HANG TUAH JAYA
GREENHOUSE GAS (GHG) INVENTORY REPORT

Hang Tuah Jaya CITY

Majlis Perbandaran Hang Tuah Jaya - Bandaraya Pintar

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SUSTAINABLE DEVELOPMENT GOALS

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HANG TUAH JAYA GREENHOUSE GAS INVENTORY DEVELOPMENT

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Client Project Manager:	Mr. Rozaidi Bin Mahat
Client Company Name:	Majlis Perbandaran Hang Tuah Jaya
Issued By:	International Green Training Centre Sdn Bhd
	Unit A.02.10 Tamarind Square
	Persiaran Multimedia
	63000 Cyberjaya
	Selangor, MALAYSIA
	Tel: + 6 (0) 3 8800 5227
	Fax: + 6 (0) 3 8800 5229
	www.greentrainings.org

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Issue No	Name	Date	Position
Prepared by	Mathias Warming	23.8.2019	Senior Sustainability Expert
Checked by	Ismail Bin Abdullah	28.8.2019	President & CEO
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ABBREVIATIONS

AFOLU	Agriculture, Forestry and Other Land Use
BAU	Business As Usual
BP	Blok Perancangan
BPK	Blok Perancangan Kecil
CAGR	Compound Annual Growth Rate
DEFRA	Department for Environment, Food and Rural Affairs, UK
DOSM	Department of Statistics Malaysia
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GPC	Global Protocol for Community-scale Greenhouse Gas Emission Inventories
GWP	Global Warming Potential
IGTC	International Green Training Centre
IPCC	Intergovernmental Panel on Climate Change
IWK	Indah Water Konsortium
JKR	Jabatan Kerja Raya
MGTC	Malaysian Green Technology Corporation
JPJ	Jabatan Pengangkutan Jalan
KPDNHEP	Ministry of Domestic Trade and Consumer Affairs
kWh	Kilowatt hour
LCCF	Low Carbon City Framework
MESTECC	Ministry of Energy, Science, Technology, Environment and Climate Change
MIDA	Malaysian Investment Development Authority
MITC	Melaka International Trade Centre
MMU	Multimedia University
MPHTJ	Majlis Perbandaran Hang Tuah Jaya
MWh	Megawatt hour
PIC	Person In Charge
PKNM	Perbadanan Kemajuan Negeri Melaka
SAMB	Syarikat Air Melaka Berhad
ST	Suruhanjaya Tenaga
SW CORP	Perbadanan Pengurusan Sisa Pepejal Dan Pembersihan Awam
tCO_2e	Metric Tons of Carbon Dioxide Equivalent
TNB	Tenaga Nasional Berhad
UTH	Unit Teknologi Hijau
WRI	World Resources Institute

EXECUTIVE SUMMARY

Major cities are estimated consuming more than 75% of the world's energy and being responsible for 80% of greenhouse gas emissions that caused the global warming and climate change phenomena. The Malaysian Government has introduced Low Carbon City Framework (LCCF) to provide guidelines for local authorities to address climate change from their own impacts and seek to motivate and influence other sectors of the economy to do more.

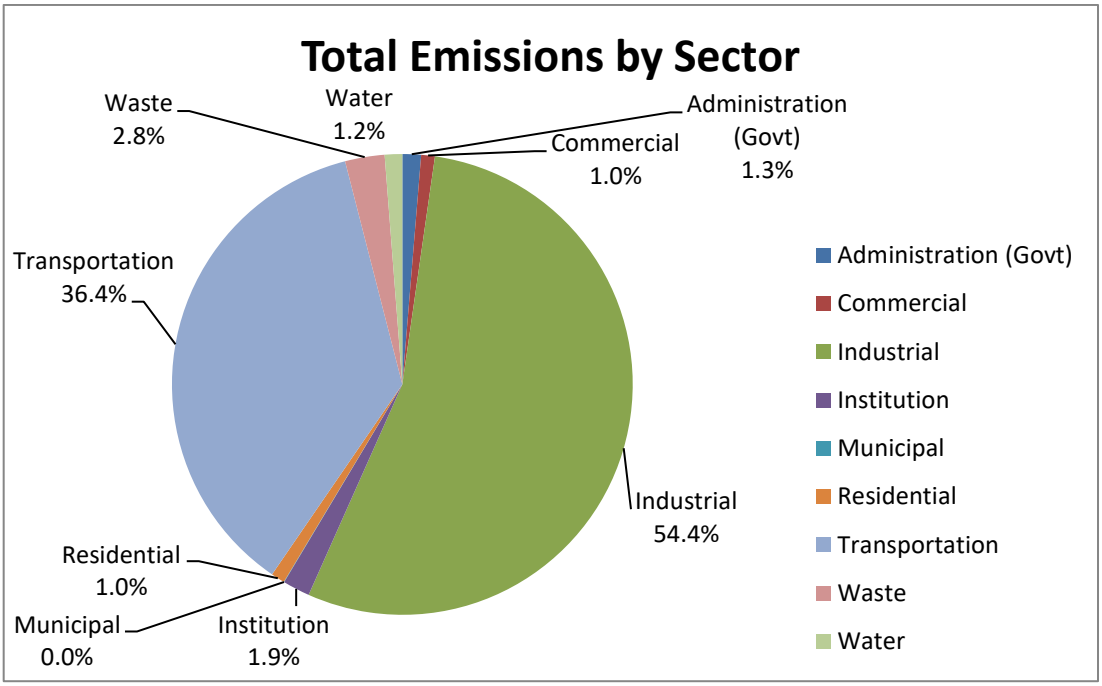
The City of Hang Tuah Jaya MELAKA has established a reputation as a leader in tackling climate change, earning a LCCF Diamond Award in year 2014 for its pioneering efforts to address the effects of climate change within the municipal boundary and becoming the first local authority in Malaysia to develop a comprehensive Green City Action Plan. Pursuing their goals to reduce emissions intensity per GDP by 45% in year 2030, the Municipal Council has decided to develop detail greenhouse gas inventory for 2018 baseline for them to chart more definitive actions for municipal and cumminity-wide activities.

In 2018, an estimated 1,030,237.97 tCO_2e was emitted from activities within the municipal boundary of Hang Tuah Jaya.

Table 1: Community-Wide Greenhouse Gas Emissions by Sector and Scope

No.	Sector	Emissions tCO2e				%
		Scope 1	Scope 2	Scope 3	Total	
1.	Administration (Govt)	-	13,433.63	-	**13,433.63**	1.3
2.	Commercial	38.40	9,857.34	-	**9,895.74**	1.0
3.	Industrial	3,481.95	557,015.67	-	**560,497.62**	54.4
4.	Institution	61.66	19,587.89	-	**19,649.55**	1.9
5.	Municipal	153.94	291.29	342.86	**788.09**	0.0
6.	Residential	-	9,936.31	-	**9,936.31**	1.0
7.	Transportation	374,822.54	-	-	**374,822.54**	36.4
8.	Waste	1,620.30	-	26,950.80	**28,571.10**	2.8
9.	Water	-	12,643.39	-	**12,643.39**	1.2
Grand Total		**380,178.79**	**622,765.52**	**27,293.66**	**1,030,237.97**	100.0

Figure 1: Community-Wide Greenhouse Gas Emissions by % Sector



Note: Municipal emissions are approximately 0.08% of total emissions

As shown in **Table 1** above, the reported emissions are predominantly from industrial facilities and transportation, with waste, residences and institutions providing much smaller yet still significant contributions.

The current emission intensity is estimated at 0.132 kgCO_2e per RM in GDP (2010 prices), or 5.41 tCO_2e per capita. Hang Tuah Jaya is expecting a steady growth in population, for the coming years, and we assume the economy and emissions will develop in line with the national economy. If that is the case, Hang Tuah Jaya will need to reduce total emissions by approximately 495,000 tCO_2e per year by 2030, or 2.8 tCO_2e per capita, relative to the BAU scenario, by 2030 to reach its target. While national initiatives will undoubtedly cover some of these reductions, action at the local level is still crucial.

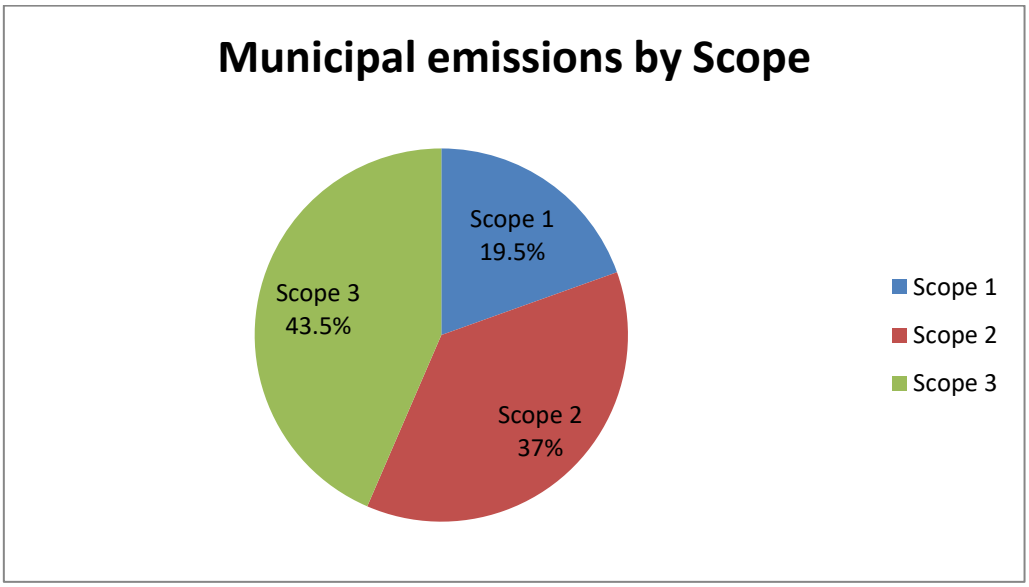
While comparatively small in absolute terms, the emissions reported from municipal operations have special significance, as they offer an opportunity for the municipal council to lead from the front, and inspire community members to take on mitigation actions of their own.

Table 2: Municipal Greenhouse Gas Emissions by Scope and Sector

No.	Sector	Emission tCO2e				%
		Scope 1	Scope 2	Scope 3	Total	
1.	Vehicle Fleet	153.94	-	-	**153.94**	19.5
2.	Buildings and Facilities	-	291.29	-	**291.29**	37.0
3.	Staff Commutes	-	-	342.86	**342.86**	43.5
Total		**153.94**	**291.29**	**342.86**	**788.09**	100.0

At present, reported emissions from municipal operations stand at 788.09 tCO_2e, 43.5% which stems from employee commutes, as seen in **Table 2** above.

Figure 2: Municipal Greenhouse Gas Emissions by % Scope



The inventory exercise provides a solid foundation for the forthcoming GHG management Action Plan for MPHTJ. As the data included is considerably more granular than in previous exercises of its kind in Malaysia, the Action Plan will be able to more directly target major emitters, and thus ensure that the Action Plan is implementable, measurable and trackable over time.

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1.0 INTRODUCTION

This report is the third deliverable of the ongoing Greenhouse Gas (GHG) Inventory and Reduction Action Plan project for Majlis Perbandaran Hang Tuah Jaya (MPHTJ), conducted by International Green Training Centre (IGTC). The goal of the report is to place this new inventory into the context of existing efforts toward climate action within MPHTJ as well as the emission reduction action plan which is to be based off of the inventory, as well as to highlight initial findings from the collected GHG data.

1.1 Background of Green City Initiatives

The Melaka state government has established the Melaka Green City State Blueprint 2020 in year 2010 with missions to be the first full-fledged green city state using United Nation's Urban Environmental Accords (UEA) indicators for green city status and The Organisation for Economic Cooperation and Development (OECD) indicators for city state status. The Majlis Perbandaran Hang Tuah Jaya was chosen to lead the initiatives and to be followed by Majlis Bandaraya Melaka Bersejarah, Majlis Perbandaran Alor Gajah and Majlis Perbandaran Jasin.

MPHTJ is the youngest of four (4) Municipal Councils in Melaka, however, in that short time MPHTJ has established itself as one of the most progressive municipal authorities in Malaysia, with regards to GHG management. In addition to the state level inventories conducted by ICLEI, MPHTJ has through the Low Carbon City Framework (LCCF) successfully managed the impacts of 14 administrative buildings within the city. For these efforts, MPHTJ was the first local council to receive a Diamond rating from the The Ministry of Energy, Green Technology and Water Malaysia (KeTTHA) in 2014.

1.2 Background of Previous Inventories

Majlis Perbandaran Hang Tuah Jaya has committed to be the first full-fledged green city in Melaka and reduce 45% of its greenhouse gas emission intensity of GDP by 2030 in line with the nationally set target. For the purpose of realizing this target, the current monitoring and reporting frameworks have some shortcomings. The ICLEI inventories are conducted at the state level, and mostly on the basis of centrally aggregated consumption figures. This results in two issues from a city-level action standpoint. Firstly, due to using only centralized data, it offers limited insight into local emission hotspots, and thus does not aid in the identification of high-leverage interventions. Secondly, due to the low-resolution nature of state-level data makes the tracking and attribution of impacts from emission reduction interventions very difficult. The results of city-level interventions simply get lost in the noise of a high-level state inventory.

The LCCF reports are very localized, but unfortunately also very limited in their scope. For energy use, they cover only 14 administrative buildings within the city, and thus provide no insight for hundreds of other buildings in the city, including industries that would be expected to be the largest emitters.

