UNIVERSITI KEBANGSAAN MALAYSIA
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Land Cover/Land Use Change SARI International Regional Science Meeting in South/Southeast Asia, Chiang Mai, Thailand 17-19th, 2017

ADAPTING CLIMATE CHANGE IMPACTS IN THE URBAN ECOSYSTEM: GREEN SPACES AND COMMUNITY CARBON FOOTPRINT IN MALAYSIA

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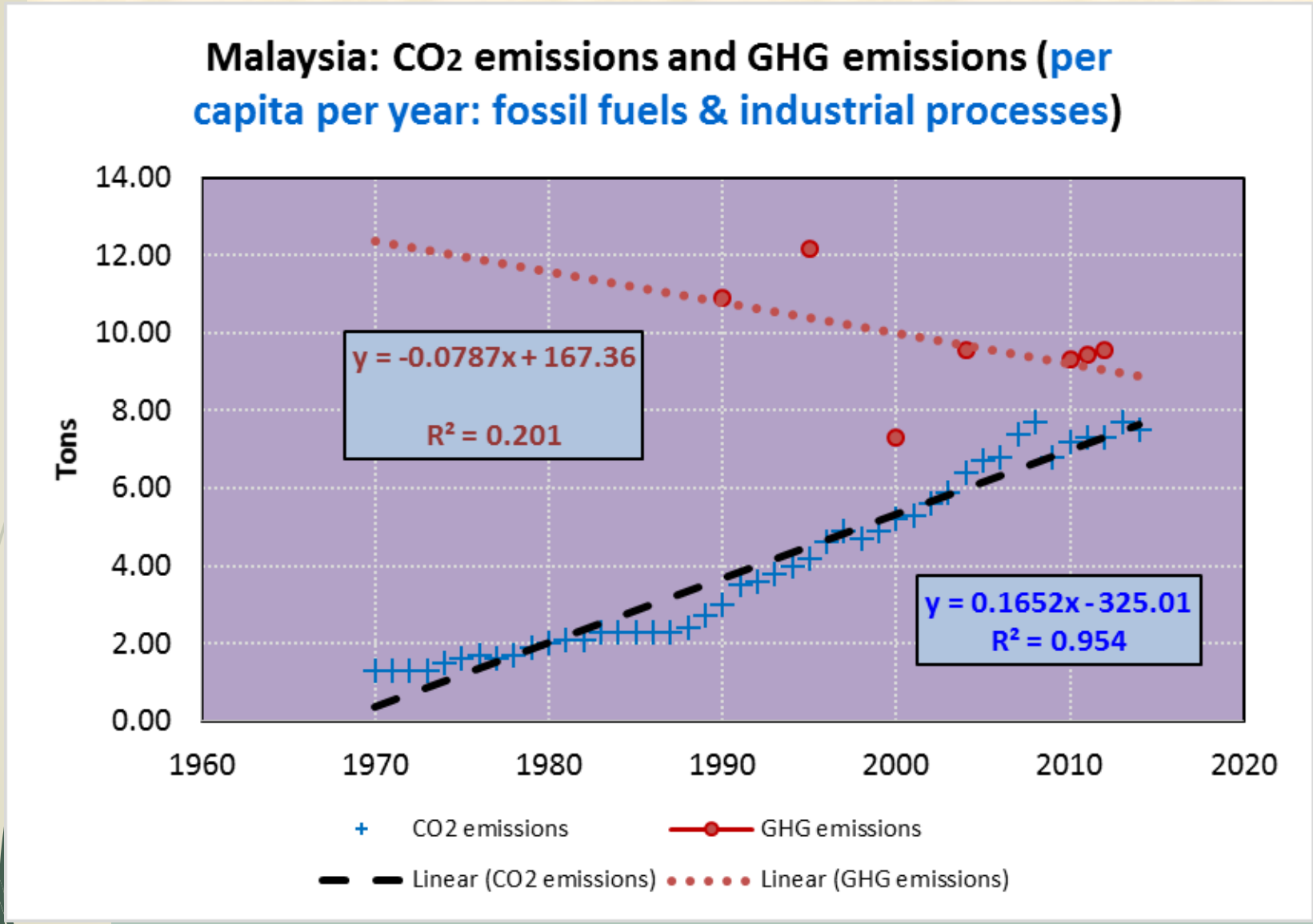
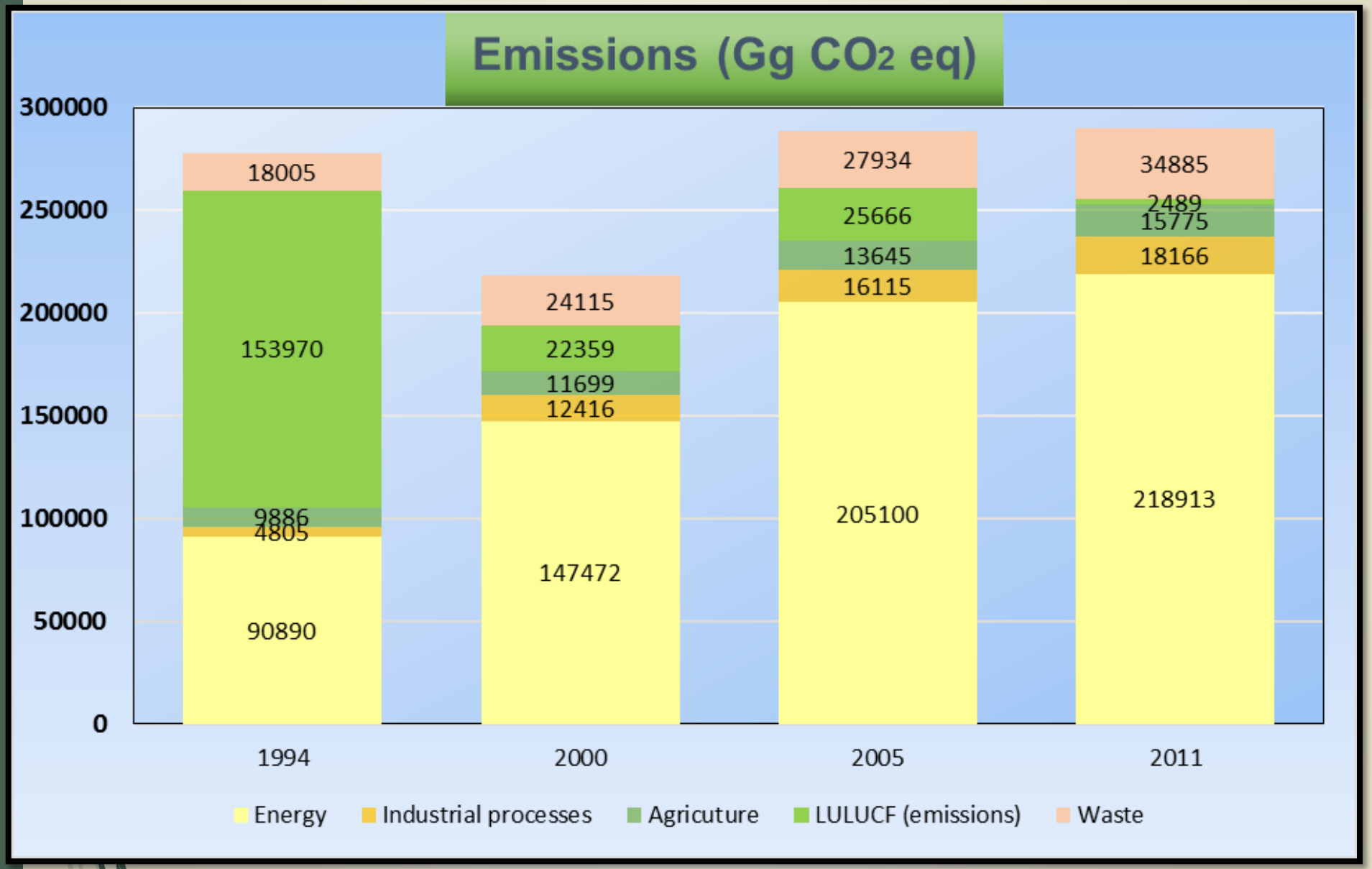
Universiti Kebangsaan Malaysia

