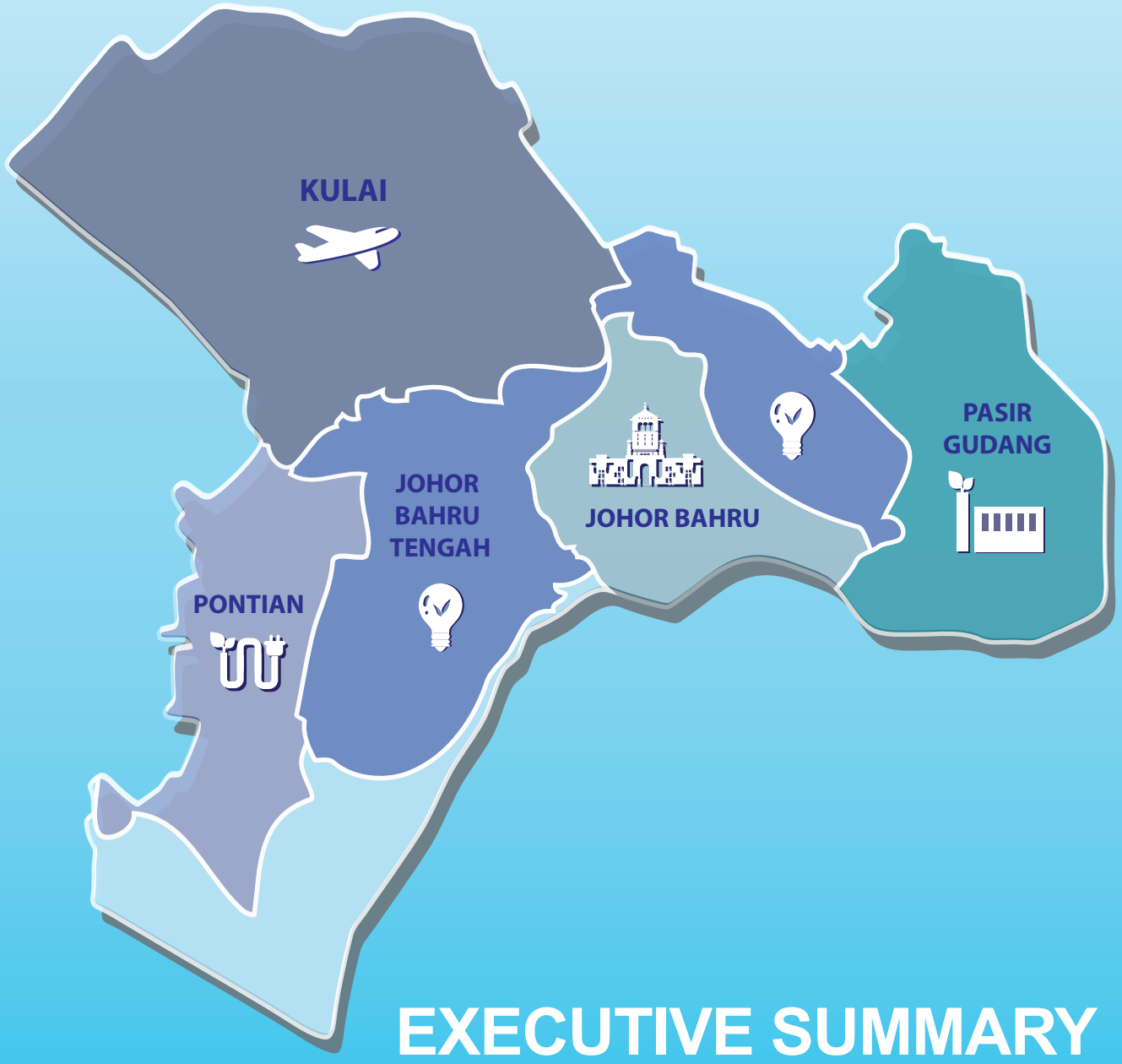
Celebrating

10 YEARS

2006 – 2016

ISKANDAR MALAYSIA

ISKANDAR MALAYSIA
GREENHOUSE GAS INVENTORY
2015



EXECUTIVE SUMMARY

ISKANDAR MALAYSIA GREENHOUSE GAS INVENTORY 2015

Executive Summary

Foreword

Dato' Sri Mohd Najib Tun Abdul Razak

Prime Minister of Malaysia
Co-Chairman of Iskandar Regional Development Authority

The issues of climate change and its intensifying impacts have been seen and experienced in many parts of the world – even in Malaysia, with occurrence of devastating extreme weather phenomenon within our country. For the benefits of current and future generations, and to ensure the continued growth and prosperity of our nation, we must act together decisively against the threats of climate change. We have a mandate to reduce our GHG intensity emissions by 45% by 2030, which I had announced at COP21 in Paris in December 2015.

Iskandar Regional Development Authority (IRDA), through various initiatives notably under the Low Carbon Society Blueprint for Iskandar Malaysia 2025, has been leading the way in efforts to address climate change while pursuing social and economic development for the economic development corridor in South Johor Malaysia. The success of Iskandar Malaysia under the leadership of IRDA deserves recognition and I commend them for their continued efforts in leading the way forward for sustainable development regionally and nationally.

Foreword

Dato' Mohamed Khaled Nordin

Menteri Besar of Johor
Co-Chairman of Iskandar Regional Development Authority

The State of Johor and Iskandar Malaysia are committed to improving its people's quality of life and we will continue to pursue social and economic development without compromising sustainability and the protection of the natural environment. I firmly believe that development and sustainability are not mutually exclusive goals.

Iskandar Malaysia – the economic development corridor in South Johor, Malaysia under the leadership of Iskandar Regional Development Authority (IRDA) has proven to be a successful example of this paradigm. At State level, we have also prepared the Johor Sustainability Policy, which reflects our seriousness in ensuring that developments are sustainable.

As the state of Johor and Iskandar Malaysia embark on the path of sustainable development, the contribution of key stakeholders and the support of local communities are paramount in ensuring the realisation of our development goals for a better quality of life.

I would like to express my sincere thanks to IRDA for its strong commitment to the development of Iskandar Malaysia through its Low Carbon Society Blueprint. This inaugural GHG Inventory document is an important start in ensuring that IRDA monitors its emissions as the economic region develops further over the next decade.

Foreword

Datuk Ismail Ibrahim

Chief Executive
Iskandar Regional Development Authority

The preparation of the Iskandar Malaysia Greenhouse Gas Inventory 2015 marks a significant milestone for Iskandar Regional Development Authority (IRDA), in its ambition to make Iskandar Malaysia a **strong and sustainable metropolis of international standing** by 2025.

Iskandar Malaysia is first in the region to use an internationally recognised standard – the Global Protocol for Community-scale Greenhouse Gas Emissions Inventory (GPC) – to account for greenhouse gas emissions within the boundary of the economic development corridor. The findings from the Iskandar Malaysia Greenhouse Gas Inventory 2015 is a valuable measure of IRDA's progress and commitment in the implementation of the Low Carbon Society Blueprint, which it launched globally at COP18, in Doha, Qatar in 2012. This Blueprint provides reliable guidance for policy-makers, businesses and others on how we can work together towards achieving GHG emission reductions of 50% by 2025. From the very beginning, IRDA has championed the vision of a sustainable green economy for Iskandar Malaysia and IRDA will continue to provide leadership and guidance towards the realisation of its vision for Iskandar Malaysia.

I wish to thank Universiti Teknologi Malaysia, Eco-Ideal Consulting Sdn. Bhd. and my staff team who have worked very hard in putting together Iskandar Malaysia's inaugural greenhouse gas inventory.