1.3 Purpose of New GHG Inventory

This inventory aims to fulfil four (4) objectives, namely;

i. To provide a more detailed picture of the emissions from within Hang Tuah Jaya, in order to facilitate targeted policies and programs, both within the operations of the municipal authority and in the community at large, to reduce emissions in line with the municipal targets. This is done by compiling the inventory, using a two-way data collection and aggregation approach. On one hand, the totalized figures are comparable with previous GHG reporting activities, as they utilize similar top-down data sources. On the other, this inventory provides insight into the specific emissions of most major emitters within the municipal boundary, by including bottom-up data from dozens of entities within the boundary. This allows for comparison across entities, and provides the ability to focus emission reduction efforts on the highest potential sectors and areas.

ii. To provide a platform for designing, monitoring and tracking impacts of policies and programs. The inventory itself is only the beginning. Once the baseline is established and programs or policies are enacted, it is important to monitor and track which initiatives were effective and which were not. This is only possible, if data is collected continuously and sufficiently detailed to provide insight into possible solutions. The action plan that is forthcoming following this inventory, aims to provide the starting point for this active management of emissions within the city limit.

iii. To vastly expand the number of people and organizations who are actively engaged with monitoring GHG emission activity in Hang Tuah Jaya. This in turn, should make more people aware and perhaps interested in acting to reduce their emissions. To spur this, each relevant participating entity will be advised of their utility usage intensity (i.e. kWh/m^2/year) in relation to relevant international and Malaysian standards (Malaysia Standard MS 1525:2014. Energy efficiency and use of renewable energy for non-residential buildings - code of practice), calculated based on their submitted data. In addition, the action plan following this inventory will provide specific measures for major emitters to reduce their climate impacts and utility costs, through suggested, industry specific measures, based on their reported activities.

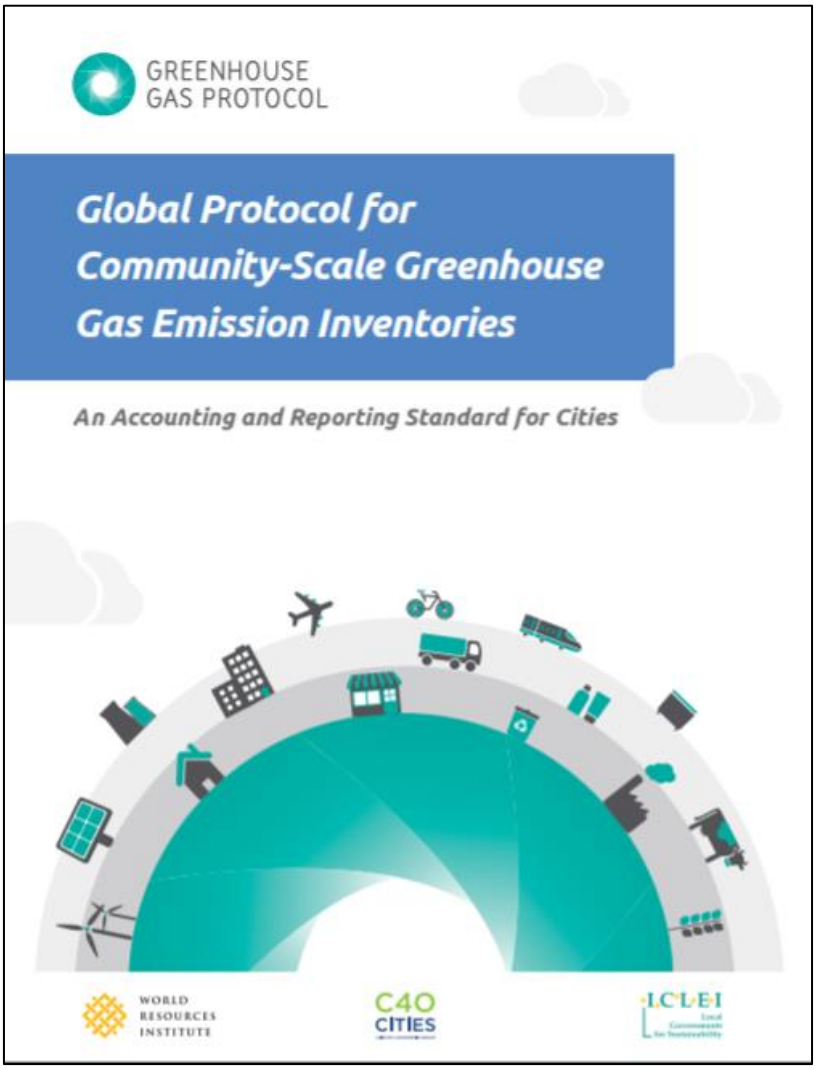
iv. This inventory will be shared amongst major stakeholders for the purpose of economic impact to both industries and MPHTJ. Various projects pertaining to energy and water efficiency e.g. Energy Performance Contracting, Nett Energy Metering, Off-grid renewable energy, etc can be introduced. In addition, new green business opportunity also can be explored as outcomes of this inventory. Detailed action plan for GHG reduction can be found in the next report.

2.0 METHODOLOGY

2.1 GHG Accounting Principles

This inventory follows the principles laid out in the **WRI Global Protocol for Community-Scale Greenhouse Gas Emission Inventories**, amended to suit the context. As such, the inventory aims to follow the principles of **Relevance, Completeness, Consistency, Transparency** and **Accuracy.** Throughout this chapter, methodology choices will generally refer to one or more of these principles.

Figure 3: WRI Global Protocol for Community-Scale Greenhouse Gas Emission Inventories



2.2 Two-Way Approach

This inventory utilizes a two-way approach to gathering and aggregating data, and thus to calculate emissions; top-down and bottom-up. Top-down in this context refers to using centralized data sources such as total electricity consumption within the boundary, collected from the grid operator. These data are important, as they are a good way of getting the estimation of the total emissions in a consistent and efficient manner (principles of **Completeness, Accuracy** and **Consistency**). However, these data tend to be very generic, and thus make it difficult to attribute the apparent success or failure of particular program or policy.

Bottom-up refers to collecting data from a large number of individual entities, and then aggregating those data together, to get an image of the whole. These data are much richer by nature, and thus give a much better basis for action, as interventions can be closely targeted and monitored for impact (principle of **Relevance**). However, bottom-up data are often messy and incomplete, and thus may not give accurate or consistent estimates of the total.

This inventory endeavours to get the best of both worlds, by estimating totals using top-down data, while estimating the contribution of different sectors, and even different emission types within individual organizations, through the collection of data from companies and government agencies within the municipal boundary.

2.2.1 Linking to Previous Inventories

This inventory should not be seen as a departure from the work that has gone before it, but rather as a compliment that work, which provides much more data overall and improves the ability to design, implement, track and attribute the impact of emission reduction initiatives.

2.2.2 Double Counting

With the two-way approach, there is a significant risk of double counting, as the data from different sources are overlapping. To counteract this, this inventory does not add bottom-up data and top-down data for the same categories. Where top-down data exists, this is assumed to represent the total. Where top-down data is not available, bottom-up data is used, and if necessary extrapolated, to estimate totals.

2.3 Setting the Inventory Boundary

As mentioned above, this inventory has two parts, the municipal inventory and the community-wide inventory. As such, there are two sets of boundaries. These boundaries are defined below.

2.3.1 Geographic Boundary

The boundary for the community-wide inventory follows the spatial municipal boundary of MPHTJ as attached in Appendixes for reference. The inventory covers all activities within that spatial boundary, whether conducted by residents, industries or public institutions.

The boundary for the municipal inventory follows operational control of MPHTJ. Thus, the boundary covers the facilities of the main office of MPHTJ at Melaka Mall and the Melaka Zoo, along with municipally operated vehicles and public lighting (i.e. street lights, traffic signals and flood lights).

2.3.2 Time Period and Baseline

The inventory covers all activities within the boundaries conducted between January and December 2018.

As this is the first GHG inventory for MPHTJ, there is no previous baseline with which to compare the results from this inventory. This inventory should serve as a baseline for comparison for future inventory exercises.

2.3.3 Greenhouse Gases

For the covered activities, this inventory accounts for the six major greenhouse gases. The Global Warming Potential for each gas is calculated using the conversion factors from the IPCC Fifth Assessment Report, as listed in **Table 3** below.

Table 3: Greenhouse Gases and Their GWPs

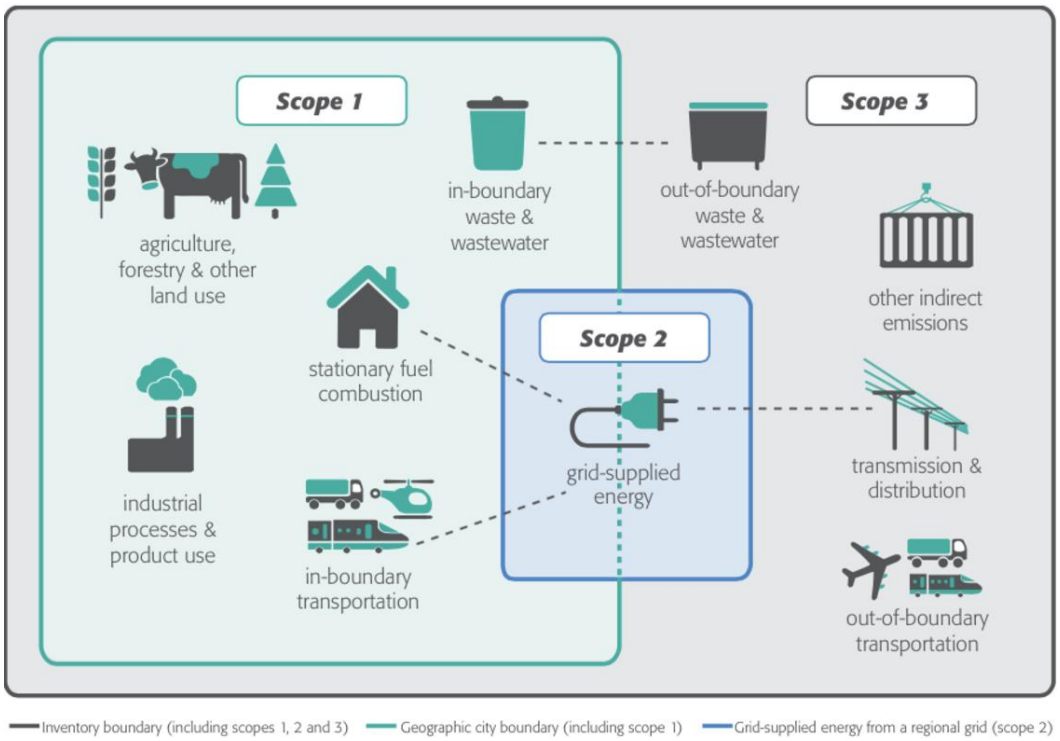
No.	GHG Type	Chemical Formula	Global Warming Potential (CO_2e)
1.	Carbon Dioxide	CO_2	1
2.	Methane	CH_4	28
3.	Nitrous Oxide	N_2O	265
4.	Hydroflourocarbons	Various	116-12,400
5.	Perflourocarbons	Various	6,630-11,100
6.	Sulfur Hexafluoride	SF_6	23,500

(Source: IPCC, 2016)

2.3.4 GHG Emission Sources

For aggregate emission estimates, the inventory will follow the Scope framework from the WRI Global Protocol for Community-Scale Greenhouse Gas Emission Inventories, which is outlined below:

Figure 4: Emission Scopes



(Source: Global Protocol for Community-Scale Greenhouse Gas Inventories)

Scope 1 refers to all emissions caused by activity within the boundary. Scope 2 refers to emissions caused by the generation of electricity, used to drive activity within the boundary, but produced outside of it. Scope 3 refers to emissions from other activity that occurs outside the boundary, but is caused by activity inside the boundary.

Table 4: Estimation of Emissions by Source

No.	Sector	Emission Source	Data Source	Estimation Approach	Emission Scope
1.	Residential	Electricity Use	TNB	Top-down	2
2.	Institutional/ Commercial	Fuel Use	Direct engagement	Bottom-up	1
		Electricity Use	Direct engagement	Bottom-up	2
			ST	Bottom-up	
			TNB	Top-down	
3.	Industrial	Fuel Use	Direct engagement	Bottom-up	1
		Electricity Use	Direct engagement	Bottom-up	2
			ST	Bottom-up	
			TNB	Top-down	
4.	Transportation	Fuel Use	Petrol Kiosks	Top-down	1
		Staff Commutes	Direct engagement	Bottom-up	3
5.	Waste treatment	Decomposition	SW Corp	Top-down	3
6.	Water supply	Electricity Use	SAMB	Top-down	2 &3

For waste emissions, the actual emissions release from the landfill over a long period of time, from the vantage point of the municipal authority, these emissions are no longer within their purview, and thus cannot be avoided. Similarly, the point of intervention for municipal policy is to reduce the amount of waste, and thus impacts of this type of intervention should be visible in the inventory. For this purpose, all waste emissions expected from the decomposition of waste deposited in landfills within the inventory timeframe is attributed to the inventory year.

Emissions from grid electricity should have been estimated using top-down data from TNB. However, due to TNB's internal systems not including municipal boundaries, and the short timeline of this exercise, it was not possible to obtain top-down data for electricity consumption. This should be the top-priority for future data collection improvements, and close collaboration with TNB to obtain this data is strongly advised moving forward.

For fuel consumption, it was only possible to obtain sales data from 9 of the 22 petrol stations that were in operation in Hang Tuah Jaya in 2018 (two more have opened in 2019). Close engagement with the petrol companies to obtain data from the remaining stations, as well as bulk sales is advised.

