Quantifying GHG emissions from Urban Water Sector- Case Study: SPAM Jatiluhur II

Webinar on Quantifying Emissions (GHGs and SLCPs) from the Urban Infrastructures

Junko Akagi
IGES Kitakyushu Urban Centre

December 7th 2022

Institute for Global Environmental Strategies

Contents

1. General information on the monitoring, reporting and verification (MRV)

    - MRV at a glance
    - Quantifying GHG reductions relative to a base line scenario
    - Steps for GHG accounting & reporting
    - GHG accounting principles

2. GHG emissions from urban water treatment system

3. Preliminary results for the Jatiluhur II

MRV at a glance

		Type I: MRV of GHG emissions at organisation level	Type II: MRV of GHG reductions at project level for crediting	Type III: MRV of GHG emissions at national level	Type IV: MRV of GHG reductions by policy/action
Object		GHG emissions at organisation level under GHG scheme	GHG reductions realised by individual project	GHG emissions at national/ sub-national level	GHG reductions by policy/ action at national/sub-national level
Aim		Determination of GHG emissions at covered organisation under GHG scheme	Crediting and certification of amount of GHG reductions by individual project under GHG scheme	Determination of GHG emissions at national level and compliance assessment for developed countries under Kyoto Protocol	Quantitative evaluation of policy/action
Methodology	**M. R**	Monitoring and Reporting Guidelines under GHG scheme	Monitoring/ Baseline/Calculation methodologies under GHG scheme	IPCC Guidelines and UNFCCC COP/CMP Decisions	Unavailable
	V	Verification Guideline under GHG scheme	Verification Guideline under GHG scheme	UNFCCC COP/CMP Decisions and Kyoto Protocol Art.8 with related documents for review	Unavailable
Implementation body	**M. R**	Covered organisation under GHG scheme	Project participant of individual project	National government/ sub-national government	Unknown (probably, government that is implementing the policy/action)
	V	Third-party verification body	Third-party verification body	Expert Review Team under UNFCCC/ Kyoto Protocol Art.8	Unknown

Source: Ninomiya Y. (2012) Classification of MRV of Greenhouse Gas (GHG) Emissions/Reductions: For the discussions on NAMAs and MRV. IGES Policy Brief. https://www.iges.or.jp/en/publication_documents/pub/policy/en/3145/PB_25_E_final.pdf

MRV at a glance (Cont.)

	Type I: MRV of GHG emissions at organisation level	Type II: MRV of GHG reductions at project level for crediting	Type III: MRV of GHG emissions at national level	Type IV: MRV of GHG reductions by policy/action
Characteristics	•Very high required level of accuracy •Technically well matured and sophisticated MRV •Sufficient knowledge and experiences accumulated in developed countries •Relatively simple	•Very high required level of accuracy •Technically well matured and sophisticated MRV •Globally operated via CDM all over the world •Technical difficulties inherited in baseline setting, additionality demonstration	•Medium required level of accuracy (not as much as Type I and II) •Technically matured and widely operated in developed countries •Not well established in developing counties •Relatively simple	•Undeveloped MRV •Required level of accuracy unknown, but possibly less than medium •Important MRV regarding effectiveness of international climate regime
Examples operated	•EU-ETS •Climate Registry •California Climate Action Registry (US), •Tokyo Metropolitan Government ETS •JVETS (Japan)	•CDM •VCS •J-VER (Japan) •BOCM (Japan: under developing)	Submission and review of National GHG Inventory	Unavailable
International standards/ Guidelines	•ISO14064-1 •ISO14064-3 •ISO14065 •ISO14066	•ISO14064-2 •ISO14064-3 •ISO14065 •ISO14066	•IPCC Guidelines (M/R) •UNFCCC COP/CMP Decisions (R/V)	Unavailable