Acknowledgements

This inaugural Greenhouse Gas (GHG) Inventory report marks the beginning of a long term carbon monitoring and tracking process for Iskandar Malaysia. The report is made possible with guidance and support from a wide range of stakeholders involved. IRDA would like to specifically thank the following for their relentless effort in completing this report within a very short timeframe:

- Chip Hong Rubber Sdn. Bhd.
- Department of Statistics Malaysia
- Eco-Ideal Consulting Sdn. Bhd.
- Energy Commission (ST)
- Indah Water Konsortium Sdn. Bhd. (IWK)
- Johor Economic Planning Unit (UPENJ)
- Johor Port Berhad
- Keretapi Tanah Melayu Berhad (KTMB)
- Kilang Kelapa Sawit Hadapan
- Kilang Kelapa Sawit Kulai
- Kilang Kelapa Sawit Masai
- Kilang Kelapa Sawit Sedenak
- Lotte Chemical Titan (M) Sdn. Bhd.
- Majlis Bandaraya Johor Bahru (MBJB)
- Majlis Daerah Pontian (MDP)
- Majlis Perbandaran Johor Bahru Tengah (MPJBT)
- Majlis Perbandaran Kulai (MPKu)
- Majlis Perbandaran Pasir Gudang (MPPG)
- Malaysian Palm Oil Board – Southern Region
- Malaysian Rubber Board
- Ministry of Natural Resources and Environment (MNRE)
- National Communication/ Biennial Update Reports Team
- Perlabuhan Tanjung Pelepas Sdn. Bhd. (PTP)
- Perstima Utility Sdn. Bhd.
- Senai Airport Terminal Services Sdn. Bhd.
- Solid Waste and Public Cleansing Management Corporation (SWCorp)
- State Government of Johor
- Sustainable Energy Development Authority Malaysia (SEDA)
- SWM Environment Sdn Bhd
- Tanjung Bin Power Plant, Malakoff Corporation Berhad
- Tenaga Nasional Berhad (TNB)
- Town and Country Planning Department of Johor (JPBD Johor)
- Universiti Teknologi Malaysia - Low Carbon Asia Research Centre (UTM-LCARC)
- World Resources Institute (WRI)
- YTL Power Generation Sdn. Bhd.

1.0 Preamble

Climate Change – A Real and Present Issue

Over the past few decades, climate change has become an increasingly evident reality in our world. Rapid urbanisation and accelerating development of human activities have led to unprecendented warming globally with severe impacts on the environment. The issue of intensifying climate change has sparked serious concerns from communities, governments and business leaders at all levels – whether local, national or the international stage.

An agreement namely Paris Agreement was adopted on 12 December 2015 at the 21st session of the Conference of the Parties (COP 21) to the United Nations Framework Convention on Climate Change (UNFCCC) held in Paris. This agreement is a global agreement that brings together all nations into a common cause to undertake ambitious but doable efforts to combat climate change and adapt to its effects[1].

Malaysia's Involvement and Commitment

As the issue on climate change gains greater attention, mandatory and voluntary efforts in reducing Greenhouse Gas (GHG) emissions are observed in many countries around the globe, including Malaysia. During the COP 15 by the UNFCCC in December 2009 at Copenhagen, Denmark, the Prime Minister of Malaysia announced Malaysia's voluntary initiative to achieve up to 40% reduction in emissions intensity of Gross Domestic Product (GDP) by 2020 based on 2005 level. This target is to be achieved under the condition that technology transfer and financial support are provided from developed countries.

More recently in 2015, Malaysia released its **Intended Nationally Determined Contribution (INDC)** of achieving **45% emissions intensity by GDP by year 2030** as compared to year 2005 level, under the same condition of receiving technology transfer and support. As announced[2] by the Minister of Natural Resources and Environment, Malaysia is set to ratify the Paris Agreement 2015 before end of year 2016.

1 http://unfccc.int/paris_agreement/items/9485.php
2 http://www.thestar.com.my/news/nation/2016/09/19/malaysia-to-ratify-climate-change-accord-soon/

Iskandar Malaysia – Taking the Lead for Malaysia

In conjunction with the Malaysian Government's voluntary GHG emissions reduction effort, Iskandar Malaysia, a developing economic hub, took the initiative to address carbon emissions in its jurisdiction. This proactive stance also reflects the ultimate target of Iskandar Malaysia to be "**A Strong and Sustainable Metropolis of International Standing**" by the year of 2025.

Low Carbon Society Blueprint for Iskandar Malaysia 2025

The Low Carbon Society Blueprint for Iskandar Malaysia 2025 (LCSBPIM2025) - officially launched by the Prime Minister of Malaysia and adopted by the Iskandar Regional Development Authority (IRDA) in 2012, outlines a total of 281 implementation programmes which are projected to reduce Iskandar Malaysia's carbon emissions intensity by 58% in 2025 compared to 2005 levels. **Several strategic programmes outlined in the LCSBPIM2025 have been implemented since 2013**.

The LCSBPIM2025 is a research output of the Science and Technology Research Partnership for Sustainable Development (SATREPS) project on the Development of Low Carbon Society Scenarios for Asian Region sponsored by Japan International Cooperation Agency (JICA) and Japan Science and Technology Agency (JST). The main research institutes involved in this collaboration are Universiti Teknologi Malaysia (UTM), Kyoto University, National Institute for Environmental Studies (NIES), and Okayama University. There is also strong partnership in the preparation of the Plans from IRDA and the 5 Local Authorities - Majlis Bandaraya Johor Bahru (MBJB), Majlis Perbandaran Johor Bahru Tengah (MPJBT), Majlis Perbandaran Pasir Gudang (MPPG), Majlis Perbandaran Kulai (MPKu) and Majlis Daerah Pontian (MDP).

To further accelerate the realisation of Low Carbon Society (LCS) at local level, 5 LCS Action Plans are formulated. These Local Authority-Level LCS Action Plans are crucial to ensure effective implementation of the LCSBPIM2025 as each LCS Action Plan recognises and responds to the distinctive economic, social and environmental characteristics, as well as the strengths, potentials and issues unique to each Local Authority area. By adopting their respective LCS Action Plan, the Local Authorities are in fact adopting LCS policies and programmes within the regional level framework of the LCSBPIM2025 that are suitable to their socioeconomic and environmental contexts.

The Iskandar Malaysia Low Carbon Society Blueprint was launched at COP18 in Doha, 2012

Iskandar Malaysia – Greenhouse Gases (GHG) Emissions Reporting Objectives

Monitoring and reporting is a crucial step in tracking the progress and path towards the goals and targets set. Iskandar Malaysia has completed 5 out of 6 stages of the Low Carbon Development Cycle and currently is in stage 6 - tracking performance of implemented LCS programmes.

The Environment Division of IRDA is responsible for tracking the implementation of LCSBPIM2025 and more importantly the carbon emissions in Iskandar Malaysia.