When discussing emissions from a facility or sector perspective, the scope framework is used from the perspective of the discussed sector or facility, meaning emission sources (e.g. staff commutes) may be scope 1 for the inventory as a whole, but scope 3 for the facility or sector.

2.3.5 Other Scope 3 Emissions

While the list of Scope 3 sources that could have been included is virtually endless, due to resource constraints and to focus initial mitigation actions on easily accessible and large sources, most of these have been excluded.

For a future round of interventions, sources such as embodied emissions in materials sourced from third parties (e.g. food, appliances, construction materials or vehicles) could be included to improve procurement practices.

2.3.6 Boundaries for Mitigation Goals

The boundaries for this inventory have been set to align with the existing mitigation goal of reducing 45% of its greenhouse gas emission intensity of GDP by 2030 in line with the nationally set target.

2.3.7 Aggregation Methodology for Municipal Inventory

As the emphasis of this inventory is on guiding interventions, the municipal inventory has been aggregated according to facilities that are under the operational control of MPHTJ, rather than according to ownership. The goal is to empower MPHTJ to actively manage the emissions that they control directly, and thus track emissions accordingly.

2.3.8 Exclusions

Due to resource constraints and low data availability, emissions from Agriculture, Forestry and Other Land Use (AFOLU) are not estimated for this inventory. At the state level, these emissions have been estimated to account for only 2.16% of total emissions[1], so the impact on total emissions from this exclusion is believed to be small. These emissions are also estimated to be less conducive to mitigating actions, and thus their absence from the emission reduction action plan is similarly expected to be insignificant. The decision to exclude AFOLU emissions should be re-evaluated for future inventories.

The Melaka Zoo only transferred to municipal operation in October 2018. Due to the transfer of operations, the data for 2018 was not accessible, and the Zoo was thus excluded from this inventory. The Zoo should however be included in future inventories.

Currently, only MPHTJ office is included and others are not due to small energy usage and no data compilation exercise been done, there deemed to be below threshold and not included in this inventory

[1]http://www.melakagreentech.gov.my/index.php/go-green/peta-lokasi/2014-09-12-03-41-25/inventori-karbon-melaka-bersama-iclei

2.4 Materiality

For this inventory, a materiality threshold of 1% has been used. This means that emission categories from the state level inventories that contribute less than 1% of total emissions are considered non-material, and have thus been excluded, in addition to AFOLU emissions as explained above. This materiality threshold has resulted in the exclusion of air-transport as well as biological treatment of waste. These categories amount to only 0.17% of the total emissions at the state level, and as such their exclusion in this inventory is expected to have minimal impact.

Within each emission category, facilities which ex-ante is estimated to have annual emissions above the 400 tCO_2e/year are designated to be Major Emitters, and will be included in the inventory. If MPHTJ has the same emission intensity per capita as Melaka as a whole, this means that every facility which contributes more than 0.05% of the total emissions will be included.

For the purposes of ex-ante screening of potential participants, electricity consumption was used as a proxy for total emissions, as this data is more readily available and relatable to prospective participants. To ensure inclusion of participants with large fuel and other emissions relative to electricity, the screening threshold was set at 250,000 kWh per year.

2.5 Data Collection Procedures

The two-way approach utilized in this inventory, requires data to be collected from a large group of varied sources, both central and individual. The two figures below outline the procedures for the collection of data from each major data source. The questionnaire and NDA have been attached as Appendixes, for reference.

Data will be verified and collected according to geographic location of participating facilities.

Figure 5: Data Collection Flow Chart for Municipal Data

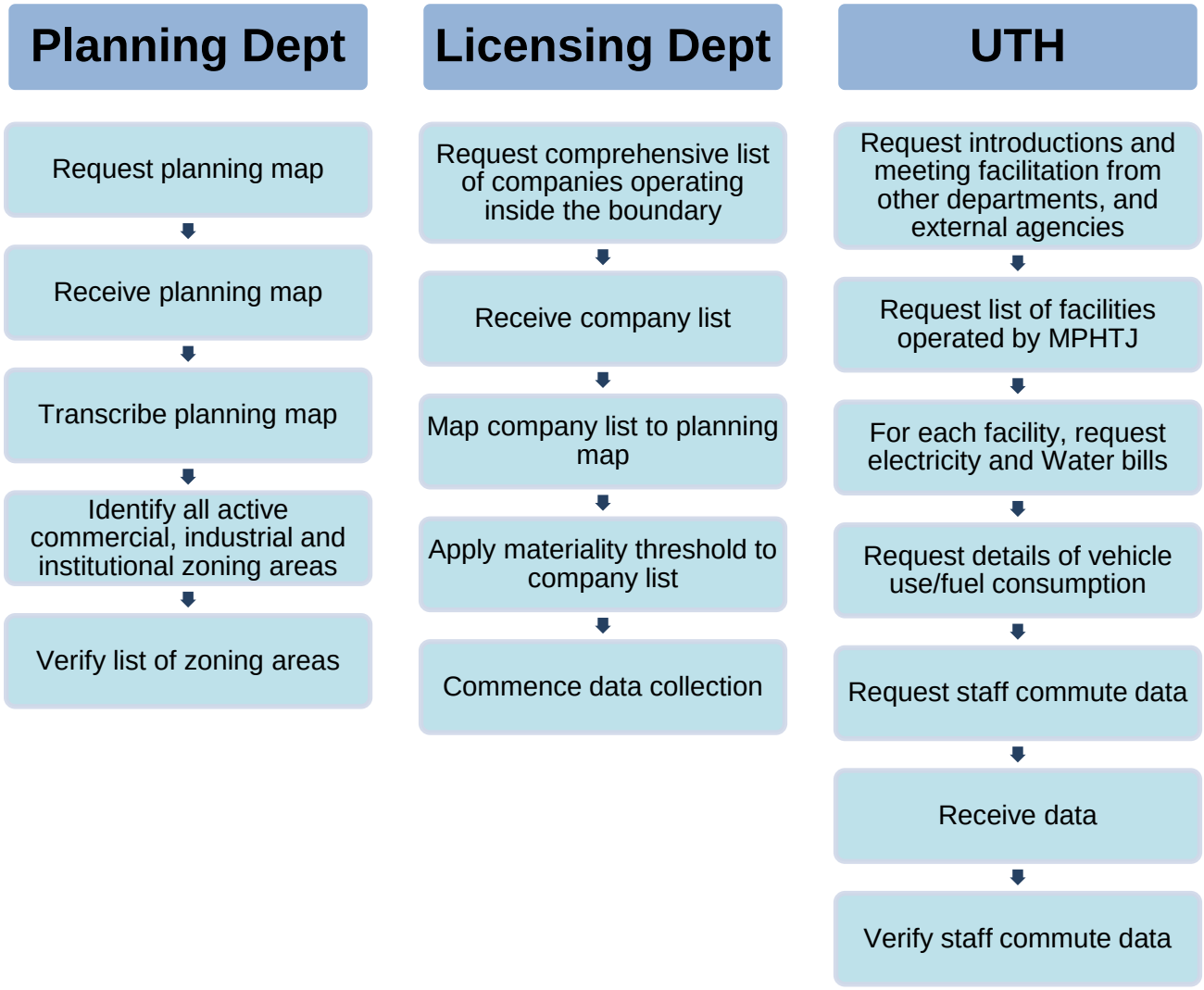
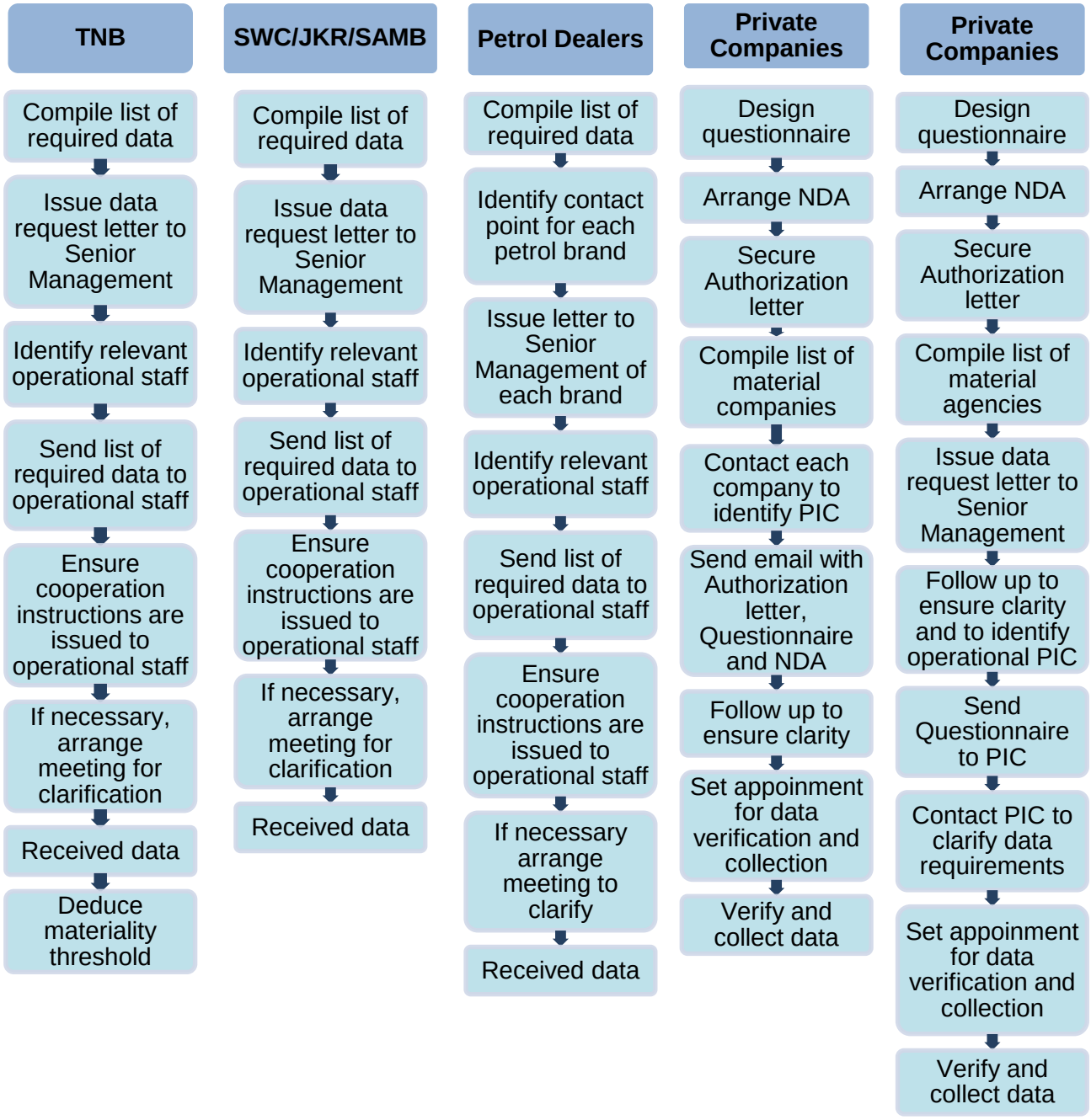


Figure 6: Data Collection Flow Chart for Community Data



2.6 Emission Factors

For the purpose of this inventory, emission factors related to direct energy usage are sourced from the Intergovernmental Panel on Climate Change (IPCC). Emissions from electricity usage utilize the latest grid emission study published by the Malaysian Green Technology Corporation from 2014. As there is no national database of vehicle emissions for Malaysia, emissions from vehicle usage will use the latest relevant publication from DEFRA2018. Emission factors for solid waste disposal are derived from the CDM "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site."

2.7 Estimating GDP for a City

The Gross Domestic Product (GDP) is not currently being tracked by the Department of Statistics, Malaysia (DOSM), though the development of such tracking is currently under development. Yet, in order to track the progress towards MPHTJ's stated target of reducing the carbon intensity of the city's GDP by 45% by 2030, it is necessary to establish a proxy measure for GDP.

Table 5: Melaka and Hang Tuah Jaya GDP and Population Data

No.	Population and GDP	%	2015	2016	2018	Source
1.	Melaka Population	-	890,000	900,000	920,000	DOSM
2.	Melaka GDP (RM Millions 2010 Prices)	-	31,727	33,163	-	DOSM
3.	Melaka GDP CAGR	6.32%	-	-	-	Calculated
4.	Melaka GDP Projection (RM Millions 2010 Prices)	-	-	-	38,132	Calculated
5.	Hang Tuah Jaya Population	-	-	-	190,529	RT 2025
6.	Scaled GDP Estimate (RM Millions 2010 Prices)	-	-	-	7,897	Calculated

For the purpose of this report, state-level GDP figures for 2017 projected to 2018 using the CAGR for the preceding 3 years scaled by population have been used, then scaled down to the municipal level by population.

While an imperfect measure, this is the closest it is currently possible to get to a GDP-figure at the municipal level. Hang Tuah Jaya and other municipalities should continue to work with DOSM to improve the quality of estimation of GDP at the local level, to improve the measure and reporting over time. Once better municipal level data is available, the baseline should be recalculated as described below.

2.8 Recalculating the baseline

If, in connection with future inventory exercises, better information becomes available, than is currently accessible for the present inventory, the baseline emission estimate should be recalculated to reflect this, and the new inventory should be considered using the recalculated baseline estimate. This is done in order to ensure comparability between the inventories (principle of **Consistency**), while improving the usefulness and precision of the inventory estimate and the tracking of associated interventions and initiatives (principle of **Accuracy**).