Source: Ninomiya Y. (2012) Classification of MRV of Greenhouse Gas (GHG) Emissions/Reductions: For the discussions on NAMAs and MRV. IGES Policy Brief. https://www.iges.or.jp/en/publication_documents/pub/policy/en/3145/PB_25_E_final.pdf

FIGURE 2.1 Quantifying GHG reductions relative to a baseline scenario

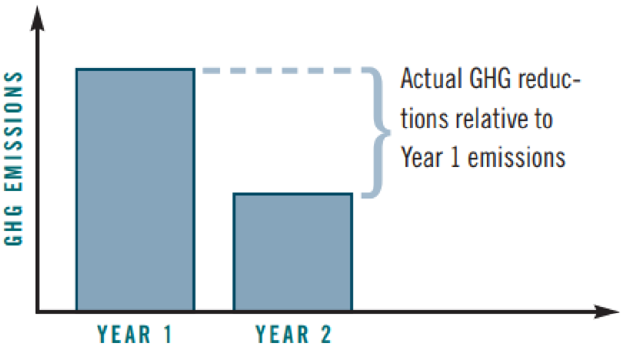


FIGURE 2.1a: Comparison against a base year for corporate/entity accounting

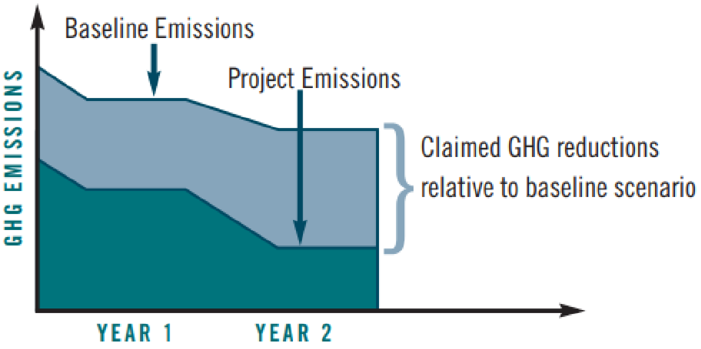
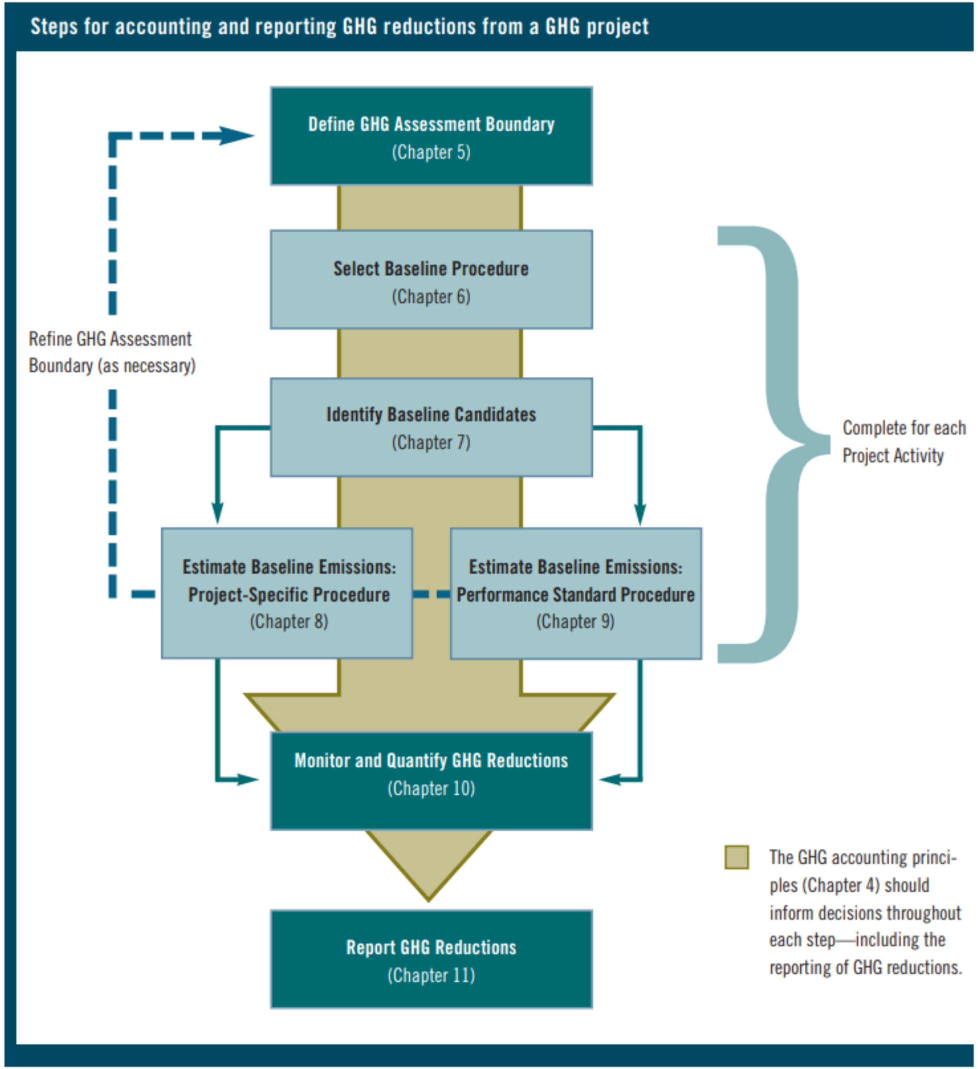