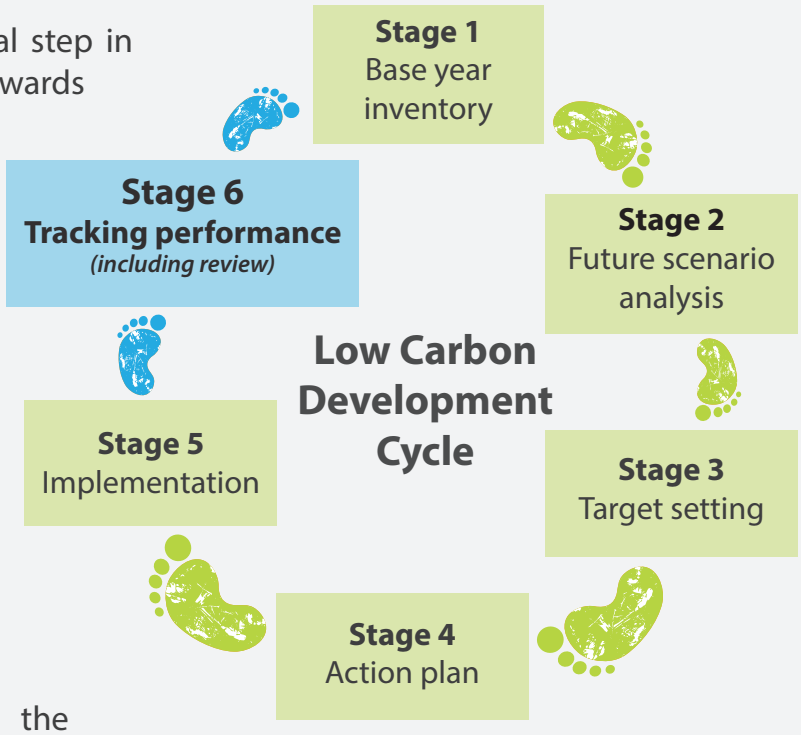


Figure 1: Low Carbon Development Cycle

In order to track and manage the performance of carbon emissions over time, **Global Protocol for Community Scale Greenhouse Gas Emission Inventories (GPC) - an internationally-recognised carbon monitoring and reporting framework** has been adopted for this study.

Why GPC?

The GPC was launched in 2014 by its lead authors, World Resources Institute (WRI), the C40 Cities Climate Leadership Group and International Council for Local Environmental Initiatives (ICLEI) – Local Governments for Sustainability as the first internationally accepted standard for measuring city level greenhouse gas emissions.

Currently, through the Compact of Mayors, there are about 600 cities across the globe that have committed to use the GPC to report their emissions.

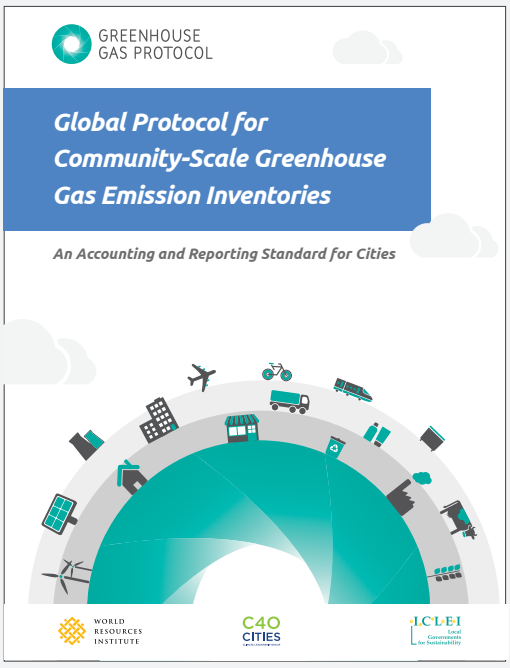


Figure 2: GPC

Figure 3: Cities committed to the Compact of Mayors[3]

The advantages of adopting the GPC for emissions reporting can be summarised below:

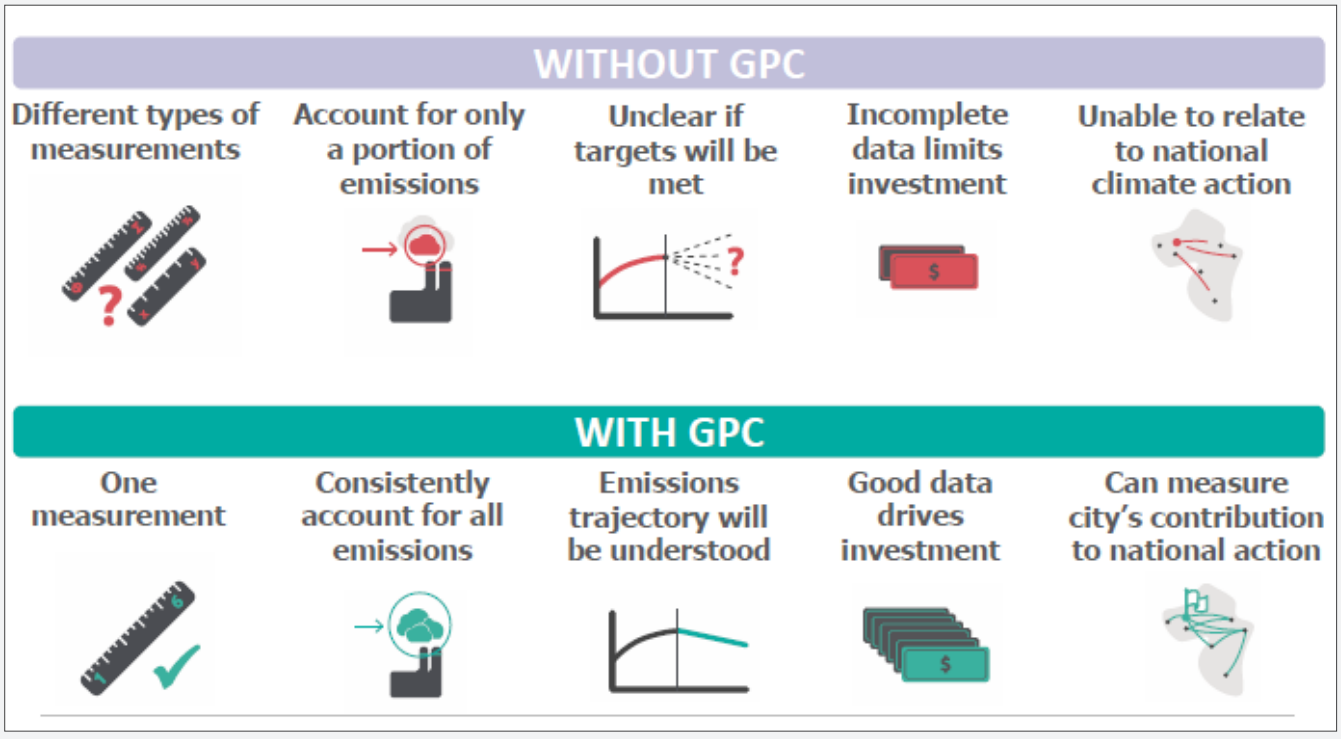
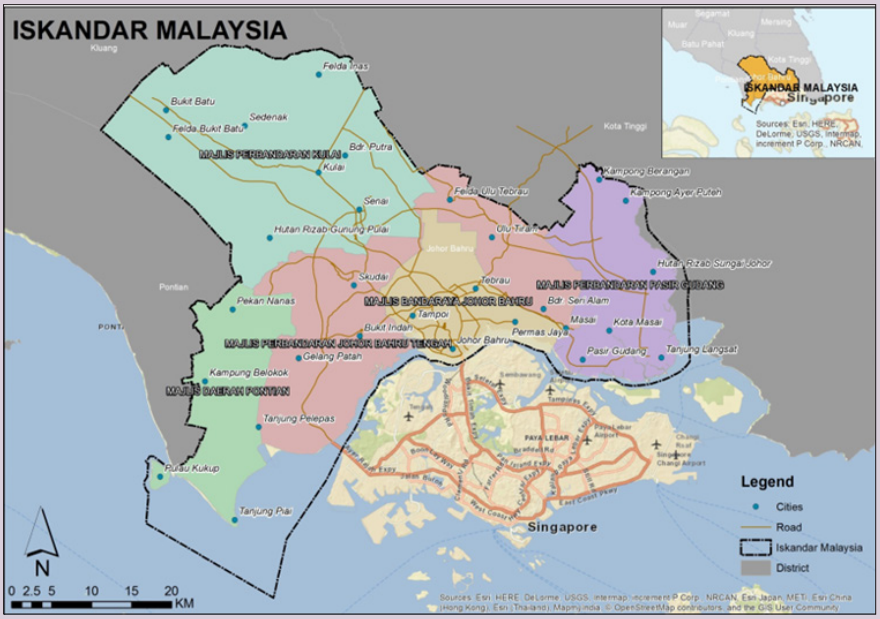