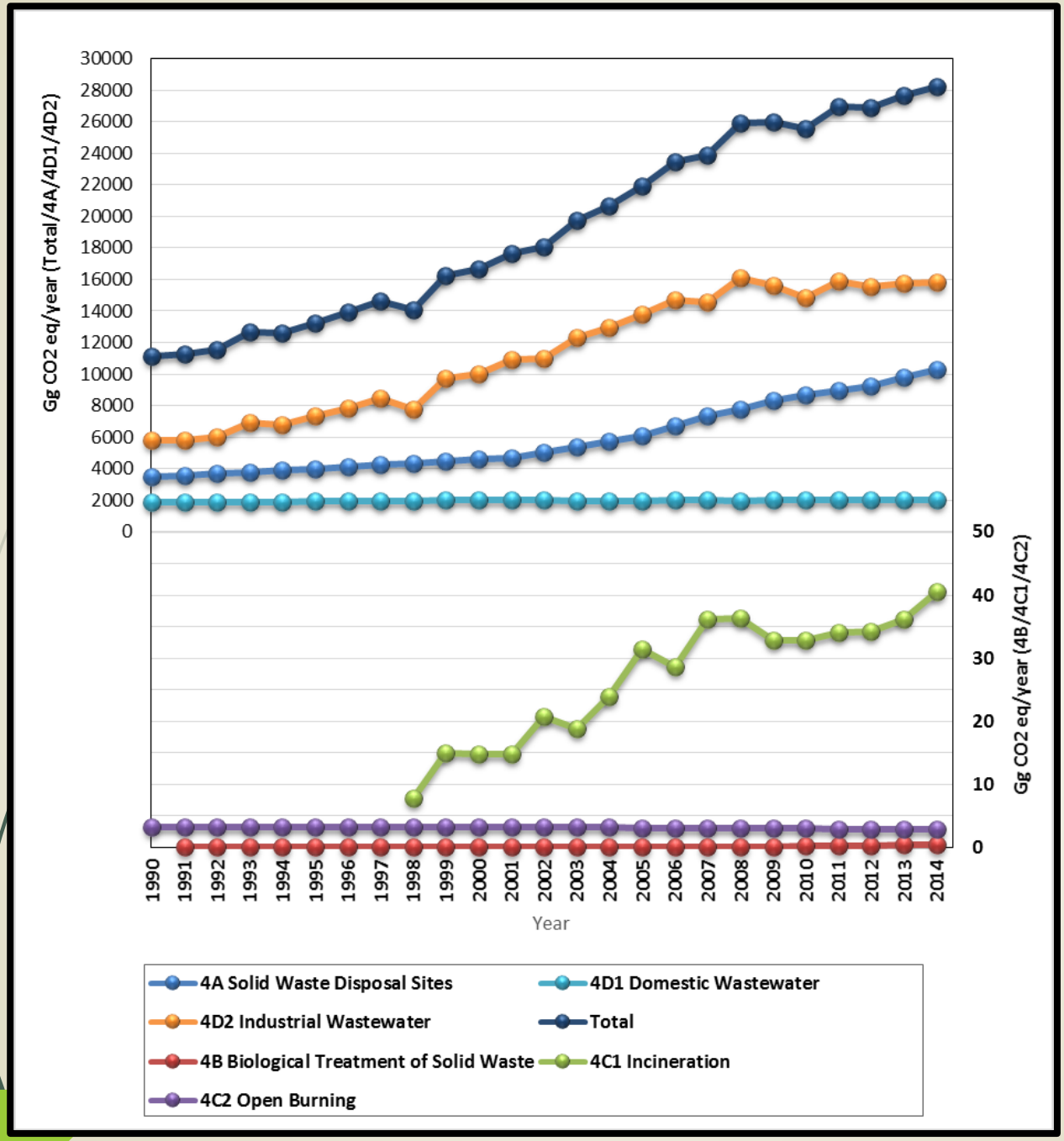
Preamble: CO_2 emissions for Malaysia



Reference: Olivier, J.G.J., Janssens-Maenhout, G., Muntean, M. Peters, J.H.A.W., Trends in global CO2 emissions - 2015 report, JRC report 98184 / PBL report 1803, November 2015.
GHG time series 1990-2012 per capita emissions for world countries
http://edgar.jrc.ec.europa.eu/overview.php?v=GHGts_pc1990-2012



Ref: Malaysia BUR Country Report 2016



Time Series of GHG Emissions for the Waste Sector in Malaysia

Population plays a major role in determining the wastes

(Ref: BUR 2016)