FIGURE 2.1b: Comparison against a baseline scenario for project accounting

GHG reductions must be quantified relative to a reference level of GHG emissions. Under national and corporate-level GHG accounting, reductions are typically quantified against actual GHG emissions in a historical base year (see Figure 2.1a). For project-based GHG accounting, however, GHG reductions are quantified against a forward-looking, counter-factual baseline scenario (see Figure 2.1b). The most important challenge for GHG project accounting is identifying and characterizing the baseline scenario.

Source: The GHG Protocol for Project Accounting https://ghgprotocol.org/sites/default/files/standards/ghg_project_accounting.pdf



Source: The GHG Protocol for Project Accounting https://ghgprotocol.org/sites/default/files/standards/ghg_project_accounting.pdf

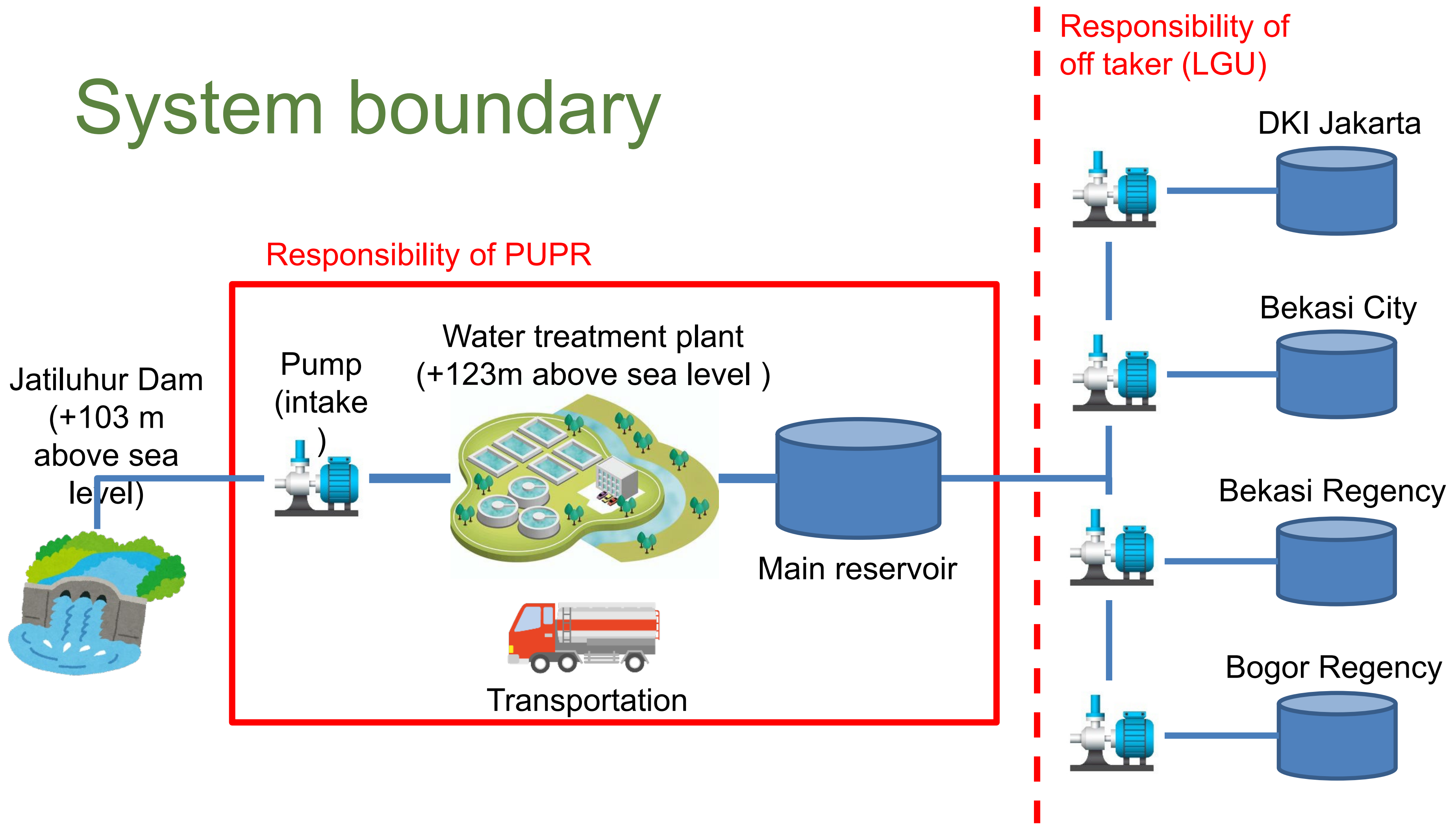
GHG accounting principles

Principles	Details
Relevance	Use data, methods, criteria, and assumptions that are appropriate for the intended use of reported information
Completeness	Consider all relevant information that may affect the accounting and quantification of GHG reductions, and complete all requirements
Consistency	Use data, methods, criteria, and assumptions that allow meaningful and valid comparisons
Transparency	Provide clear and sufficient information for reviewers to assess the credibility and reliability of GHG reduction claims
Accuracy	Reduce uncertainties as much as is practical
Conservativeness	Use conservative assumptions, values, and procedures when uncertainty is high