The following events should trigger a recalculation of the baseline emission estimate:

Discovery of a material error in baseline emissions calculations

Access to new (improved) sources of data for material activity data (e.g. better estimate of aggregate electricity use)

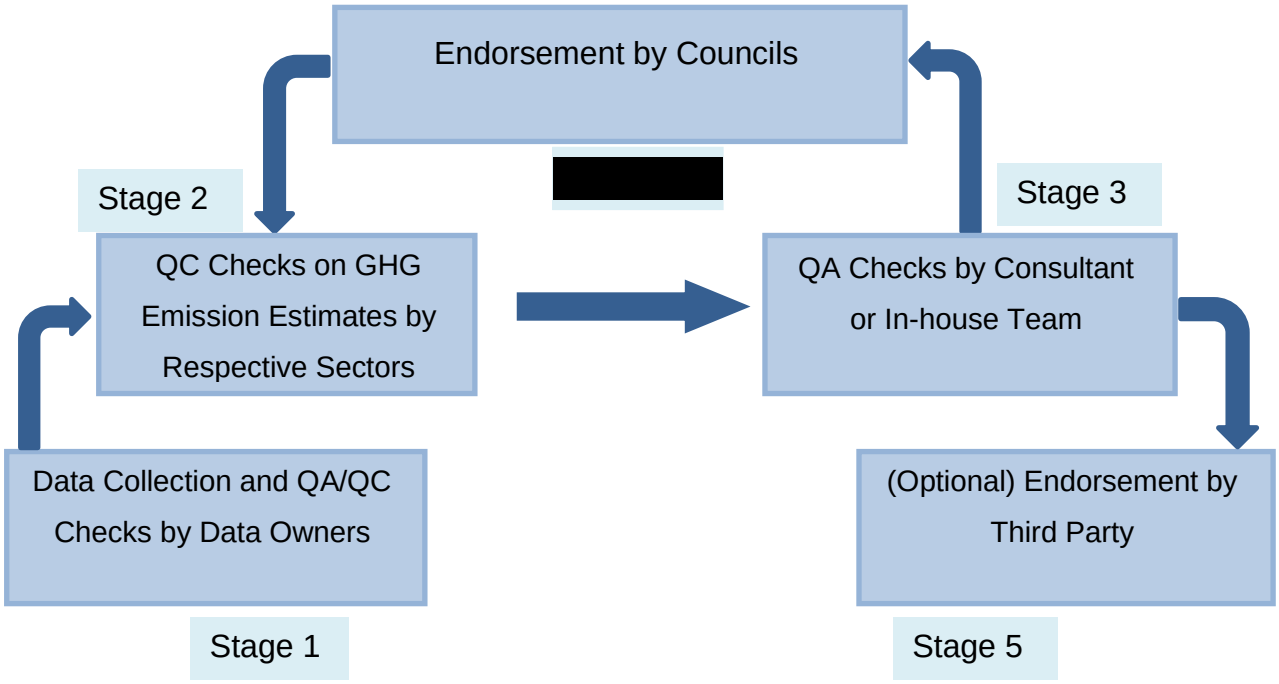
Access to new (improved) emission factors for material activity (e.g. local emission factors for Malaysian vehicle fleet)

Expansion of inventory, to cover emission sources that are currently excluded (e.g. inclusion of agricultural emissions)

2.9 Quality Assurance and Quality Control

To ensure the validity of GHG emission estimates, rigorous QA/QC procedures must be followed, of both input data and of calculations and compilation of the GHG inventory. The figure below outlines the flow of QA/QC for the inventory.

Figure 7: QA/QC Procedures



Each data point is checked both at the data collection stage and at the data entry stage, cross-referencing with source documentation. Then calculations are checked by the person in charge, and cross-checked by another team member. Following this, figures are sent to the City Council for endorsement.

If further assurance of the GHG emissions estimates are required, it is possible to have a third party verfy the data and calculations. While third party verification has not been conducted for this inventory, it remains an option for future inventories, if deemed necessary.

3.0 MUNICIPAL INVENTORY RESULTS

While comparatively small in absolute terms, the emissions reported from municipal operations have special significance, as they offer an opportunity for the city council to lead from the front, and inspire community members to take on mitigation actions of their own.

3.1 Municipal Emissions by Scope

The municipal emissions reported total 788.09 tCO_2e, of which 445 tCO_2e stem from municipal operations directly, with the balance stemming from staff commutes. The breakdown by source can be seen in **Figure 2: Municipal Greenhouse Gas Emissions by % Scope**. Scope 3 emissions from staff commutes is the largest source of emissions, followed by electricity from the operations of the main office at Melaka Mall, and lastly by the vehicles owned and operated by MPHTJ itself.

3.2 Municipal Emissions by Sector

3.2.1 Buildings and Facilities

MPHTJ operates 15 facilities in total, namely Kompleks Melaka Mall, Pasar Borong Batu Berendam, Jalan Wakaf Bukit Katil, Kolam Ayer Panas and Tempat Letak Kereta Pasar Borong. However, due to small energy usage and no data compilation exercise been done, there deemed to be below threshold and not included in this inventory. Due to the recent transfer of operations of the Zoo to MPHTJ, data for 2018 is not accessible, and the Zoo has thus not been included in this inventory.

The main office at Melaka Mall reported electricity consumption of 419,732 kWh for 2018, corresponding to 291 tCO_2e. This represents 37% of total reported municipal emissions.

3.2.2 Streetlights and Traffic Signals

There is a total of 6,127 lamps deployed to illuminate the streets of Hang Tuah Jaya. These are a mix of Conventional bulbs, High-pressure sodium or Son bulbs and the more energy efficient Light-Emitting Diode (LED) bulbs. The breakdown can be seen in **Table 6** below.

Table 6: Hang Tuah Jaya Street Lights by Bulbs Type

No.	Type of Bulb	Number of Bulbs
1.	LED	1,333
2.	High-pressure sodium	3,312
3.	Conventional	1,482
Total		**6,127**

As part of this inventory, it was not possible to gain access to energy consumption data for the operation of the street lights. This source of emissions would have likely dwarfed the other municipal emission sources, and it should be a focus for future data collection improvements.

3.2.3 Vehicle Fleet

MPHTJ operates a fleet of 28 vehicles, as can be seen in **Table 7** below. In 2018, these vehicles used a combined 36,660 liters of petrol and 25,913 liters of diesel. This represents total emissions of 154 tCO_2e, or roughly 20% of the reported municipal total.

Table 7: MPHTJ Vehicles

No.	Category	Type	Vehicle	Quantity
1.	Motorcycle	Motorcycle	Honda	2
2.	Passenger Car	Passenger Car	Honda Hybrid	1
			Nissan Extrail	7
			Honda CRV	1
3.	Light Vehicles	Van	Toyota Hiace	3
			Mobile Counter, Maxus v80	1
		4-wheel drive	Toyota Frontier	2
			Isuzu D-Maxx	1
			Toyota Hilux	1
		Lorry	Hino	4
			Isuzu	2
			Nissan	1
4.	Heavy vehicle	Vehicle Exceeding 5 Tons	JCB	1
			Skylift	1
Total Vehicles				**28**

(Source: Majlis Perbandaran Hang Tuah Jaya)

3.2.4 Employee Commutes

All 411 MPHTJ staff surveyed regarding their daily commutes, and 256 responded. Those 256 respondents reported combined commutes of 1,802,092 vehicle-kilometers in 2018 (an average of 13 km to and from their place of work), representing emissions of 253 tCO_2e. As the majority of the non-reporting staff are lower rank workers, it is assumed for estimations purposes that all remaining staff use motorcycles, and that they on average commute as far as their colleagues. This brings the total estimated emissions for staff commutes to 342 tCO_2e, or 43% of the total reported emissions.

4.0 COMMUNITY-WIDE INVENTORY

Overall, an estimated 1,030,237 tCO_2e were emitted from activities within the municipal boundary of Hang Tuah Jaya. In order to avoid double counting, this estimate disregards bottom-up data where it overlaps with top-down data, specifically on transportation/staff commutes and waste disposal. This bottom-up data is reintroduced in the sector breakdown below.

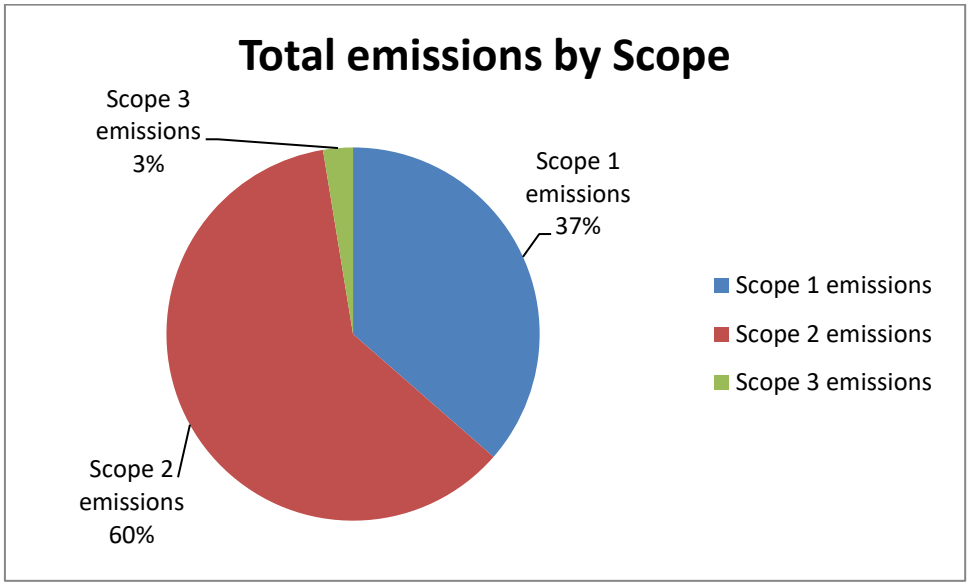
4.1 Community Emissions by Scope

Emissions from electricity imported from the grid were by far the largest source of emissions, constituting 60% of the total estimated emissions from the city, stemming primarily from industrial participants. Secondarily, emissions from fuel use, near exclusively from transportation uses, contributed 37% of the total.

Table 8: Community-Wide Greenhouse Gas Emissions by Scope

Scope	Total Emissions (tCO2e)	%
1	380,178.79	37.0
2	622,765.52	60.0
3	27,293.66	3.0
Total	**1,030,237.97**	100.0

Figure 8: Community-Wide Greenhouse Gas Emissions by % Scope



4.2 Community Emissions by Sector

As mentioned previously, sector-wise emissions are reported from the perspective of the individual sector, leaning more heavily on bottom-up data.

4.2.1 Public and Non-Profit Offices and Institutions

Non-municipal government facilities account for 13,433.63 tCO_2e, with other non-profit institutions making up an additional 19,649.55 tCO_2e, meaning the two sectors combine for about 3.2 % of total emissions. Both sectors are dominated by emissions from grid electricity, constituting over 95% of the sector total. The remaining emissions stem primarily of from company vehicles and staff commutes.

4.2.2 Residences

Emissions from residences have been estimated only using top-down data from TNB, referring to the report provided on 22nd August 2019, the summary of which can be referred in Appendixes. However, due to TNB's internal systems not tracking municipal boundaries, only estimates for 31 identified neighbourhoods totalling 14,317,443 kWh was provided, representing emissions of 9,936.31 tCO_2e. This estimate is incomplete, and would benefit from close engagement with TNB, to capture the remaining residences in the city.

4.2.3 Commercial/Industrial

Industry is by far the largest contributing sector to the emissions of Hang Tuah Jaya, representing emissions of 560,497.62 tCO_2e, or 54.4% of the estimated total. In addition, other commercial facilities contribute 9,895.74 tCO_2e, or about 1% of the total.

These emissions stem primarily from grid electricity, though 4,358 tCO_2e come from fuel use, the majority of which is natural gas use from a single industrial facility, and 6,214 tCO_2e are from Scope 3 emission, primarily staff commutes.

4.2.4 Transportation

Transportation emissions within the municipal boundary are using the Fuel Sales-method, as described in the WRI Global Protocol for Community-Scale Greenhouse Inventories. Sales data from 9 of the 22 petrol kiosks within the boundary has been reported, totalling 46,318,251 liters of petrol and 16,912,648 liters of diesel. This represents emissions of 153,539 tCO_2e. Assuming this sample of petrol stations is representative for the stations within Hang Tuah Jaya, the total emissions from transportation is estimated to be 374,822.54 tCO_2e.

4.2.5 Solid Waste

In 2018 and total on 50,084 tonnes of municipal solid waste was collected within the municipal boundary of MPHTJ and deposited at the Sg Udang Sanitary landfill. Based on sampling conducted by SW Corp, the waste composition breaks down as seen in **Table 9** below.

As waste decomposes in a landfill, the organic material in the waste gets converted to methane, due to the low availability of oxygen. While there is methane flaring equipment at Sg Udang, which does significantly reduce the methane emissions from the site, the current open flaring system is only a partial solution.