Figure 4: Advantages of GPC [4]

3 Source: https://www.compactofmayors.org/cities/

4 Souce: GPC Infographic, http://www.ghgprotocol.org/files/ghgp/GPC_infographic_printready.pdf

Inventory City Information

Inventory boundary	City Information
Name of city	Iskandar Malaysia Economic Region
Country	Malaysia
City established	8 November 2006 (region formalised)
Administered	Iskandar Regional Development Authority (IRDA)
Inventory year	2015
Geographic boundary	 Southern tip of peninsular Malaysia. Comprise 5 Local Authorities: Majlis Bandaraya Johor Bahru (MBJB), Majlis Perbandaran Johor Bahru Tengah (MPJBT), Majlis Perbandaran Pasir Gudang (MPPG), Majlis Perbandaran Kulai (MPKu) and part of Majlis Daerah Pontian (MDP)
Land area	2,300 km^2 (12% of Johor State)
Resident population	1.89 million
GDP	RM 56,772 million (USD 13,847 million) @ 2005 constant price
Composition of economy	Industry and manufacturing
Climate	Tropical rainforest

GHG Inventory Reporting Framework

GPC reporting level	BASIC
GHG included in inventory	CO_2, CH_4, N_2O
Global Warming Potential (GWP)	IPCC Fifth Assessment Report (AR5)
Description of overall methodology and tools used	GPC, 2006 IPCC Guidelines

City-induced and Scope Framework – BASIC Level

In the GPC, city-induced reporting framework seeks to account for emissions as a result of activities in the city.

Considering the inaugural attempt and limitations of data for Iskandar Malaysia (refers as reporting city) to establish its GHG inventory using GPC, the Iskandar Malaysia GHG emissions accounting and reporting for 2015 is limited to the BASIC level.

Iskandar Malaysia GHG emissions accounting and reporting at the BASIC level covers the following sectors:

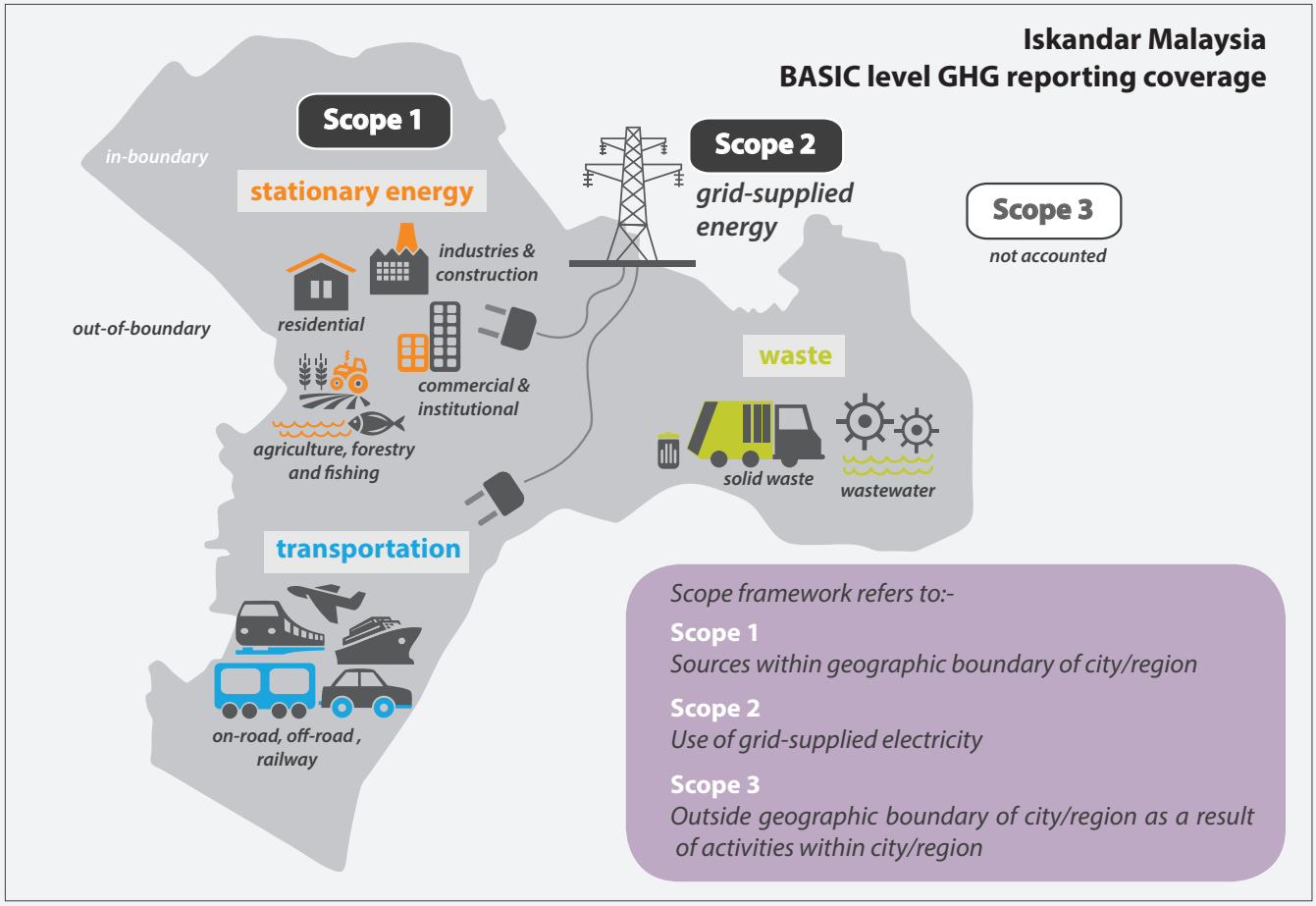


Figure 5: Coverage of Iskandar Malaysia's BASIC level GHG reporting

Photo credits: IRDA

2.0 Methodologies and Approaches

Stationary Energy

With reference to GPC, energy consumption (Scope 1-fuel and Scope 2-electricity) within the Iskandar Malaysia region from the sub-sectors below were accounted in this inventory:

- residential buildings;
- commercial, institutional buildings and facilities;
- manufacturing industries and construction;
- energy industries; and
- agriculture, forestry and fishing activities.

Data Source and Calculation Approach

Primary and secondary data for electricity consumption and energy consumption were collected respectively from the Energy Commission (ST) and Individual Power Plants (IPPs).

As there is no specific data available on other fuel consumption within Iskandar Malaysia, the secondary data was extracted from National Energy Balance (NEB) 2005-2014 and scaled down either using population or industrial GDP (depending on sectors) to obtain data which relate to Iskandar Malaysia.

The relevant emission factors were sourced from 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines.

The emission factors for Peninsular Malaysia's grid electricity were sourced from Malaysian Green Technology Corporation (MGTC).


Coals
Photo credits: Freelmages.com/zachh reinhart


Natural gas
Photo credits: Freelmages.com/ Jayesh Nair


Petroleum
Photo credits: Freelmages.com/ Matthew Maaskant

Transportation

Emissions from fuel consumption for on-road and off-road transportations and railways occurring within the city were accounted for in this inventory.

According to the GPC, only emissions from aviation and waterborne navigation that originate and terminate within the city boundary are accounted for – under Scope 1 emissions. Therefore, emissions from aviation and waterborne navigation were not estimated in this inventory. The reasons for the exclusion were the lack of such information and it is believed that the number of aviation and waterborne navigation trips made within the city boundary are insignificant.