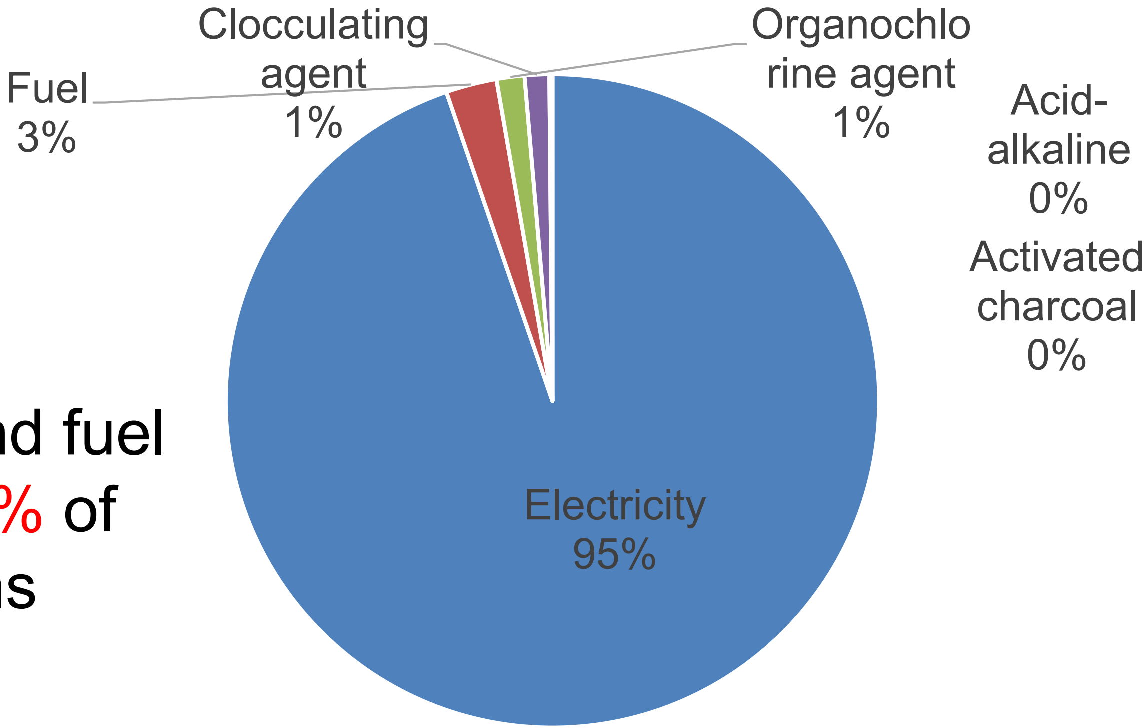
← This is not included in the other GHG protocols

Source: The GHG Protocol for Project Accounting https://ghgprotocol.org/sites/default/files/standards/ghg_project_accounting.pdf

System boundary



GHG emission sources



Electricity and fuel occupies 98% of the emissions

Imai M et al (2020) Greenhouse Gas Emissions at Purification Plant and sewage treatment plants. Online Technical Papers of Annual Meeting The Society of Heating, Air-Conditioning and Sanitary Engineers of Japan 2020. A-26. https://www.jstage.jst.go.jp/article/shasetaikai/2020.1/0/2020.1_101/_article/-char/en

Electricity consumption of TMG Bureau of Waterworks

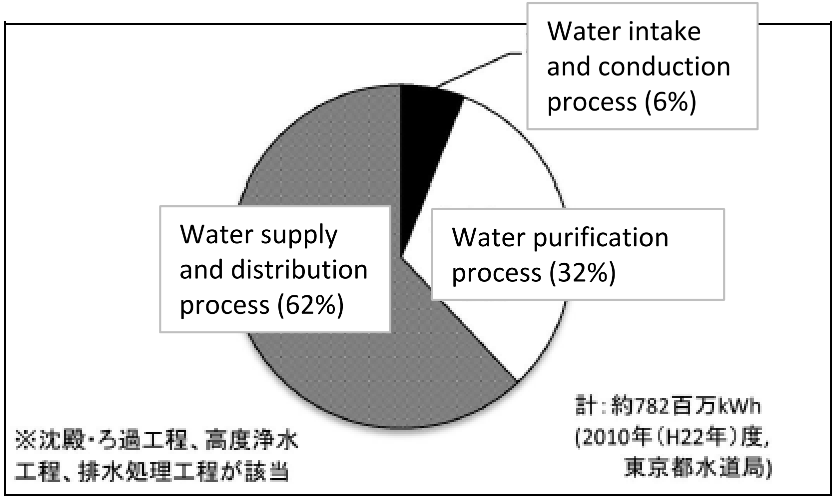
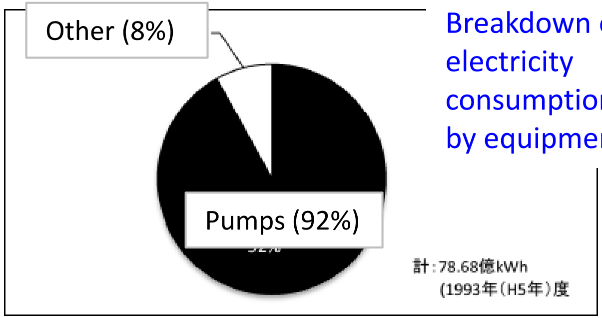