Table 9: Waste Composition at Sungai Udang Sanitary Landfill

No.	Category	Percentage
1.	Food waste	37.6%
2.	Plastics	28.8%
3.	Paper	5.3%
4.	Metal	1.9%
5.	HHW	0.2%
6.	Tetrapak	0.5%
7.	Glass	2.1%
8.	Textile	5.0%
9.	Rubber/leather	0.6%
10.	Wood	0.2%
11.	Garden/yard	0.1%
12.	Diapers/napkins	12.4%
13.	Comingle	5.1%
14.	Other	0.1%

(Source: Perbadanan Pengurusan Sisa Pepejal Dan Pembersihan Awam, 2018)

Based on the waste composition, the organic fraction of each waste type and the current methane management system, as well as the fuel and electricity used to operate the landfill, the total net emissions due to waste is estimated to be 0.57 tCO_2e per ton of waste, or a total of 28,571.10 tCO_2e for all the waste deposited in 2018, or roughly 2.8% of all reported emissions.

Table 10: Waste Emissions from Hang Tuah Jaya, 2018

Month (2018)	MPHTJ Waste collected (tonnes)				Decomposition emissions	Diesel emissions	Electricity emissions	Collection emissions	Total GHG emissions
	SWM	Contractor	ICI	Total	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
January	2,049	1,680	396	**4,125**	2,201	13.02	5.61	133.44	**2,220**
February	1,845	1,417	909	**4,171**	2,226	13.17	5.67	134.93	**2,245**
March	1,942	1,544	732	**4,217**	2,250	13.31	5.74	135.44	**2,270**
April	1,891	1,462	580	**3,933**	2,099	12.42	5.35	127.25	**2,117**
May	1,908	1,660	660	**4,228**	2,256	13.35	5.75	136.77	**2,275**
June	1,766	1,842	671	**4,280**	2,283	13.51	5.82	138.45	**2,303**
July	2,232	2,020	613	**4,864**	2,596	15.36	6.62	157.37	**2,618**
August	1,943	1,776	554	**4,273**	2,280	13.49	5.81	138.23	**2,300**
September	1,739	1,728	474	**3,941**	2,103	12.44	5.36	127.49	**2,121**
October	1,933	1,770	462	**4,164**	2,222	13.15	5.66	134.72	**2,241**
November	1,750	1,674	557	**3,981**	2,124	12.57	5.41	128.78	**2,142**
December	1,760	1,728	420	**3,908**	2,085	12.34	5.32	126.42	**2,103**
Grand Total	**22,757**	**20,300**	**7,027**	**50,084**	**26,725**	**158.11**	**68.13**	**1,620.30**	**28,571**

(Source: Perbadanan Pengurusan Sisa Pepejal Dan Pembersihan Awam)

4.2.6 Water Consumption

An estimated total of 30,279,480 m^3 of water was supplied to entities within the municipal boundary in 2018. Energy consumption data associated with the delivery of that water was 18,218,136 kWh, representing emissions of 12,643.39 tCO_2e.

5.0 TARGETS AND MONITORING

Setting and managing targets for emission reductions should always be the ultimate goal of any greenhouse gas inventory. Without guiding management policy, the inventory does not have much value. As mentioned previously, the present exercise will be accompanied by an Action Plan report, for this exact reason, which will contain the majority of the policy recommendations related to this inventory. This chapter aims to highlight the background for target setting and recommendations focused on monitoring progression towards the targets, rather than on how to reach the targets in specific.

5.1

MPHTJ is targeting to reduce the emissions of the municipality equal to the national UNFCCC commitment of reducing the GHG intensity of GDP by 45% by 2030. To date, this target has not been accompanied with specific monitoring and management plans, and hence this exercise has been put in place.

Table 11: National Emissions and GDP Projections

No.	Description	%	2014	2020	2025	2030	Source
1.	National Emissions Projection (BAU, Approach 1) (ktCO2e)	-	314,310	393,390	452,940	530,290	NC3, BUR2
2.	National GDP Projection (RM billion, 2010 prices)	-	1,012.50	1,338.37	1,691.77	2068.44	NC3, BUR2
3.	National GHG Intensity (kgCO2e/RM 2010 prices)	-	0.310	0.294	0.268	0.256	NC3, BUR2
4.	National Emissions CAGR	3.3%	-	-	-	-	Calculated
5.	National Population Growth Rate Projection (Annual)	-	-	-	-	0.87%	NC3, BUR2
6.	National GDP Growth Projections (Annual)	-	-	3.88%	3.77%	3.19%	NC3, BUR2

(Sources: Malaysia Third National Communication and Second Biannual Update Report to the UNFCCC, NC3, BUR2)

Table 12: Hang Tuah Jaya emissions, GDP and Population projections

No.	Emissions Projection (Hang Tuah Jaya)	2018	2020	2025	2030	Source
1	HTJ Emissions Projection (ktCO2e)	1,030	1,099	1,295	1,525	Calculated
2	HTJ GDP Projection (RM million 2010 prices)	7,897	8,521	10,253	11,997	Calculated
3	HTJ Population Projection	190,529	200,699	228,562	238,678	RT2025
4	HTJ Emissions Intensity Projection ($kgCO_2e$/RM, 2010 prices)	0.130	0.129	0.126	0.127	Calculated
5	Hang Tuah Jaya Emissions Per Capita Projection (tCO_2e/ population)	5.41	5.48	5.67	6.39	Calculated
6	Target Emissions ($ktCO_2e$)	1,030	1,002	931	860	Calculated
7	Target Emissions Per Capita (tCO_2e)	5.41	4.99	4.08	3.61	Calculated
8	Target Emission Intensity Per GDP (kgCO2e/RM, 2010 prices)	0.130	0.117	0.091	0.072 (Reduction 45%)	Calculated

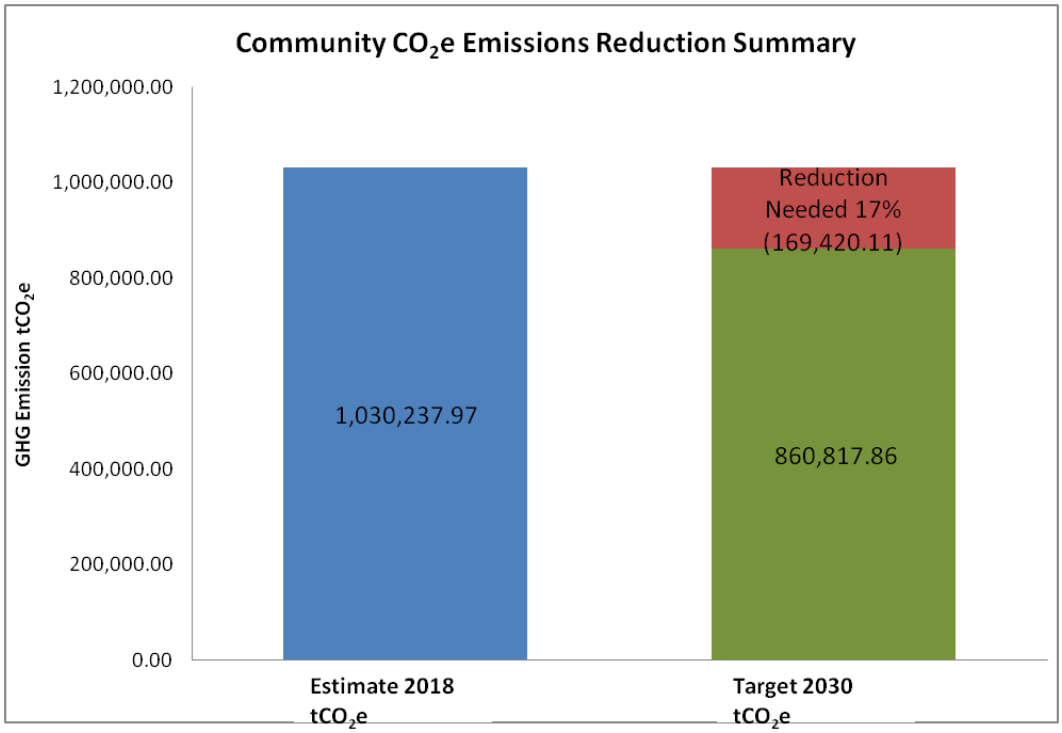
(Source of HTJ Population Projection: Rancangan Tempatan Hang Tuah Jaya (Pengubahan) 2025, RT2025)

The GDP for Hang Tuah Jaya in 2018 is estimated to be RM7.897 billion (in constant 2010 prices). As such the GHG intensity is estimated to be 0.130 $kgCO_2e$/RM GDP (2010 prices).

In order to project the needed savings between now and 2030, the emissions estimate has been extrapolated, assuming it will follow the national emissions growth rate, and similarly that the GDP will grow along with national expectations. A summary of national emissions and GDP growth projections can be seen in **Table 11**, and the consequent projections for Hang Tuah Jaya can be seen in **Table 12**, both above.

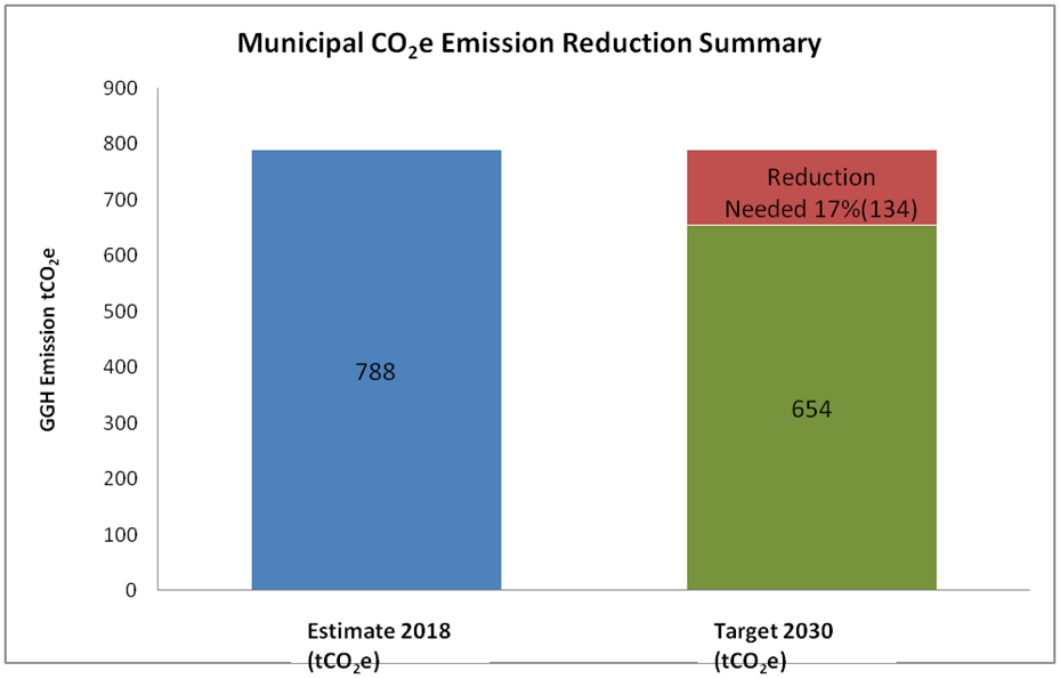
To reach its target of reducing emissions intensity of GDP by 45% by 2030, Hang Tuah Jaya will need to reduce 495,000 tCO_2e per year by 2030, or 2.8 tCO_2e per capita, relative to the BAU scenario. This is equivalent to absolute overall emissions by 17%, or roughly 170,000 tCO_2e per year by 2030, or 1.8 tCO_2e per capita per year, from to 2018 level while maintaing GDP growth equal to that of the nation as a whole. This is illustrated in **Figure 9** below.

Figure 9: Community Emissions Reduction Summary



Should MPHTJ wish to lead the way, and reduce emissions by and equal amount in absolute terms, they would need to reduce 134 tCO_2e per year from their own operation, as shown in **Figure 9.**

Figure 10: Municipal Emissions Reduction Summary



It is clear that there is a lot work to be done. While it is expected that national initiatives will cover some of the difference between the projection and the target, specific initiatives at the local level are still crucial.

The Action Plan report will specify specific mitigation actions that can be undertaken in the near and medium term, and assess the gap remaining for further future actions to cover. Furthermore, the Action Plan will include intermediate targets for emission reductions by 2020 and 2025. These intermediate targets will serve as guides, as to whether the management plan is on track, or whether additional mitigation actions are required to reach the ultimate target.

5.2 Recommendation for Future Data Collections Management

In order to track progress towards both the intermediate targets and the 2030-target, it is necessary to consistently track progress over time. Through this first-in-the-nation exercise to gain more granular insight into municipal GHG emissions, several lessons have been learned that should be incorporated into future monitoring plans, as the job of monitoring emissions moves to municipal staff.

5.2.1 Establish Dedicated Team

As with most tasks in a complex environment such as the running of a city, specialization of functions is necessary to ensure sufficient competency to manage the task. This is equally true for GHG management. As such it is paramount for the long-term success of the GHG monitoring and management programme that a team are dedicated to the task over an extended period and that resources are allocated to ensure the team has the ability to build up competency over time, through both training and practical experience.

5.2.2 Engage Key Stakeholders

As data will need to be collected largely from the same group of stakeholders over several years, it is well worth establishing formal channels of engagement, both with governmental and government-linked agencies such as TNB, DOSM, SW Corp and ST, and with the energy intensive community members, such as industries and institutions. Maintaining open lines of communications can help ensure a smoother data collection process over time, and provide an avenue for feedback on mitigation actions. This will also help ensure mitigation actions have the expected impacts on both emissions and energy costs for the community and to identify and correct shortfalls early.

In addition to increased communication, it might be conducive to integrate data collection into existing formal structures, such as operating licensing, by introducing *undang-undang kecil* for GHG emission data submission, e.g. as a requirement for license renewal. This kind of initiative can increase the coverage of the collected data, and incentivise the participation of laggards.