Data Source and Calculation Approach

On-road transportation

Due to lack of primary data (i.e. fuel consumption), secondary data on Malaysia fuel sales was extracted from NEB 2005-2014 and scaled down by population to estimate the fuel consumption for on-road transportation in Iskandar Malaysia.

On-road transportation
Photo credits: Fwww.pinterest.com/pin/28499410112673254

Off-road transportation

Emissions from off-road trasportation was calculated based on the primary data (i.e. fuel consumption) provided by the port authorities and airport authority.

Railways

Emissions from railways were calculated based on the primary data (i.e. number of trips per year, diesel consumption per trip and train distance per trip) provided by railway operator.

The relevant emission factors were sourced from 2006 IPCC Guidelines.

Waste

Emissions from domestic waste, agricultural waste (from palm oil mill), domestic wastewater, sludge, and industrial wastewater (from palm oil mill and rubber mill) were accounted in this inventory.

Industrial wastewater from other manufacturing industries not covered above was excluded due to data unavailability.

Data Source and Calculation Approach

Primary data on domestic waste generated within the region was obtained from SWCorp and local authorities. The GHG emissions from solid waste was calculated based on the 2006 IPCC Guidelines – Tier 2 first order decay method (2006 IPCC Guidelines, Volume 5, Chapter 3).

Primary data of domestic wastewater volume and treatment method were provided by some of the operators. When primary data of wastewater volumes were not available, the data were extrapolated from the wastewater volume of other Local Authorities based on population ratio. The GHG emissions were estimated using the 2006 IPCC Guidelines Tier 2 emissions calculation methodology (2006 IPCC Guidelines, Volume 5, Chapter 6). Emission factors for each of the relevant treatment methods were sourced from 2006 IPCC Guidelines.

Wastewater treatment plant
Photo credits: Eco-Ideal Consulting Sdn Bhd

Emissions from industrial wastewater treatment were estimated based on the industrial production data and wastewater outflows treated by each treatment plant using the 2006 IPCC Guidelines Tier 2 emissions calculation methodology. As mentioned previously, the emissions from industrial wastewater calculated under this inventory only includes palm oil mill industry (i.e. palm oil mill effluent (POME)) and rubber mill.

Emissions from municipal sludge treatment were estimated based on the total volume of sludge treated by each treatment plant. There are 3 different types of sludge treatment processes, i.e. Sludge Drying Bed (DB), Sludge Lagoon (SL) and Sludge Reception Facility (SRF). Emission factors for each of the relevant treatment methods were sourced from 2006 IPCC Guidelines. Amount of sludge treated and treatment methods were provided by some of the operators. Where data of sludge volumes were not available, sludge volumes were extrapolated from the wastewater volume of other Local Authorities based on population ratio.

Coordination with the National Communication (NC) / Biennual Update Report (BUR)

This inventory was prepared in close consideration of the national level reporting (NC/BUR) to the United Nations. Coordination to ensure consistency in data sources, emission factors and coverage has been carried throughout the process.

Photo credits: IRDA

3.0 Results

Summary of Iskandar Malaysia GHG Inventory 2015

Sector		Total by Scope ($MtCO_2e$)		Total by city-induced reporting level ($MtCO_2e$)
		Scope 1	Scope 2	BASIC
Stationary Energy	Energy use	3.42	6.79	10.21
	Energy generation supplied to the grid	12.59		
Transportation		4.45	IE (energy use)	4.45
Waste	Generated in the city	0.81		0.81
	Generated outside city	NO		NO
Total	**All Territorial Emissions**	**28.06**		**15.47**
		All BASIC Emissions		

Notation Key

NE - Not Estimated NO - Not Occurring IE - Included Elsewhere

- - Sources required for territorial total but not for BASIC/ BASIC+ reporting (*italics*)
- - Non-applicable emissions

If AR4 is applied on the calculation, the total of all territorial emissions (by scope) in Iskandar Malaysia is 28.07 $MtCO_2e$ and all BASIC emissions is 15.47 $MtCO_2e$.

Iskandar Malaysia GHG Emissions 2015

Total of all BASIC emissions in Iskandar Malaysia for year 2015 is 15.47 million tonnes of carbon dioxide equivalent ($MtCO_2e$).

66% of the total emissions is contributed by the stationary energy sector (excludes energy generation supplied to the grid) followed by the transportation sector (29%) and waste sector (5%).

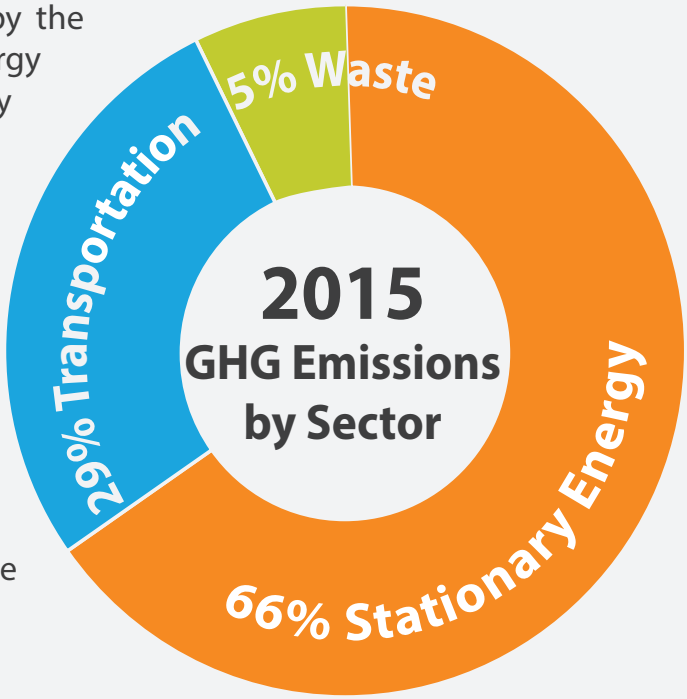


Figure 6: All BASIC emissions in 2015

Iskandar Malaysia GHG Emissions 2005 – 2015

Iskandar Malaysia GHG emissions reflect the rapid growth for all 3 sectors over the last 10 years. In 2007, there was a sharp growth in emissions from manufacturing industries and construction sub-sectors (due to high natural gas consumption).