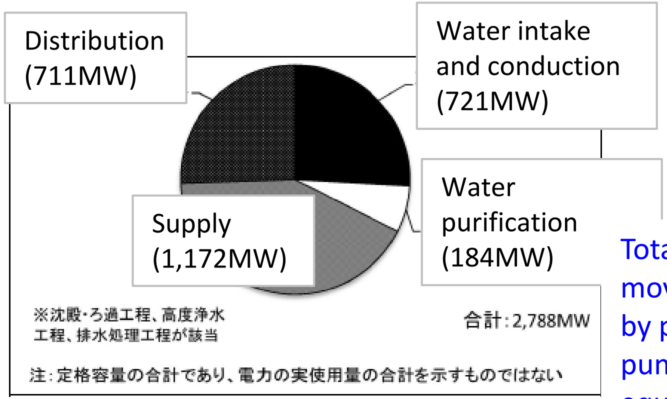
図 3-3　東京都水道局における工程別電力消費量割合
出典：東京都水道局「環境報告書 2011」

Breakdown of electricity consumption by process at TMG Bureau of Waterworks



Breakdown of electricity consumption by equipment

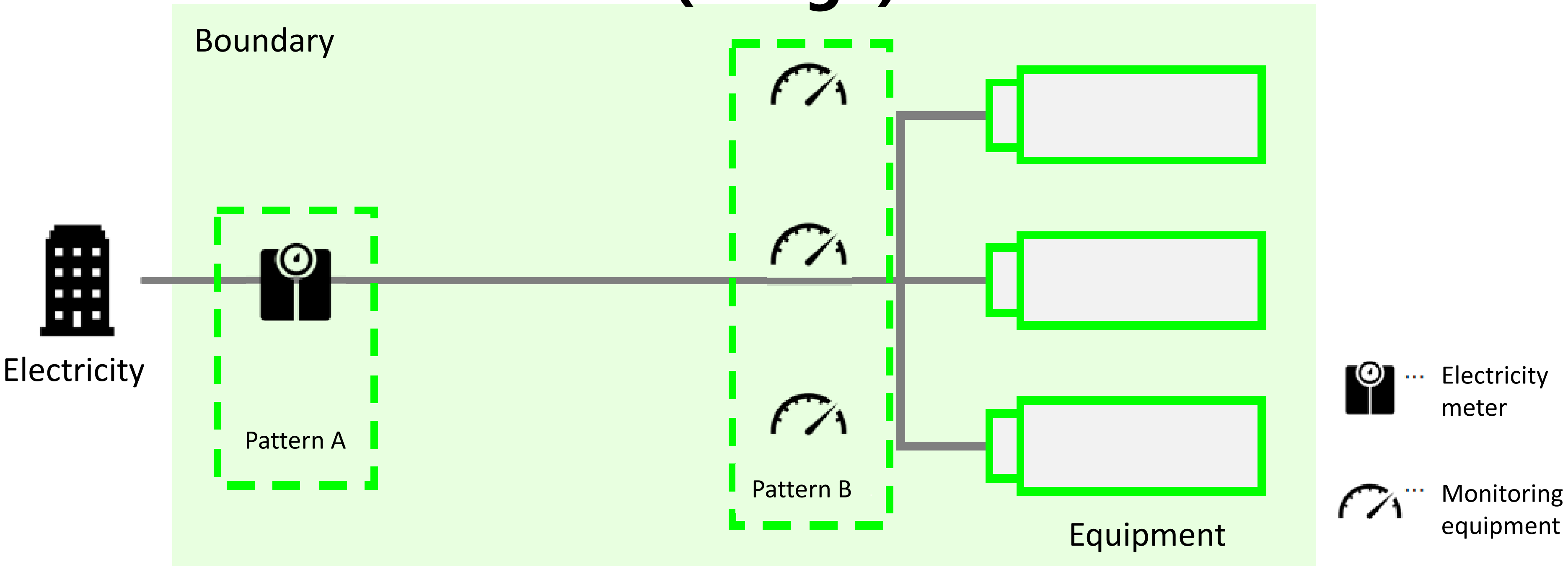
図 3-4　上水道事業及び水道用水供給事業における電力消費量の内訳
出典：厚生労働省「水道事業における環境対策の手引書（改訂版）」