GHG Indices for Malaysia

Population	23.3	26.1	29.1
GDP at 2005 prices	431.23	544	711.8
Approach 1: without LULUCF	**2000**	**2005**	**2011**
CO_2 eq emissions (mil ton)	195.7	263	287.8
CO_2 eq emissions per GDP (ton/cap)	8.4	10	9.9
CO_2 eq emissions/ capita (ton/1000 RM)	0.5	0.5	0.4
Approach 2: with LULUCF (emissions)	**2000**	**2005**	**2011**
CO_2 eq emissions (mil ton)	218	289	290
CO_2 eq emissions per GDP (ton/cap)	9.4	11.1	10
CO_2 eq emissions/ capita (ton/1000 RM)	0.5	0.5	0.4
Approach 3: with LULUCF (emissions & removals)	**2000**	**2005**	**2011**
CO_2 eq emissions (mil ton)	-32.9	30.1	27.3
CO_2 eq emissions per GDP (ton/cap)	-1.4	1.2	0.94
CO_2 eq emissions/ capita (ton/1000 RM)	-0.07	0.05	0.04

Preamble: Cities contribute to CC

- **Cities are major contributors to climate change**: covering < 2 % of the earth's surface, cities consume 78 % of the world's energy and produce more than 60% of CO_2 & GHG (energy generation, vehicles, industry, and biomass use).
- Cities and towns are vulnerable to climate change (rising sea levels, intense heat and extreme weather events)
  - USA: The Heat Wave Sweeping the East Coast Comes With a Side of Smog (Bloomberg - 06/13/2017)
  - USA: Why California's Climate Change Fight Is Also About Public Health (Time Magazine - 06/15/2017) :
  - Temperatures in Iran city of Ahvaz, hit 53.8C in one of world's hottest days ever recorded (Evening Standard-07/1/2017)

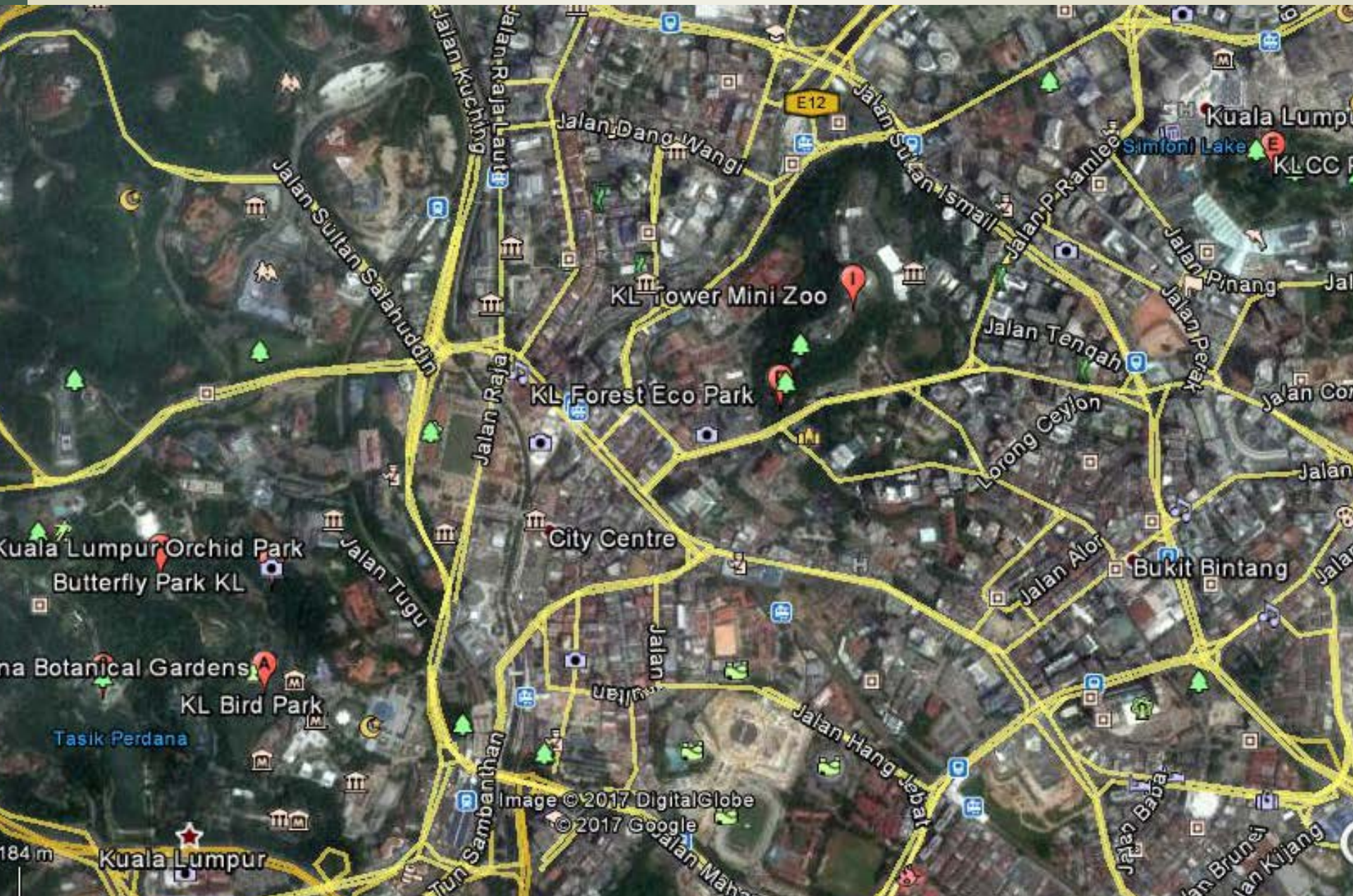
- **WHY CITIES CAN BE THE SOLUTION TO CLIMATE CHANGE**.
- Despite these risks, many cities have not yet addressed climate change. The reasons **: lack** of relevant **city policies and action plans**; existence of regulations on urban planning and environment which have not been adjusted to manage climate change; slow response to climate disasters from **lack of capacity and resources**; and **lack of public awareness** on climate variability and climate change-induced hazard mitigation.