5.2.3 Introduce Digital Resources for Data Collection and Management

As the monitoring programme is to run continuously over a long period, it could be worthwhile to invest in software for the collection, management and/or analysis of GHG inventory data. This could include an online data submission solution, a data management tool specific to this type of data and/or a GHG calculation tool to ensure accuracy and consistency.

5.3 Recommendation for Future Emissions Monitoring and Reporting

When embarking on a major intervention programme such as this GHG management programme, it is important to ensure that the work in properly integrated into the day-to-day operations of the organization, and that the programme is leveraged to ensure that the programme has the highest possible impact towards the its overall policy-goals. This chapter aims to highlight a few possible ways that MPHTJ can improve the performance of the programme along these lines. While not meant to be exhaustive, it is meant as inspiration for ways to mainstream GHG management into the municipal operations.

5.3.1 Incorporate GHG Into KPIs for Top Management

As mentioned above, it is key for the core team around the programme to have sufficient competencies to conduct the programme. However, it is equally important to ensure that higher levels of management within the organization is also invested in the success of the programme. One way of achieving this is to integrate GHG programme performance into the KPIs of key managers in the reporting line for the ongoing activities, including senior management.

When used well, KPIs can be a powerful tool to guide management towards the issues that are of the highest priority of an organization’s governing body. Especially in cases where, as with GHG management, performance can relatively easily quantify, targets can be set unambiguously and progress can be tracked in a timely manner.

5.3.2 Rally Peers for Upwards Policy Influence

While intervention at the municipal level is important, rallying other municipalities to exert pressure on the state and federal governments provides an opportunity to forward the overall policy goals of the programme, beyond the municipal boundary. Furthermore, an active peer group opens forums for cost-sharing, sharing of best-practices and an improved ecosystem of practitioners, which improves the efforts within each municipality individually.

Lastly, increased attention from the state and federal governments could result in funds and programmes which could feeds into the municipal activities, thus lowering programme costs at the municipal level.

6.0 CONCLUSION

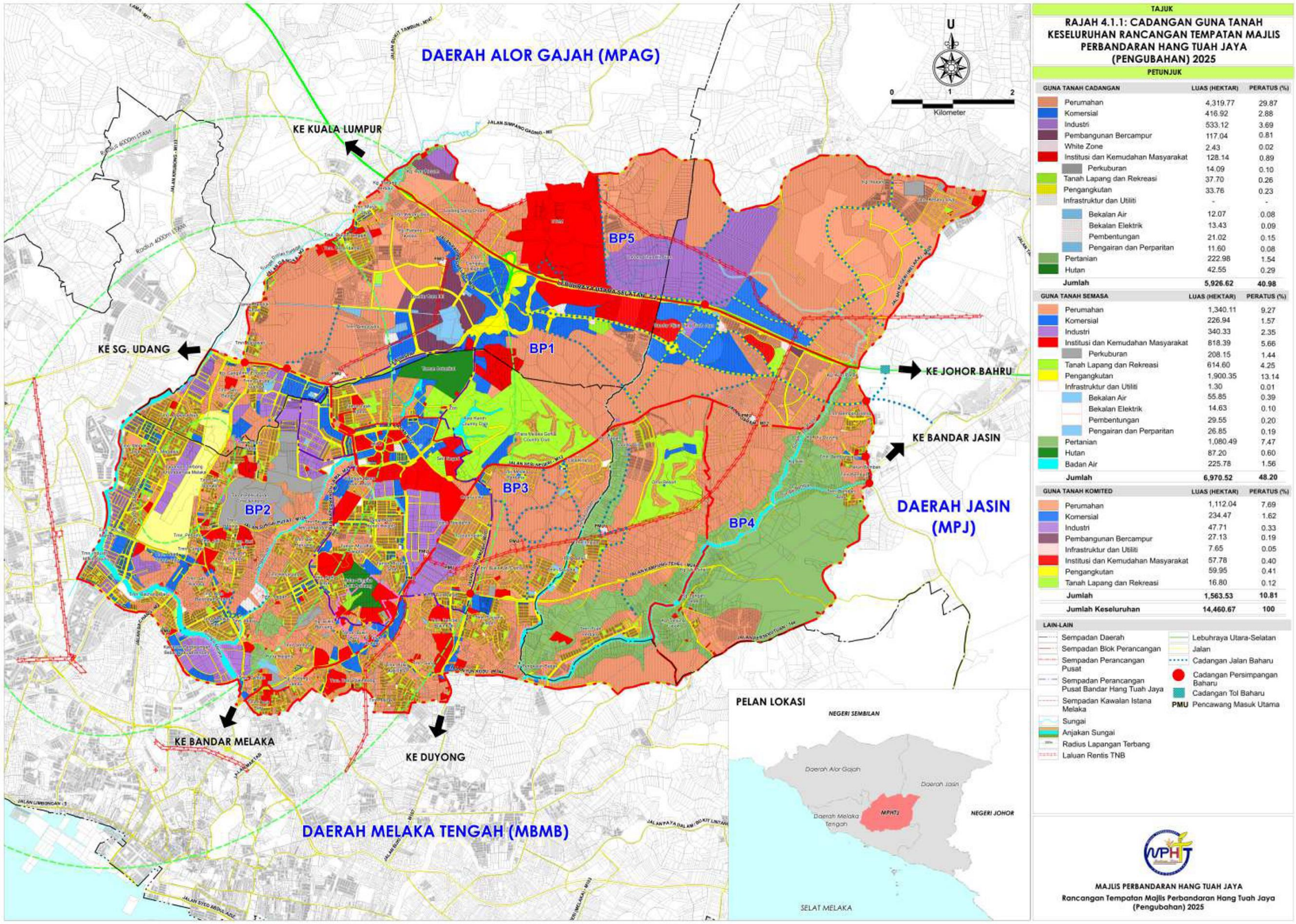
Industry emissions related to electricity consumption is by far the largest emissions category in the current estimate. This would indicate industrial energy efficiency and renewable energy through interventions such as energy conservation measures, Net Energy Metering and Energy Performance Contracting should play a starring role in the Action Plan moving forward. Similarly, electricity use in Administration and Institution facilities would also be worthwhile investigating further.

It is worth nothing, that data availability has been a challenge through the process to date, and thus looking into measures to improve data collection, such as those highlighted in **Chapter 5.2** of this report are critical for the long-term success of the GHG management programme.

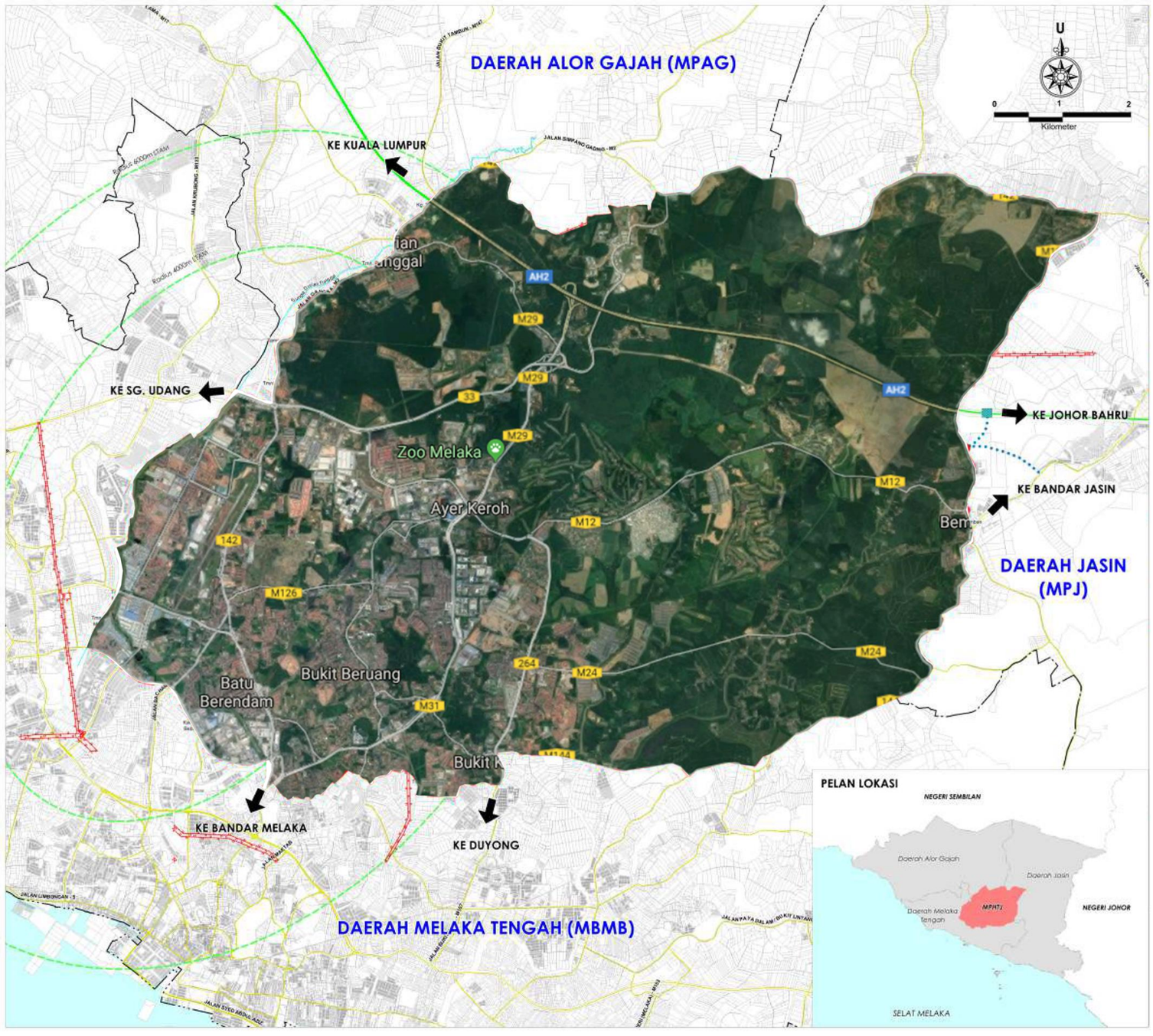
The inventory exercise provides a solid foundation for the forthcoming GHG management Action Plan for MPHTJ. As the data included is considerably more granular than in previous exercises of its kind in Malaysia, the Action Plan will be able to more directly target major emitters, and thus ensure that the Action Plan is implementable, measurable and trackable over time.

7.0 APPENDIXES

7.1 Hang Tuah Jaya Municipal Boundary



(Source: Majlis Perbandaran Hang Tuah Jaya ï Rancangan Tempatan)



(Source: Satellite Imagery)

7.2 Summary of Residential Electricity Consumption in Hang Tuah Jaya

No.	Area	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Total
		kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh
1	TMN MERAK BUKIT KATIL	28,848	37,223	34,029	35,443	38,614	34,588	31,953	36,585	33,640	34,378	37,467	35,090	**417,858**
2	PASAR BORONG MERDEKA	43,244	46,463	46,478	45,397	46,369	48,129	43,201	45,729	43,715	44,846	51,464	46,440	**551,475**
3	TMN MURAI JAYA	33,451	36,748	36,227	41,305	39,852	41,505	34,956	38,995	38,951	39,825	41,876	43,730	**467,421**
4	TIARA GOLF, TIARAVILLE	29,166	40,130	38,732	42,776	43,888	39,931	36,436	42,266	39,496	38,762	42,309	41,473	**475,365**
5	TMN SERI BAYAN	29,300	32,177	37,532	34,147	37,786	33,637	36,002	36,524	35,172	34,686	35,814	35,565	**418,342**
6	TMN BTU BERENDAM PUTRA	46,724	48,073	51,391	56,773	55,907	52,227	59,989	55,613	53,403	51,486	54,731	62,842	**649,159**
7	TMN DESA IDAMAN	38,814	45,231	35,412	36,002	36,017	39,699	32,841	36,963	38,080	45,412	41,608	49,790	**475,869**
8	TMN SURIA BUKIT KATIL	30,403	41,091	38,183	39,599	45,040	38,657	36,043	38,868	38,126	35,007	36,657	36,406	**454,080**
9	TMN SUTERA WANGI	26,581	27,921	30,884	32,702	31,271	28,001	29,260	32,363	32,229	34,347	34,278	36,250	**376,087**
10	TMN ANGKASA NURI	39,513	44,653	50,050	46,526	51,091	51,971	41,991	47,557	50,787	48,167	48,659	48,766	**569,731**
11	TMN GANGSA HEIGHTS	9,301	11,724	11,562	12,802	10,854	11,104	9,810	12,326	12,905	11,034	10,555	11,375	**135,352**
12	TMN SAUJANA INDAH	27,577	32,567	31,763	32,828	34,720	32,641	29,277	35,403	34,045	32,779	35,075	32,580	**391,255**
13	TMN ARA PERMAI	43,537	48,493	58,536	55,168	55,854	50,492	54,053	53,870	53,854	48,759	52,161	54,873	**629,650**
14	TMN BELATOK MAS	17,434	19,846	19,066	19,001	18,453	19,302	17,145	18,647	17,614	19,759	19,102	19,727	**225,096**
15	KG PADANG KERBAU	42,502	40,827	32,093	37,617	34,547	37,866	32,966	34,686	65,785	34,883	40,520	36,649	**470,941**
16	TMN SUTERA WANGI	24,431	25,714	28,301	33,056	32,387	29,417	30,732	33,085	30,158	32,530	35,801	33,344	**368,956**
17	TMN ARA PERMAI	35,306	34,525	42,504	38,913	40,870	35,299	39,986	37,853	37,128	40,809	36,689	37,252	**457,134**
18	TMN SERI BAYAN	13,150	15,729	17,092	16,709	19,001	17,330	17,976	20,982	19,349	22,550	20,465	19,480	**219,813**
19	TMN MURAI JAYA, DURIAN TUNGGAL	35,353	39,746	40,010	45,475	44,551	7,275	37,371	43,032	41,382	44,689	48,103	47,758	**514,745**
20	TMN BKT KATIL DAMAI	28,402	33,724	35,489	36,335	41,688	36,104	4,302	39,456	36,959	37,876	38,957	36,666	**435,958**
21	TMN MERDEKA	32,934	36,556	38,843	40,676	40,526	43,853	31,034	36,425	41,224	34,618	35,127	35,111	**446,927**
22	TMN PUNCAK BKT KATIL	33,437	43,227	40,218	42,384	43,818	39,790	35,764	41,400	39,927	39,399	42,062	38,142	**479,568**
23	TMN MERAK MAS	32,072	36,943	39,321	40,721	43,959	39,891	35,345	41,228	38,710	41,406	43,285	40,909	**473,790**
24	TMN PERTAMA	29,013	28,150	32,820	33,649	32,311	30,516	43,266	36,681	33,153	31,325	33,225	31,352	**395,461**
25	TMN CERGAS	30,590	31,378	8,521	31,789	34,225	28,280	31,216	31,144	32,503	31,113	30,371	42,988	**384,118**
26	KG BT BERENDAM	41,359	45,426	42,820	46,095	43,022	34,168	50,544	44,629	43,140	40,718	42,606	40,697	**515,224**
27	TMN MERDEKA	38,445	42,172	44,751	49,649	52,127	57,758	41,446	49,023	50,344	47,776	49,225	47,664	**570,380**
28	TMN MUZAFFAR SHAH	58,090	69,060	58,618	57,087	60,567	58,443	57,389	64,743	55,872	65,545	62,008	60,135	**727,557**
29	KG GANGSA DURIAN TUNGGAL	65,130	75,480	77,295	76,063	75,923	82,494	72,024	83,219	92,563	79,374			**779,565**
30	TMN BERINGIN	31,784	38,908	37,690	40,176	46,044	43,506	34,400	39,281	42,171	43,121	39,484	37,223	**473,788**
31	KG SOLOK JELUTONG	34,835	31,641	28,297	31,134	29,663	32,081	26,365	29,527	33,887	29,367	30,202	29,779	**366,778**
	Total	**1,050,726**	**1,181,546**	**1,184,528**	**1,227,997**	**1,260,945**	**1,215,955**	**1,145,083**	**1,238,103**	**1,256,272**	**1,216,346**	**1,169,886**	**1,170,056**	**14,317,443**