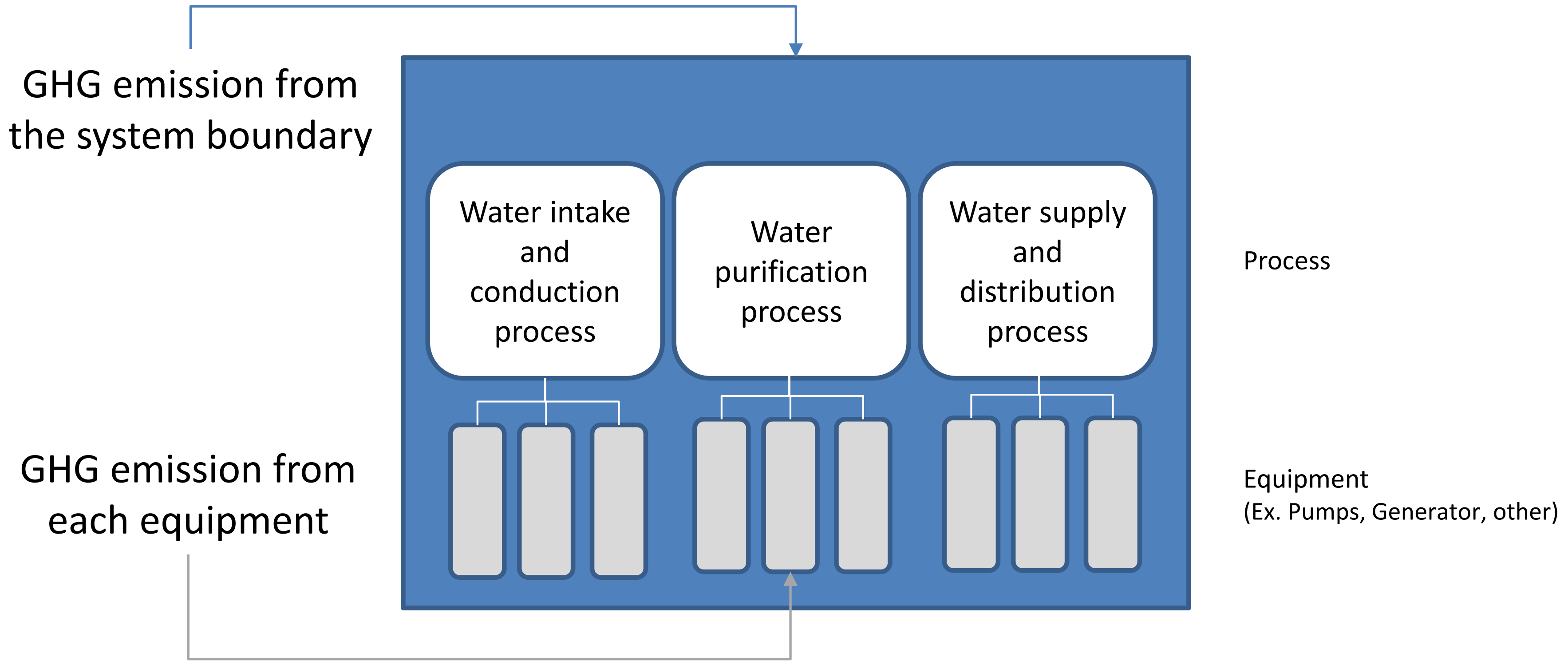
Total prime mover output by process for pump equipment