KUALA LUMPUR CITY

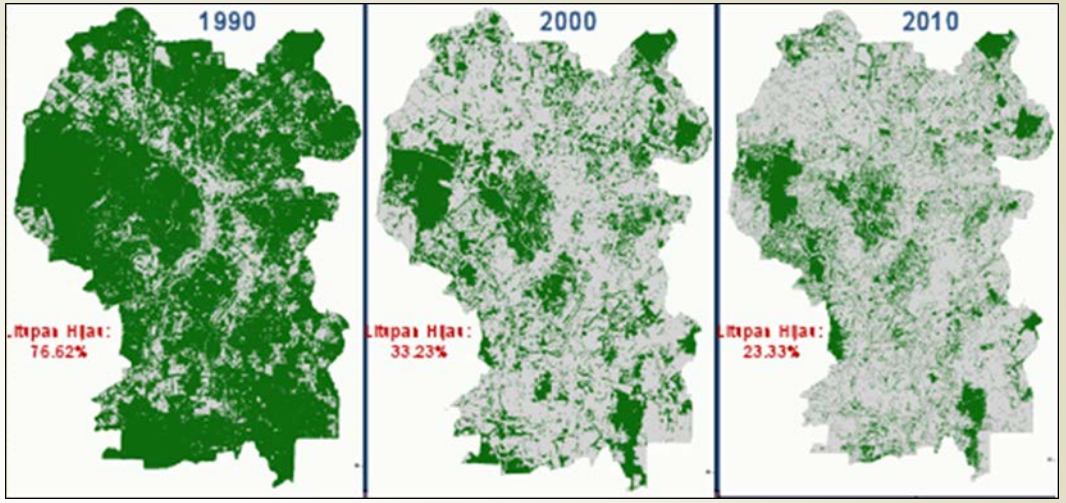
- City activities contribute to 75% of world carbon dioxide (CO_2) emissions - the United Nations Human Settlements Program (UN-Habitat)
- Kuala Lumpur as the rapidly developing capital city of Malaysia is facing the same problem.
- Uncontrolled urbanization in Kuala Lumpur caused green space to decline by 43% from 1990 to 2010.