(Source: Tenaga Nasional Berhad)

7.3 Project Master Schedule

S TUAH JAYA GREENHOUSE GAS INVENTORY AND ACTION PLAN DEVELOPMENT MASTER PLAN
rnational Green Training Centre
Project Start Date: **15/04/2019**
Project End Date: **15/11/2019**
Status as of: **07/08/2019**

Doc. Ref: IGTC/MPHTJ/2019/05/SCH-001-3

Legend: Weekends; Public Holidays; Planned Schedule; Actual Work Done; Revised schedule; Hard deadline for IGEM

WBS	Activity	Milestone	Progress (%)	Original schedule Start	Original schedule End	Revised schedule Start	Revised schedule End	Actual work done Start	Actual work done End
1.0	**ADMINISTRATIVE PROCEDURE**								
1.1	Collect Appointment Letter		100%	15/04/2019	07/05/2019	N/A	N/A	15/04/2019	29/04/2019
1.2	Submit Draft NDA MPHTJ and		100%	15/04/2019	30/04/2019	N/A	N/A	15/04/2019	02/05/2019
1.3	Instructions to MPHTJ		100%	15/04/2019	07/05/2019	N/A	N/A	15/04/2019	29/04/2019
1.4	Approve NDA for data providers		100%	02/05/2019	07/05/2019	N/A	N/A	02/05/2019	07/05/2019
1.5	Acquire:		100%	15/04/2019	07/05/2019	15/04/2019	28/06/2019	15/04/2019	28/06/2019
2.0	**BACKGROUND RESEARCH**								
2.1	Review previous reports		100%	08/05/2019	09/05/2019	17/05/2019	28/06/2019	17/05/2019	28/06/2019
2.2	Set materiality threshold		100%	16/05/2019	17/05/2019	N/A	N/A	17/06/2019	18/06/2019
2.3	Develop reporting format		100%	13/05/2019	15/05/2019	N/A	N/A	21/05/2019	22/05/2019
2.4	Hire data collectors		100%	15/05/2019	17/05/2019	N/A	N/A	02/05/2019	28/05/2019
2.5	Design questionnaire for		100%	16/05/2019	21/05/2019	N/A	N/A	16/05/2019	29/05/2019
3.0	**DATA COLLECTION PHASE**								
3.1	**1. Identify Participant List (community)**								
	Batch 1		100%	29/04/2019	03/05/2019	N/A	N/A	07/05/2019	17/05/2019
	Batch 2		100%	07/05/2019	10/05/2019	27/05/2019	28/06/2019	27/05/2019	28/06/2019
	~~Batch 3~~		~~0%~~	~~13/05/2019~~	~~17/05/2019~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
3.2	**2. Contact Participant List (community)**								
	Batch 1		100%	07/05/2019	10/05/2019	N/A	N/A	21/05/2019	14/06/2019
	Batch 2		100%	13/05/2019	17/05/2019	17/06/2019	02/07/2019	17/06/2019	10/07/2019
	~~Batch 3~~		~~0%~~	~~21/05/2019~~	~~24/05/2019~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
3.3	**3. Email Participant List (Letter, Authorization, NDA, questionnaire)**								
	Batch 1		100%	13/05/2019	17/05/2019	N/A	N/A	21/05/2019	14/06/2019
	Batch 2		100%	21/05/2019	24/05/2019	17/06/2019	02/07/2019	17/06/2019	10/07/2019
	~~Batch 3~~		~~0%~~	~~28/05/2019~~	~~31/05/2019~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
3.4	**4. Arrange Visit (Participant, Verifier & MPHTJ)**								
	Batch 1		100%	21/05/2019	24/05/2019	10/06/2019	28/06/2019	10/06/2019	26/07/2019
	Batch 2		100%	28/05/2019	31/05/2019	22/07/2019	15/08/2019	22/07/2019	21/08/2019
	~~Batch 3~~		~~0%~~	~~03/06/2019~~	~~14/06/2019~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
3.5	**5. Contact to Confirm Visit (Date, Time, Location, PIC)**								
	Batch 1		100%	24/05/2019	30/05/2019	14/06/2019	27/06/2019	14/06/2019	26/07/2019
	Batch 2		100%	31/05/2019	13/06/2019	22/07/2019	15/08/2019	22/07/2019	21/08/2019
	~~Batch 3~~		~~0%~~	~~14/06/2019~~	~~20/06/2019~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
3.6	**6. Visitation and Data Submission (Hardcopy / Softcopy)**								
	Batch 1		100%	27/05/2019	31/05/2019	17/06/2019	05/07/2019	17/06/2019	29/07/2019
	Batch 2		100%	03/06/2019	14/06/2019	23/07/2019	15/08/2019	23/07/2019	21/08/2019
	~~Batch 3~~		~~0%~~	~~17/06/2019~~	~~21/06/2019~~	N/A	N/A	N/A	N/A
3.7	**7. Re-enage and revisit laggards**								
	Re-enage and revisit laggards		100%	24/06/2019	05/07/2019	15/07/2019	15/08/2019	15/07/2019	21/08/2019
3.8	**8. Meeting with Relevant Data Providers**								
	TNB		100%	13/05/2019	17/05/2019	N/A	N/A	17/06/2019	17/06/2019
	SWCorp		100%	13/05/2019	17/05/2019	N/A	N/A	28/05/2019	28/05/2019
	SAMB		100%	27/05/2019	31/05/2019	24/06/2019	28/06/2019	31/07/2019	31/07/2019
	Zoo		100%	27/05/2019	31/05/2019	N/A	N/A	28/05/2019	28/05/2019
	JKR		~~0%~~	~~27/05/2019~~	~~31/05/2019~~	~~13/08/2019~~	~~14/08/2019~~	N/A	N/A
4.0	**DATA ANALYSIS AND REPORTING PHASE**								
4.1	Calculate facility level emissions		100%	24/06/2019	05/07/2019	24/06/2019	15/08/2019	24/06/2019	23/08/2019
4.2	Calculate sector level emissions		100%	08/07/2019	10/07/2019	12/07/2019	15/08/2019	12/07/2019	23/08/2019
4.3	Calculate total scope-level emissions		100%	11/07/2019	12/07/2019	12/07/2019	15/08/2019	12/07/2019	23/08/2019
4.4	Prepare draft report (PR-001)	1	100%	27/05/2019	31/05/2019	N/A	N/A	27/05/2019	31/05/2019
4.5	Prepare final report (PR-003)	3	100%	08/07/2019	15/07/2019	N/A	N/A	15/07/2019	23/08/2019
5.0	**ACTION PLAN DEVELOPMENT PHASE**								
5.1	Preparation of of Action Plan Development Procedure (PR-002)	2	100%	24/06/2019	28/06/2019	N/A	N/A	24/06/2019	28/06/2019
5.2	FGD 1: Input from MPHTJ stakeholders		0%	13/8/2019	13/08/2019	06/09/2019	06/09/2019	N/A	N/A
5.3	Preparation of Action Plan Draft (PR-004)	4	20%	15/07/2019	19/08/2019	15/07/2019	13/09/2019	15/07/2019	N/A
5.4	FGD 2: MPHTJ UTH & council		0%	19/08/2019	19/08/2019	06/09/2019	06/09/2019	N/A	N/A
5.5	Consolidate feedback from UTH		0%	20/08/2019	21/08/2019	11/09/2019	12/09/2019	N/A	N/A
5.6	Submission of Final Action Plan (PR-005)	5	0%	21/08/2019	21/08/2019	13/09/2019	13/09/2019	N/A	N/A

7.4 Questionnaire for Data Collection

	Project	MPHTJ GHG Inventory Development	Doc Ref	IGTC/MPHTJ/2019/05/
	Subject	**Questionnaire for HTJ Greenhouse Gas Inventory for 2018**		

This questionnaire is part of the data collection for the Hang Tuah Jaya greenhouse gas inventory, conducted on behalf of MPHTJ by International Green Training Centre (IGTC) (Co. Reg. 1114419-K). This exercise aims to map greenhouse gas emissions within the geographic boundary of Hang Tuah Jaya.

The purpose of this exercise is, to provide all participants with a starting point for monitoring and managing their utility use and their emissions, as well as providing MPHTJ with an effective tool to monitor overall progress and the efficacy of Low Carbon City targets. To facilitate this, each participating facility will receive their electricity usage intensity in accordance with MS 1525:2014 - Malaysian Standard Energy efficiency and use of renewable energy for non-residential buildings - Code of practice. (Second revision)., and an indication of their performance relative to their peers.

A separate questionnaire should be filled for each facility (e.g. factory, building or municipal department), and each data input should be provided with supporting documentation. Data and supporting documentation is considered confidential, is covered by a Non-Disclosure Agreement between IGTC and Stakeholders, and will only be published in anonymized and/or aggregated form.

Should you require any clarification regarding the questionnaire or the Greenhouse Gas Inventory exercise, please contact IGTC at htjghg@greentrainings.org or at +60388005227.

Kertas soal selidik ini adalah sebahagian daripada pengumpulan data untuk pembangunan Inventori Gas Rumah Hijau Hang Tuah Jaya bagi pihak MPHTJ, yang telah diamanahkan kepada International Green Training Centre (IGTC) (1114419-K). Matlamat aktiviti ini adalah untuk pemetaan pelepasan gas rumah hijau di dalam kawasan pentadbiran Majlis Perbandaran Hang Tuah Jaya.

Tujuan aktiviti ini adalah untuk menyediakan semua peserta dengan tanda aras untuk memantau dan menguruskan penggunaan utiliti dan pelepasan GHG yang berkenaan, serta menyediakan MPHTJ dengan kaedah yang berkesan untuk memantau kemajuan keseluruhan dan keberkesanan dasar Bandar Rendah Karbon. Setiap fasiliti yang memberikan maklumbalas akan menerima intensiti penggunaan tenaga elektrik menurut MS 1525:2014, sebagai ukuran prestasi mereka berbanding fasiliti-fasiliti lain.

Soal selidik berasingan harus diisi untuk setiap kemudahan (cth: Kilang, bangunan atau jabatan perbandaran), dan setiap input data harus disediakan dengan dokumentasi sokongan. Data dan dokumen sokongan dianggap rahsia, dilindungi melalui Perjanjian Tanpa Pendedahan (NDA) antara IGTC dan Pemberi Maklumat, dan hanya akan diterbitkan tanpa nama dan/atau dalam bentuk agregat.

Sekiranya anda memerlukan sebarang penjelasan mengenai soal selidik atau mengenai Inventori Gas Rumah Hijau, sila hubungi IGTC di htjghg@greentrainings.org atau di talian +60388005227.