図 3-5　全国のポンプ設備の工程別原動機出力の合計
出典：（社）日本水道協会「水道統計」（平成 25 年度版）
※施設別ポンプ設備原動機出力（kW）の全事業者合計値を水道統計より算出

Monitoring of electricity consumption (Image)



GHG emissions from water treatment facility



1. Basic information

- Total amount of water intake: 7,000 L/sec
- Electricity source: grid / diesel generator / renewable
- Sludge treatment: incineration / landfilling / composting

Preliminary results

Jatiluhur II water treatment plant

Annual CO2 emission for water treatment ↓

		Product specs (kW)	Number of items	Working hours (Hours/day)	Working days (Days/year)	Working hours (Hours/year)	Electricity consumption (kWh/yr)	Electricity consumption (MWh/yr)	Emission factor (tCO2/MWh)	CO2 emission (tCO2/yr)
Electricity use							167,845,980	167,846	0.87	146,026
Pumping system	Pompa Intake & Air Baku/吸水・排水ポンプ	1,200	3	24	365	8,760	31,536,000			
	Aerator & process/エアレーター&プロセス	630	-	24	365	8,760	5,518,800			
	Filter System/フィルターシステム	1330	-	24	365	8,760	11,650,800			
	Pompa Air Olahan/加工水ポンプ	4,062.50	3	24	365	8,760	106,762,500			
	Chemical System/化学システム	313	-	24	365	8,760	2,741,880			
	Chlorin System/塩素系システム	263	-	24	365	8,760	2,303,880			
	Sludge facilities/汚泥設備	487	-	24	365	8,760	4,266,120			
Ruang Operator/bangunan pendukung	Lighting/照明	350	-	24	365	8,760	3,066,000			
	AC/交流		-	12	365	4,380	0			

		Product specs (L/h)	Number of items	Working hours (Hours/day)	Working days (Days/year)	Working hours (Hours/year)	Electricity consumption (L/yr)	Electricity consumption (MWh/yr)	Emission factor (tCO2/MWh)	CO2 emission (tCO2/yr)
Fuel use (Stationary)							102,200	102	2.619	268
Diesel	Generator /発電機	840	2	0.2	365	61	102,200			
	Switchgear and transformator/ 開閉装置と変圧器		2	24	365	8,760	0			
	Travo Oil/ トラボオイル（？）		1	24	365	8,760	0			

Note: Other types of fuels (e.g., Gasoline, LPG, CNG) are not used.

		Product specs (L/km)	Number of items	-	-	Traveling distance (km/year)	Fuel comsumption (L/yr)	Fuel comsumption (kL/yr)	Emission factor (tCO2/kL)	CO2 emission (tCO2/yr)
Fuel use (Mobile)							2,029,080	2,029	2.322	4,712
Gasoline	Directur and Manager Car – SUV/MPV	0.077	22	-	-	34,320	58,080			
	Operational Car - MPV	0.100	30	-	-	36,500	109,500			
	Operational Motorcycle – Matic	0.017	510	-	-	215,350	1,861,500			

Note: Other types of fuels (e.g., Diesel, LPG, CNG) are not used.

Preliminary results (Cont.)

CO_2 emission for 1 L water treatment↓

Total amount of water intake (L/sec)	Working seconds (sec/year)	Total amount of water intake (L/year)	CO_2 emissionn per L ($kgCO_2$/L)
7,000	31,536,000	220,752,000,000	0.0007

（年間2200億リットル）

One litter water treatment produces 0.7g CO_2.
水1Lの処理で0.7グラムのCO_2を排出する。

(Reference) Tokyo's case: 245g CO_2 (Fiscal year 2020)
（参考）東京都は245グラム（2020年度）