#	Zones	Area (Ha)
1	Kuala Lumpur centre	1,813
2	Wangsa Maju-Maluri	4,614
3	Sentul-Manjalara	4,657
4	Damansara-Penchala	4,520
5	Bukit Jalil-Seputih	4,390
6	Bandar Tun Razak-Sg Besi	4228

Parks in Kuala Lumpur



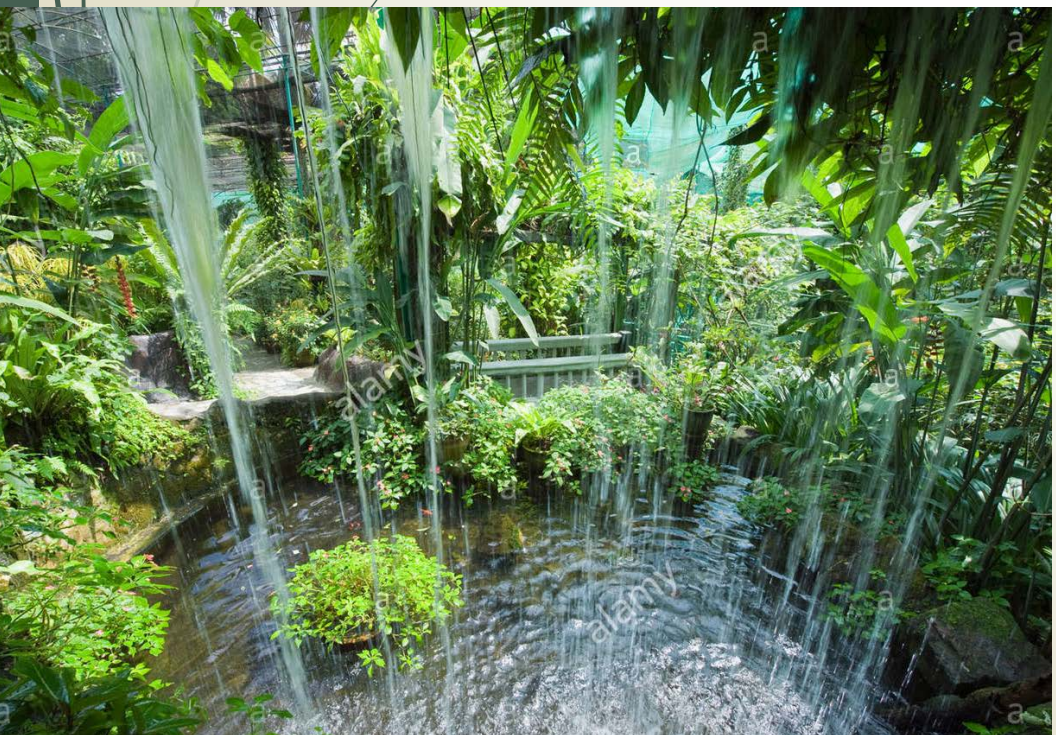
Trend of green areas in city of Kuala Lumpur



Changes in natural coverage in Kuala Lumpur from 1990, 2000 and 2010.

Year	Population	Green area (%)	Green area (ha)	Green area per person (km^2)
1990	1,145,342	76.62%	186.19	162.56
2000	1,379,310	33.23%	80.75	56.71
2010	1,588,750	23.33%	56.69	35.68

Name	Location	Size (ha)	Hierarchy
Perdana Lake Garden	Central KL	70	City park
Kepong Metropolitan Parks	North. Sentul – Manjalara	127	District park
Batu Metropolitan Park	North. Sentul – Manjalara	24	District park
Titiwangsa Lake Garden	West. Wangsa Maju - Maluri	46	District park
Pudu Lake Garden	South West. Bandar Tun Razak-Sg Besi	26	District park
Permaisuri Lake Garden	South West. Bandar Tun Razak- Sg Besi	50	District park
Bukit Jalil Park	Southern. Bukit Jalil -Seputeh	22	District park
Datuk Keramat LakeGarden	West. Wangsa Maju - Maluri	6	Neighborhood park
Manjalara Lake Garden	North. Sentul – Manjalara	10.6	Neighborhood park
TOTAL		**381.6**	