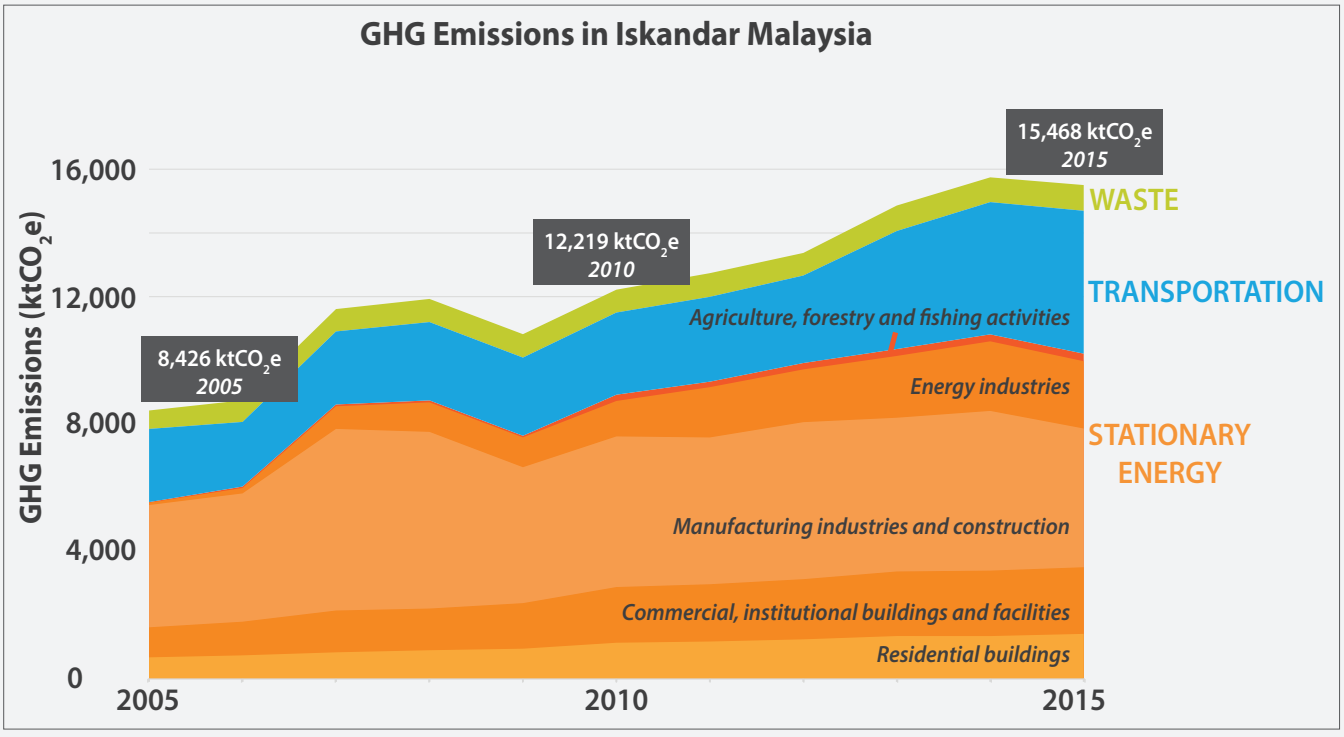


Figure 7: GHG emissions by sub-sectors in 2015

Iskandar Malaysia Emissions and GDP

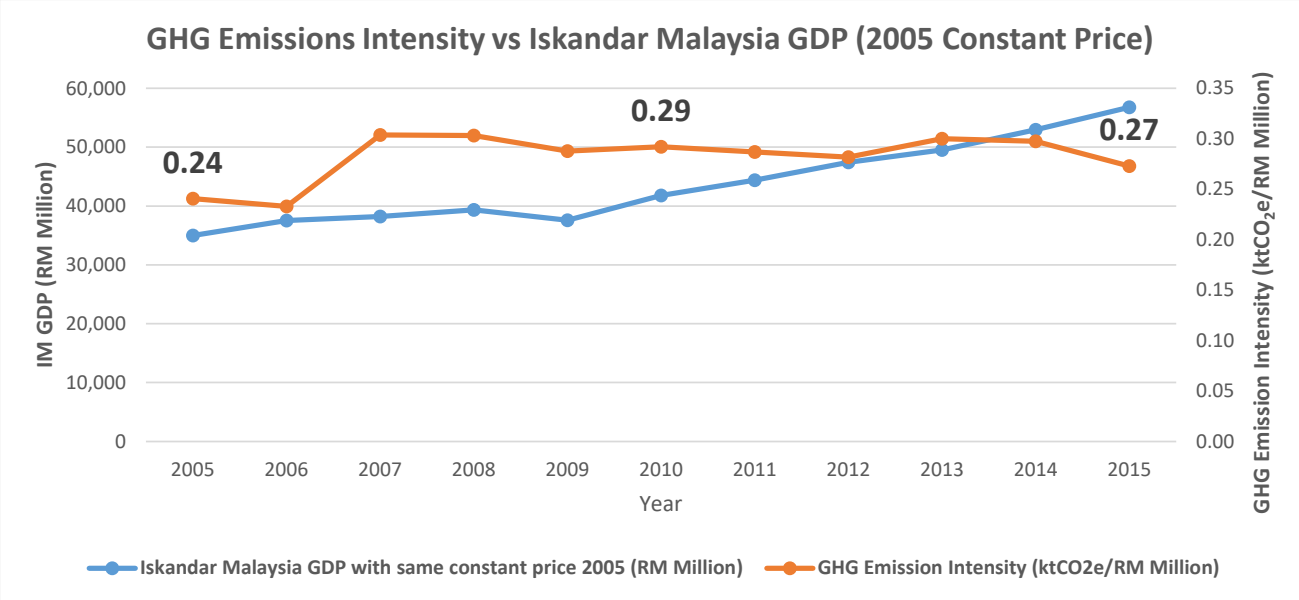


Figure 8: All BASIC emission intensity vs Iskandar Malaysia GDP (at 2005 constant price)

The emission intensity was calculated using GDP based on 2005 constant price. This is consistent with the national GHG emissions reporting approach.

Interestingly, the GHG intensity from 2005 to 2015 appears to progress through three phases:

- 2005 - 2007 Growth phase
- 2008 - 2013 Steady phase
- 2014 - 2015 Appears to be start of a decrease (but not conclusive)

However, it should be noted that at this stage it is too early to conclude that the GHG intensity of Iskandar Malaysia is on a decreasing trend for the coming years. This is because the economic region is still developing for which there will be uncertainties to consider.

Base Year for Tracking of Iskandar Malaysia Emissions

	Base year 2005	Base year 2010
Iskandar Malaysia GHG emissions ($ktCO_2e$)	8,426	12,219
Iskandar Malaysia GDP at 2005 constant price (RM million)	35,000	41,813
Iskandar Malaysia GHG Intensity % growth of base year vs 2015 ($ktCO_2e$/RM million GDP)	+13%	-7%

The impact of selecting different base year for tracking GHG emissions is highly significant. GHG emissions in 2005 are significantly lower compared to the emissions in 2010. Consequently, when comparing the GHG intensity growth, using 2005 as a base year would mean a 13% increase while using 2010 as base year would mean 7% decrease.

The analysis shows that for future tracking of Iskandar Malaysia GHG emissions, selecting 2010 as the base year would be more reasonable. The reasons are as follow:

- Iskandar Malaysia was not officially in existence in 2005 and investment activities in the economic region were not yet in place.
- Iskandar Malaysia and the various economic activities within the economic region were more established from 2010.
- Importantly, various blueprints (RE, waste, transport) were only developed during the period around 2010 and the relevant actions carried out starting about 2010.

Sectoral Emission Analysis

Stationary Energy

Out of all the sub-sectors under Stationary Energy, the highest GHG emission (43% of total Stationary Energy) is contributed by the manufacturing and construction industries. Manufacturing and construction industries of Iskandar Malaysia contribute about 36% of total Iskandar Malaysia GDP in 2015[5] , with major amount of the industrial GDP derived from electrical and electronic, chemical and chemical products and food processing sub-sectors.

The sub-sector that follows the manufacturing and construction industries is energy industries. There are 6 power plants in the economic region which has a total capacity of 3,323MW. All the power plants consume natural gas as fuel, except for Tanjung Bin Independent Power Producer (IPP) which consumes coal as its main fuel. According to the GPC, only auxiliary from energy industries is accounted for BASIC level reporting and the emissions from energy generation supplied to the grid is required for territorial total. Therefore, the emissions from the energy generation supplied to the grid also has been calculated (about 12.59 $MtCO_2e$). Commercial, institutional buildings and facilities emit about 20% of total Stationary Energy GHG emissions, followed by residential buildings, agriculture and fishing activities sub-sectors.