1. Details of informant / *Maklumat Pemberi Maklumat*
i. Name / *Nama*
ii. Position in facility / *Jawatan*
iii. Contact details / *Maklumat Perhubungan*
a. E-mail address / *Alamat Emel*
b. Phone No. / *No. Telefon*
iv. Date information given to data collectors / *Tarikh maklumat diberikan kepada pengumpul data*
v. Signature & Company seal / *Tandatangan & Cop Syarikat*

2. Details of Facility / *Maklumat Fasiliti*

i. Facility Name (as registered with municipality) / *Nama Kemudahan (seperti yg didaftarkan)*

ii. Facility Location / *Lokasi Fasiliti*

a. Address / *Alamat*

b. GPS Coordinates / *Koordinasi GPS*

iii. Facility Ownership (mark q) / Pemilikan Fasiliti *(tandakan q)*

Municipal sectors / *Sektor Perbandaran*

Non-municipal sectors / *Sektor Bukan Perbandaran*

iv. Facility Nett Floor Area / *Keluasan Bersih Lantai Fasiliti* (m²)

v. Average Number of Staff at Facility / *Purata Bilangan Kakitangan pada Satu Masa*

vi. Facility output, if applicable / *Ouput fasiliti, jika berkenaan* (e.g. Number of hotel rooms; Product tonnage; Number of school / college / university students) *(cth: Bilangan bilik hotel; Jumlah Tan produk; Bilangan pelajar sekolah / kolej / universiti)*

vii. Facility operating hours / *Waktu Operasi;*	Hours per Day / *Jam Sehari*	Days per Week / *Hari Seminggu*	Weeks per Year / *Minggu Setahun*

Scope 1 / *Skop 1*
1.1 Fuel use / *Penggunaan bahan api*

Please list the fuels that were used in the operation of the facility in whole year of 2018. Take note to ensure the accuracy of the units provided, as well as the quantity figures. If possible, please fill out one row for each monitored consumption point, to give a more detailed picture of the consumption patterns within the facility. Please provide the Data Collector with a soft or hard copy of the supporting records to facilitate traceability of the calculations.

Sila senaraikan jenis bahan api yang digunakan ketika operasi sepanjang tahun 2018. Sila pastikan jenis unit dan angka yang tepat diisikan seperti yang ditetapkan. Anda disarankan untuk mengisi satu baris untuk setiap jenis penggunaan yang dipantau, untuk memberikan gambaran yang lebih terperinci tentang corak penggunaan bahan api berkenaan. Sila sediakan/lampirkan salinan rekod data secara soft/hard copy bagi rekod sokongan untuk memudahkan pengesanan pengiraan.

No.	Type of Fuel / *Jenis Bahan Api*	Quantity / *Kuantiti*	Unit (e.g. Liters, tonnes, mmbtu, MJ)	Point of Consumption / *Jenis penggunaan* (E.g. Gen-sets, Vehicles)	Supporting Document Type and Reference / *Jenis Dokumen Sokongan* (e.g. Bills, Meter Readings, Logbooks)

Scope 1 / *Skop 1*
1.2 Water Consumption / *Penggunaan Air*

Please list the points of water consumption with the quantity used and the water source for each. If detailed data is not available, please list the total. Take note to ensure the accuracy of the units, as well as the quantity figures provided. Please provide the Data Collector with a soft or hard copy of the supporting records to facilitate traceability of the calculations.

Sila senaraikan titik penggunaan air dengan kuantiti yang digunakan dan sumber air untuk masing-masing. Jika data terperinci tiada, sila senaraikan jumlahnya. Sila pastikan jenis unit dan angka yang tepat diisikan seperti yang ditetapkan. Sila sediakan/lampirkan salinan rekod data secara soft/hard copy bagi rekod sokongan untuk memudahkan pengesanan pengiraan.

No.	Point of Water Consumption / *Jenis Penggunaan Air*	Quantity / *Kuantiti*	Unit (e.g. m^3, liters)	Source of water / *Punca air* (e.g. Municipal Water Supply, Own Well)	Supporting Document Type and Reference / *Jenis Dokumen Sokongan* (e.g. Bills, Meter Readings, Logbooks)

1.3 Vehicle use / *Penggunaan Pengangkutan*

Please list the types of vehicles used within, or in the operations of, the facility and their aggregate use. If fuel use data is available, please include it in section 1.1 above. Take note to indicate whether or not the fuel data has been included, to avoid double-counting. Please provide the Data Collector with a soft or hard copy of the supporting records to facilitate traceability of the calculations.

Sila senaraikan jenis kenderaan yang digunakan dan penggunaan agregatnya. Jika data penggunaan bahan api boleh didapati, sila sertakan dalam bahagian 1.1 di atas. Letakkan indikasi sama ada data bahan api telah dimasukkan atau tidak, untuk mengelakkan pengiraan berganda. Sila sediakan/lampirkan salinan rekod data secara soft/hard copy bagi rekod sokongan untuk memudahkan pengesanan pengiraan.

No.	Vehicle Type / *Jenis Kenderaan* (e.g. 20-ton Lorry, Bus, Forklift)	Total Vehicle-distance Travelled / *Jumlah Jarak Perjalanan* (km)	Was the fuel from this vehicle type included Sec 1.1 above? / *Adakah bahan api daripada jenis kenderaan ini termasuk dalam Sec 1.1 sebelum ini?* (Yes or no)	Vehicle ownership: 1: Self owned and operated 2: Leased from 3rd party, self operated 3: Owned and operated by 3rd party	Supporting Document Type and Reference / *Jenis Dokumen Sokongan* (e.g. Bills, Meter Readings, Logbooks)

Scope 1 / *Skop 1*
1.4 Waste treatment / *Pemprosesan Sisa*

Please list the types and quantities of waste that is generated from the facility along with where the waste is treated or deposited (landfilled). Take note to ensure the accuracy of the units, as well as the quantity figures provided. If applicable, please provide information on the organic fraction of each waste type. Make sure to provide the data collector with a soft or hard copy of the supporting records to facilitate traceability of the calculations.

Sila senaraikan jenis dan kuantiti sisa yang dihasilkan dari fasiliti beserta dengan tempat sisa saya dirawat atau dibuang (kawasan pelupusan sampah). Sila pastikan jenis unit dan angka yang tepat diisikan seperti yang ditetapkan. Jika berkenaan, sila berikan maklumat mengenai pecahan organik bagi setiap jenis buangan. Sila sediakan/lampirkan salinan rekod data secara soft/hard copy bagi rekod sokongan untuk memudahkan pengesanan pengiraan.

No.	Type of Waste / *Jenis Sisa* (e.g. waste water, wood waste, paper, plastic, textiles, process waste)	Quantity / *Kuantiti*	Unit (e.g tonnes, m^3)	Where was the waste treated/ deposited? / *Lokasi sisa dirawat/dibuang*	Organic Fraction, if applicable / *Pecahan organik, jika berkenaan* (%)	Supporting Document Type and Reference / *Jenis Dokumen Sokongan* (e.g. Bills, Meter Readings, Logbooks)

Scope 2 / *Skop 2*

2.1 Electricity use / *Penggunaan Elektrik*

Please list the points of electricity consumption with the quantity used and the source for each. If detailed data is not available, please list the total. Take note to ensure the accuracy of the units, as well as the quantity figures provided. Please provide the Data Collector with a soft or hard copy of the supporting records to facilitate traceability of the calculations.

Sila nyatakan titik penggunaan elektrik dengan kuantiti yang digunakan dan sumber elektrik. Jika data terperinci tidak tersedia, sila senaraikan jumlahnya. Sila pastikan jenis unit dan angka yang tepat diisikan seperti yang ditetapkan. Sila sediakan/lampirkan salinan rekod data secara soft/hard copy bagi rekod sokongan untuk memudahkan pengesanan pengiraan.

No.	Point of Electricity Consumption / *Jenis Penggunaan Elektrik*	Quantity / *Kuantiti*	Unit (e.g kWh, MWh)	Source of Electricity / *Sumber Elektrik* (e.g. grid/TNB, gensets)	Supporting Document Type and Reference / *Jenis Dokumen Sokongan* (e.g. Bills, Meter Readings, Logbooks)

Scope 3 / *Skop 3*
3.1 Staff commute / -

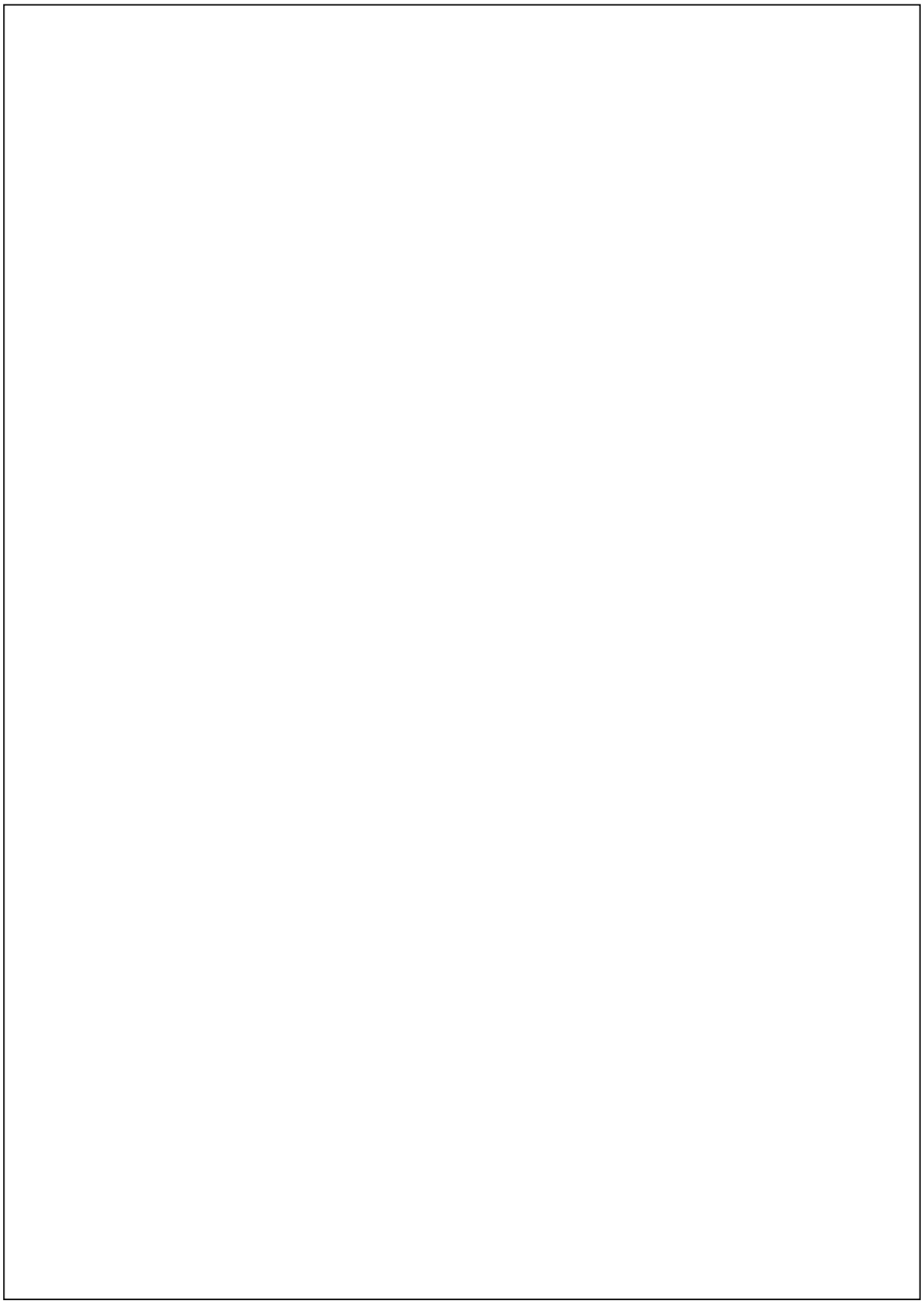
Please provide a best estimate of staff distance traveled to and from the facility, as well as details of any facility operated or outsourced solutions (e.g. staff buses, car pool initiatives etc). If staff commute data is gathered through surveys, please provide the results of those surveys.

-

Employees NOT covered by commute scheme/solution	
Number of staff	**Average commuting distance to facility (one-way)**

Employees covered by commute scheme/solution		
Number of staff	**Type of scheme/solution (e.g. bussing, carpooling, cycling)**	**Average commuting distance to facility (one-way)**

7.5 Non-Disclosure Agreement for Participants



4. **Time Periods**. The nondisclosure provisions of this Agreement shall survive the termination of this Agreement and Receiving Party's duty to hold Confidential Information in confidence shall remain in effect until the Confidential Information no longer qualifies as confidential or until Disclosing Party sends Receiving Party written notice releasing Receiving Party from this Agreement, whichever occurs first.

5. **Relationships**. Nothing contained in this Agreement shall be deemed to constitute either party a partner, joint venture or employee of the other party for any purpose.

6. **Severability.** If a court finds any provision of this Agreement invalid or unenforceable, the remainder of this Agreement shall be interpreted so as best to affect the intent of the parties.

7. **Integration**. This Agreement expresses the complete understanding of the parties with respect to the subject matter and supersedes all prior proposals, agreements, representations, and understandings. This Agreement may not be amended except in writing signed by both parties.

8. **Waiver.** The failure to exercise any right provided in this Agreement shall not be a waiver of prior or subsequent rights.

This Agreement and each party's obligations shall be binding on the representatives, assigns and successors of such party. Each party has signed this Agreement through its authorized representative.

DISCLOSING PARTY

Signature _____

Name _____

Date _____

Company Stamp _____

RECEIVING PARTY (IGTC on behalf of MPHTJ)

Signature _____

Name _____

Date _____

Company Stamp _____