETS	XX5.42	XX6.06	XX2.11	XX2.42	XX4.56	XX5.66	XX8.70
Cash & Cash Equivalents	XX5.34	XX3.37	XX0.61	XX7.86	XX7.27	XX6.29	XX7.83
Accounts Receivable, net	XX8.51	XX1.12	XX9.93	XX2.99	XX5.72	XX7.80	XX9.31





In Million Php	2019F ¹	2020B ²	2021	2022	2023	2024	2025
Materials and Supplies	XX1.57	XX1.57	XX1.57	XX1.57	XX1.57	XX1.57	XX1.57
PROPERTY, PLANT & EQUIPMENT, net	XX8.36	XX9.91	XX9.91	XX9.91	XX9.91	XX9.91	XX9.91
SERVICE CONNECTION ASSETS	XXX4.03	XXX2.21	XXX5.40	XXX5.38	XXX3.01	XXX2.44	XXX6.82
OTHER NONCURRENT ASSETS	XX5.20	XX5.20	XX5.20	XX5.20	XX5.20	XX5.20	XX5.20
TOTAL ASSETS	XXX3.00	XXX3.37	XXX2.62	XXX2.91	XXX2.68	XXX3.21	XXX0.63
CURRENT LIABILITIES	XX5.05	XX8.05	XX7.22	XX3.23	XX8.07	XX0.85	XX6.99
Trade and other payables	XX0.18	XX9.84	XX9.51	XX9.55	XX9.11	XX0.15	XX2.50
Income tax payable	XX2.01	XX5.34	XX4.85	XX5.35	XX5.47	XX5.65	XX5.69
Loans payable	XX5.83	XX5.83	XX5.83	XX1.30	XX6.46	XX8.02	XX1.77
Other Current Liabilities	XX7.03	XX7.03	XX7.03	XX7.03	XX7.03	XX7.03	XX7.03
NONCURRENT LIABILITIES	XXX4.94	XXX2.08	XXX6.09	XXX3.22	XXX4.89	XXX81.4	XXX7.91
Loans Payable	XXX0.57	XXX7.73	XXX7.94	XXX8.11	XXX1.65	XXX7.98	XXX7.65
Service Concession Obligation	XX3.53	XX6.50	XX9.47	XX2.44	XX5.41	XX8.38	XX1.35
Other Noncurrent Liabilities	XX5.89	XX5.89	XX5.89	XX5.89	XX5.89	XX5.89	XX5.89
TOTAL LIABILITIES	XXX9.99	XXX0.12	XXX3.31	XXX6.45	XXX2.96	XXX2.25	XXX4.90
CAPITAL STOCK	XX9.29	XX9.29	XX9.29	XX9.29	XX9.29	XX9.29	XX9.29
ACTUARIAL GAIN/LOSS ON PENSION PLAN	XX6.95	XX6.95	XX6.95	XX6.95	XX6.95	XX6.95	XX6.95
TREASURY SHARES	(XX7.50)	(XX7.50)	(XX7.50)	(XX7.50)	(XX7.50)	(XX7.50)	(XX7.50)
RETAINED EARNINGS	XX4.28	XX4.51	XX0.57	XX7.73	XX0.99	XX2.22	XX6.99
TOTAL STOCKHOLDER'S EQUITY	XX3.01	XX3.25	XX9.31	XX6.46	XX9.72	XX0.95	XX5.73
TOTAL LIABILITIES & STOCKHOLDERS' EQUITY	XXX3.00	XXX3.37	XXX2.62	XXX2.91	XXX2.68	XXX3.21	XXX0.63
Current ratio	0.85	0.65	0.60	0.69	0.70	0.75	0.76
Debt-to-Equity ratio	2.17	1.99	2.01	2.18	2.29	2.58	2.86

Some data were covered to safeguard confidentiality

2019Forecast

2020Budget

IV. CONCLUSIONS

Both government and private sectors enter PPP due to supposed mutualism. People benefit via improved services by the latter which the public sector cannot. Today there is clamor that such services must be returned to the control of the government due to privatization-bred burdens. Private firms are also being stereotyped for taking too much profit from a

basic need. The paper retells readers that PPPs were entered due to lack of funding. While private sector can make it easier to get the funding required, funding will only be available when the operating cashflows of the project company are expected to provide a return on investment – which is not the case for this study.

The study has shown the flip side of the coin – the challenges facing the private sector in maintaining its service obligations. For the longest time, the Company has been able to meet and even exceed some of its service obligations. The Company will need to continue providing such level of service



with bare minimum OPEX and CAPEX. If status quo is maintained for tariff, then the Company can no longer sustain its current service obligations. First to deteriorate is its world class NRW level. From a single digit NRW, it will start to breach the 2-digit mark by Y2021. Also, a decrease in water pressure and water quality will be felt by customers starting Y2022. Power efficiency will also take a hit during the same year. For 2023, there will be noncompliance and possible violations with DENR's effluent standards because of the delay in the approval of the wastewater treatment plant upgrade. Finally, RO's non decision on the water hikes may leave the company filing for bankruptcy come 2025 unless some costs are cut down or some assets be sold.

REFERENCES

- [1] Republic of the Philippines Public-Private Partnership Center. What is PPP? Retrieved from https://ppp.gov.ph/ppp-program/what-is-ppp/
- [2] Asian Development Bank. 2016. Philippines: Public-Private Partnerships by Local Government Units, Mandaluyong City, Philippines. Retrieved from https://www.adb.org/sites/default/files/publication/2
 - 13606/philippines-ppp-lgus.pdf
- [3] National Economic Development Authority. 2009. Structuring Public-Private Partnerships (PPPs) Handbook, Ortigas Center Pasig City, Philippines ch 5. pp. 34-46
- [4] Esguerra J., 2003. New Rules, New Roles: Does PSP Benefit the Poor? The Corporate Muddle of Manila's Water Concessions. Water Aid. p.6
- [5] Asian Development Bank and Manila Water Company. 2014. Tap Secrets - The Manila Water Story. Mandaluyong City, Philippines. pp. 20-21
- [6] Estimo. R, May 2007. The Curse of the MWSS Water Utility Privatization in the Philippines: Private Mismanagement and Workers' Woes. 7 May 2007 Retrieved from http://www.waterjustice.org/uploads/attachments/5_ ADB_Water
 - privatization_maynilad_estimo_kyoto_apr07_eng.p df

- [7] MWSS toughens stand against water hike. GMA News. 19 December 2013. Retrieved 23 November 2019.
- [8] Yap, C. Maynilad Water to Boost Tariff by 9.8% After Winning Appeal. Bloomberg. 5 January 2015. Retrieved 23 November 2019.
- [9] Concession Agreement for XXX Water and Sewerage System. 16March2000
- [10] Amendment No. 3 to the Concession Agreement XXX and XXX 15August2014
- [11] Metropolitan Waterworks & Sewerage System (n.d.), Rate Rebasing Retrieved 23 November 2019. from http://ro.mwss.gov.ph/?page_id=1123
- [12] DOH Department of Health (2017, June 23) DOH Administrative Order No. 2017-0010, Philippine National Standards for Drinking Water of 2017
- [13] DENR-EMB Department of Environment and Natural Resources – Environmental Management Bureau (2016, May 24) DENR Administrative Order No. 2016-08, Water Quality Guidelines and General Effluent Standards of 2016