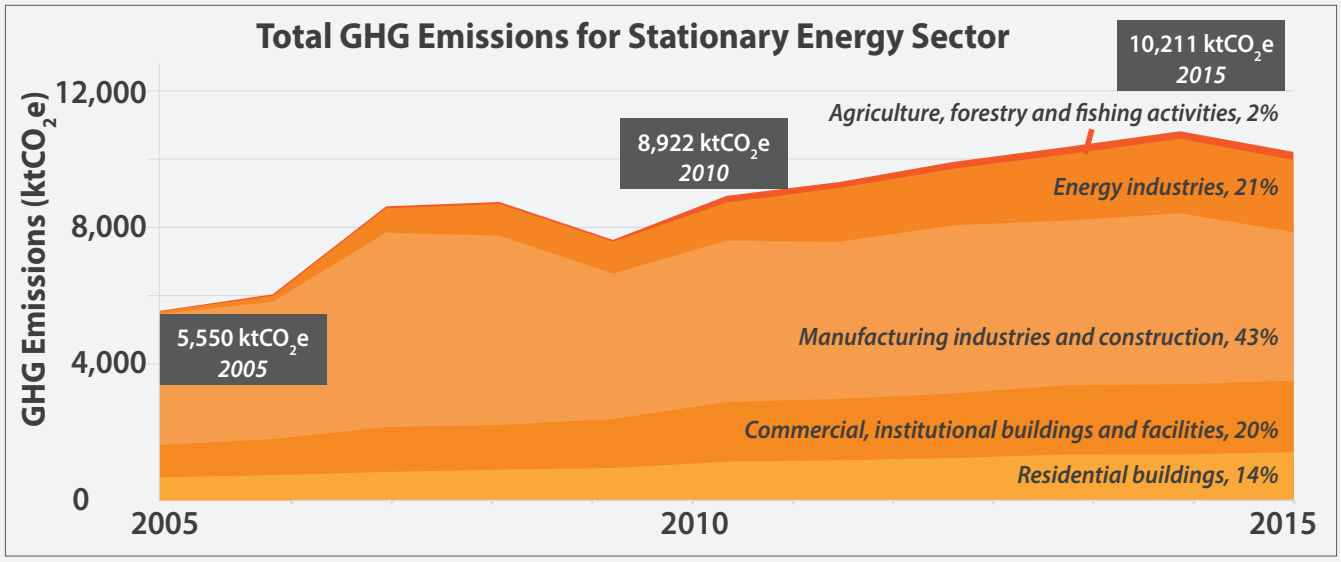


Figure 9: GHG emissions for stationary energy sector

5 Projected data using data provided by Unit Perancang Ekonomi Negeri Johor (UPENJ) from 2007-2014

Transportation

97.4% of the total emissions from the transportation sector of Iskandar Malaysia is contributed by **on-road transportation**. Among the different fuel types, petrol consumption is the highest followed by diesel and natural gas. Railway and off-road emissions are negligible in compared to the consumptions by on-road transportation.

According to GPC, CO_2 emissions from biogenic origin materials shall be reported separately from the scopes and other gases. Therefore, emissions from biodiesel consumption in Iskandar Malaysia was calculated (0.04 $MtCO_2e$) and reported under column CO_2(b).

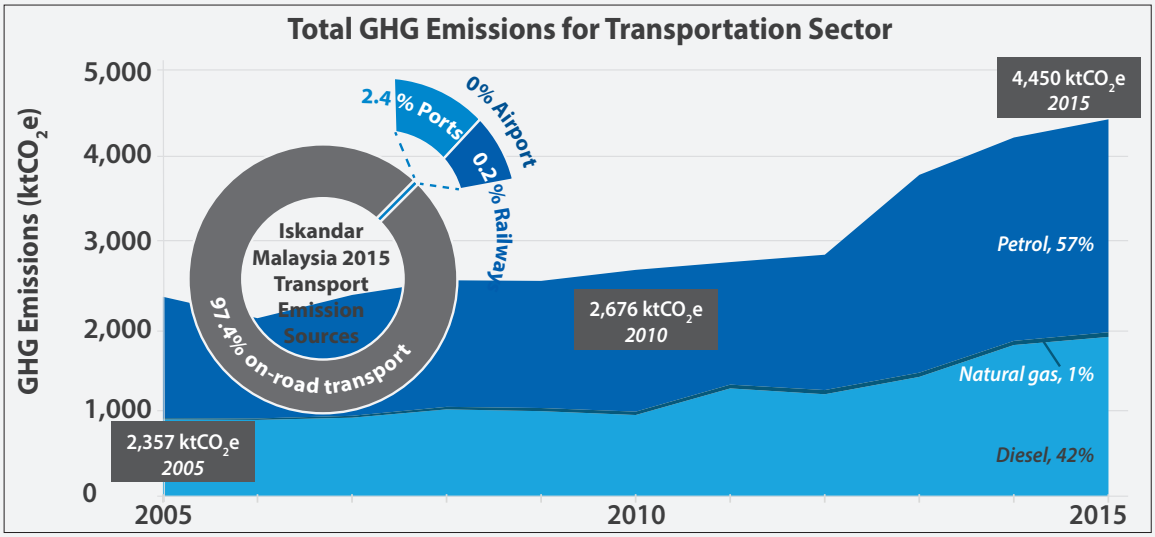


Figure 10: GHG emissions for transportation sector

Waste

Operating landfills are the main contributor of emissions in the waste and wastewater sector at about 63%, followed by industrial wastewater (from POME and rubber mill) at 25%. Closed landfills and domestic wastewater contribute 8% and 4% respectively to the emissions in the waste and wastewater sector. Emissions from sludge is very minimal.

Based on the available data, the emissions from stockpile of biomass in oil palm estates (i.e. empty fruit bunch, oil palm trunks and oil palm fronds) has also been calculated at 0.19 $MtCO_2e$.

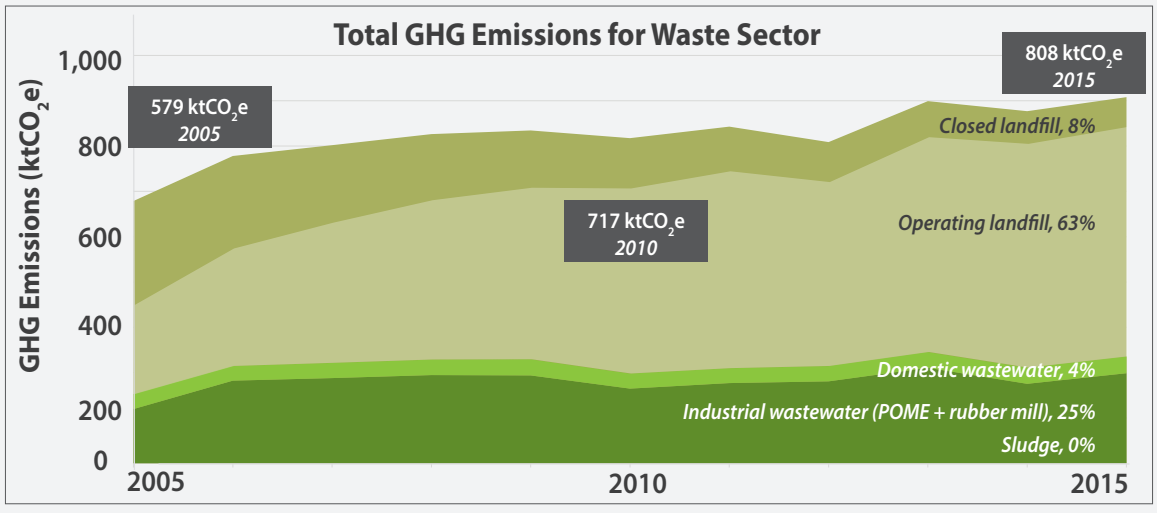


Figure 11: GHG emissions for waste sector

4.0 Concluding Remarks and Way Forward

Photo credits: IRDA

Concluding Remarks and Way Forward

The GHG inventory 2015 for Iskandar Malaysia is the first regional/city level GHG reporting performed in Malaysia using an internationally recognised reporting standard - GPC. The report provides a good basis of assessing where Iskandar Malaysia stands in terms of GHG reporting over the past 10 years and the major sources of emissions to be focused on. Most importantly, it now provides a monitoring and reporting framework for tracking the GHG emission performance for Iskandar Malaysia.

This GHG Inventory would be an instrumental launching pad for future tracking and setting of emissions reduction target. The information on major emission sources within Iskandar Malaysia provides important data for the development of strategic action plans with maximum impact on reduction of emissions. It is recommended that the GHG inventory to be updated on a yearly basis.

This inventory has been compiled using the best available data and methods. However there remains potential for improvement. Subsequent inventories should seek to build on the work undertaken here and improve the accuracy, reliability, and coverage of data.

Going forward, IRDA shall seek to:

Develop	• Sector specific emisson targets • Review emission reduction action plan • Set up a GHG Inventory unit in IRDA
Improve	• Data availability specific to Iskandar Malaysia • Expand reporting coverage and scope
Report	• Iskandar Malaysia GHG Inventory for tracking of emissions • Benchmark against similar city/ region

Sungai Pulai, Johor

Photo credits: IRDA

Detailed 2015 Iskandar Malaysia GHG Inventory

GHG Emissions Source (By Sector and Sub-sector)	Notation keys	Type of Gas Emissions (tonnes)			$MtCO_2e$
		CO_2	CH_4	N_2O	
STATIONARY ENERGY					
Residential buildings					
Scope 1 Emissions from fuel combustion within the city boundary		142,105	11	0.23	0.14
Scope 2 Emissions from grid-supplied energy consumed within the city boundary		1,269,737			1.27
Commercial, institutional buildings & facilities					
Scope 1 Emissions from fuel combustion within the city boundary		192,805	17	0.74	0.19
Scope 2 Emissions from grid-supplied energy consumed within the city boundary		1,899,120			1.90
Manufacturing and construction					
Scope 1 Emissions from fuel combustion within the city boundary		1,754,847	73	11.41	1.76
Scope 2 Emissions from grid-supplied energy consumed within the city boundary		2,595,434			2.60
Energy industries					
Scope 1 Emissions from energy used in power plant auxiliary operations within the city boundary		1,138,895	20	2.03	1.14
Scope 2 Emissions from grid-supplied energy consumed in power plant auxiliary operations within the city boundary		973,082			0.97
Scope 1 Emissions from energy generation supplied to the grid		12,580,539	224	22.43	12.59
Agriculture, forestry and fishing activities					
Scope 1 Emissions from fuel combustion within the city boundary		189,208	26	2.89	0.19
Scope 2 Emissions from grid-supplied energy consumed within the city boundary		47,713			0.05
TRANSPORTATION					
On-road transportation					
Scope 1 Emissions from fuel combustion on-road transportation occurring within the city boundary		4,242,439	1,344	207.52	4.34
Scope 2 Emissions from grid-supplied energy consumed within the city boundary for on-road transportation	NE				
Railways					
Scope 1 Emissions from fuel combustion for rainway transportation occurring within the city boundary		8,802	0	3.40	0.01
Scope 2 Emissions from grid-supplied energy consumed within the city boundary for railways	NO				
Waterborne navigation					
Scope 1 Emissions from fuel combustion for waterborne navigation occurring within the city boundary	NE				
Scope 2 Emissions from grid-supplied energy consumed within the city boundary for waterborne navigation	NE				
Aviation					
Scope 1 Emissions from fuel combustion for aviation occurring within the city boundary	NE				
Scope 2 Emissions from grid-supplied energy consumed within the city boundary for aviation	NE				
Off-road transportation					
Scope 1 Emissions from fuel combustion for off-road transportation occuring within the city boundary		52,719	87	7.96	0.10
Scope 2 Emissions from grid-supplied energy consumed within the city boundary for off-road transportation	IE				
WASTE					
Solid waste disposal					
Scope 1 Emissions from solid waste generated within the city boundary and disposed in landfills or open dumps within the city boundary			20,437	0	0.57
Scope 3 Emissions from solid waste generated within the city boundary but disposed in landfills or open dumps outside the city boundary	NO				
Scope 1 Emissions from solid waste generated outside the city boundary and disposed in landfills or open dumps withing the city boundary	NO				
Wastewater treatment and discharge					
Scope 1 Emissions from wastewater generated and treated within the city boundary			8,416	0.39	0.24
Scope 3 Emissions from wastewater generated within the city boundary but treated outside of the city boundary	NO				
Scope 1 Emissions from wastewater generated outside the city boundary but treated within the city boundary	NO				
Total		**ALL TERRITORIAL EMISSION ($MtCO_2e$)**			**28.06**
		ALL BASIC EMISSION ($MtCO_2e$)			**15.47**

CO_2(b) ($MtCO_2e$)	Data Quality		Explanatory comments (i.e. description of methods or notation keys used)
	Activity Data	Emssion Factor	
	M	L	Scaled down from secondary data based on population ratio
	M	H	Scaled down from secondary data based on population ratio
	M	L	Scaled down from secondary data based on population ratio
	M	H	Scaled down from secondary data based on population ratio
	M	L	Scaled down from secondary data based on industrial GDP
	M	H	Scaled down from secondary data based on industrial GDP
	H	L	Primary data from power plants. Assumed auxiliary operations are 5% of the total grid-supplied energy consumption when data are not available
	H	H	Primary data from power plants
	H	L	
	M	L	Scaled down from secondary data based on population ratio
	M	H	Scaled down from secondary data based on population ratio
0.04	M	L	Scaled down from secondary data based on population ratio
			Not estimated as there are only 2 units of pilot electrical vehicle available in Iskandar Malaysia
	H	L	Primary data from operator
			Not occurring as the railway transportation in Iskandar Malaysia consume diesel only
			Not estimated as lack of such information and it is believed that the number of waterborne navigation trips made within the city boundary are insignificant
			Not estimated as lack of such information and it is believed that the number of waterborne navigation trips made within the city boundary are insignificant
			Not estimated as lack of such information and it is believed that the number of aviation trips made within the city boundary are insignificant
			Not estimated as lack of such information and it is believed that the number of aviation trips made within the city boundary are insignificant
	H	L	Primary data from authorities
			Included elsewhere under scope 2 of **Commercial, Institutional buildings & facilities sub-sector**
	M	L	Primary data from authorities/ operator and extrapolation made based on population and waste generation rate when data are not available
			Not occurring in Iskandar Malaysia
			Not occurring in Iskandar Malaysia
	M	L	Primary data from operators and extrapolation made based on population and waste generation rate when data are not available
			Not occurring in Iskandar Malaysia
			Not occurring in Iskandar Malaysia

Data Quality Assessment

Data quality	Activity data	Emission factor
High (H)	Detailed activity data	Specific emission factors
Medium (M)	Modeled activity data using robust assumptions	More general emission factors
Low (L)	Highly-modeled or uncertain activity data	Default emission factors

Notation Key

NE - Not Estimated NO - Not Occurring IE - Included Elsewhere Sources required for territorial total but not for BASIC/ BASIC+ reporting (*italics*)

ISKANDAR
REGIONAL
DEVELOPMENT
AUTHORITY

ISKANDAR MALAYSIA GREENHOUSE GAS INVENTORY 2015

Environment
Iskandar Regional Development Authority
#G-01, Block 8,
Danga Bay, Jalan Skudai,
80200 Johor Bahru, Johor,
MALAYSIA