PROBLEM STATEMENT

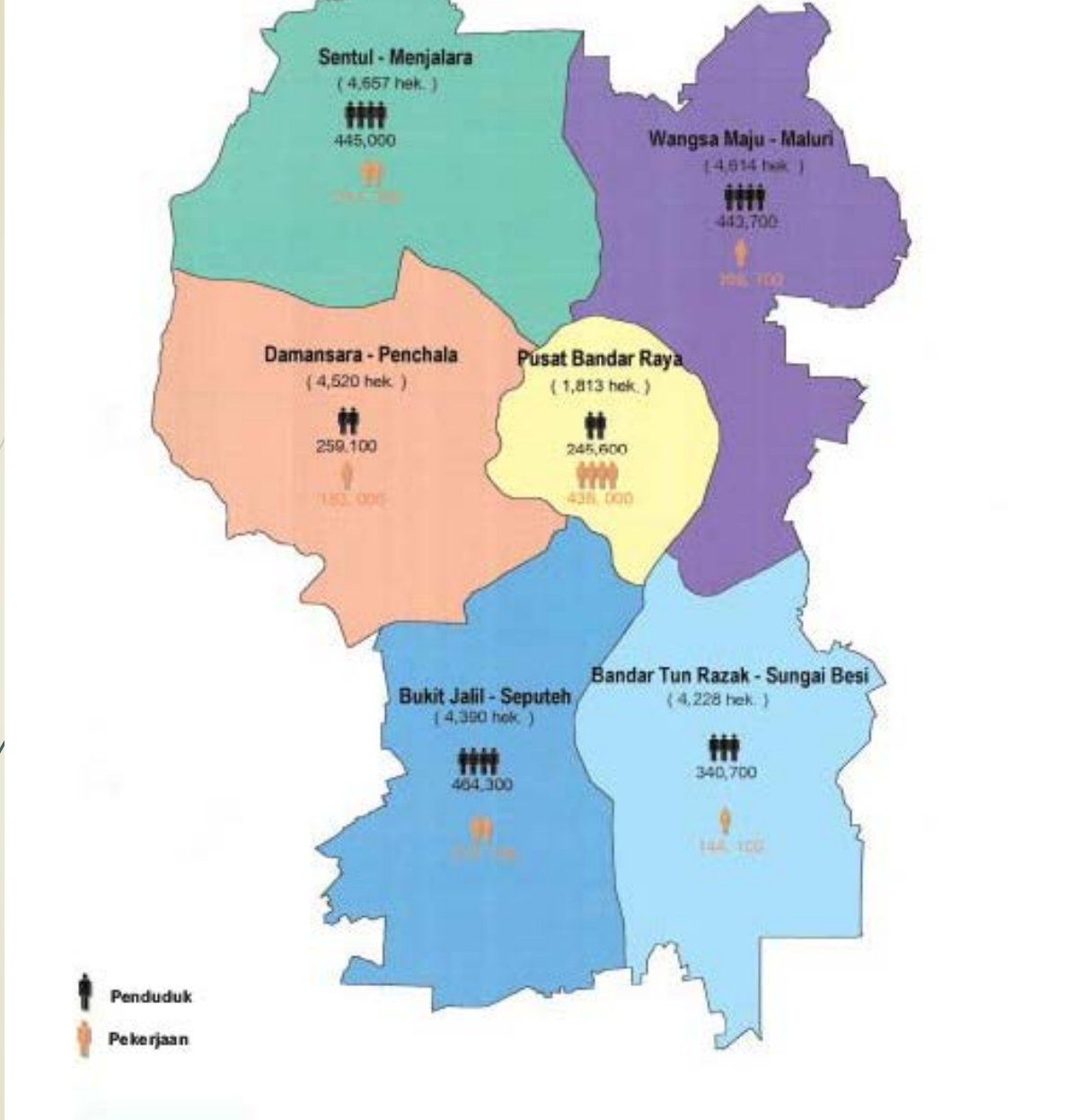
- What information can be accessed about carbon dioxide trace data from household and human respiratory activities in Kuala Lumpur?

- How is the green space capability of existing large parks in absorbing CO_2 emissions from household activities and breathing in six strategic zones according to the Kuala Lumpur 2020 development plan?

  - Analyze trace carbon dioxide data from household and respiratory activities in six strategic zones and analyse the ability of green space (large gardens) to absorb CO_2 emissions according to the Kuala Lumpur 2020 Development Plan.

SCOPE

- This study is based on a globalized issue, which is the increase in the amount of CO_2 emissions due to urbanization.
- Household activity data were obtained from a randomly distributed survey form to respondents to find out the lifestyle that contributed to the release of CO_2 Online Calculator
- The main green space data of large parks in each zone is collected to determine the ability of CO_2 absorption.

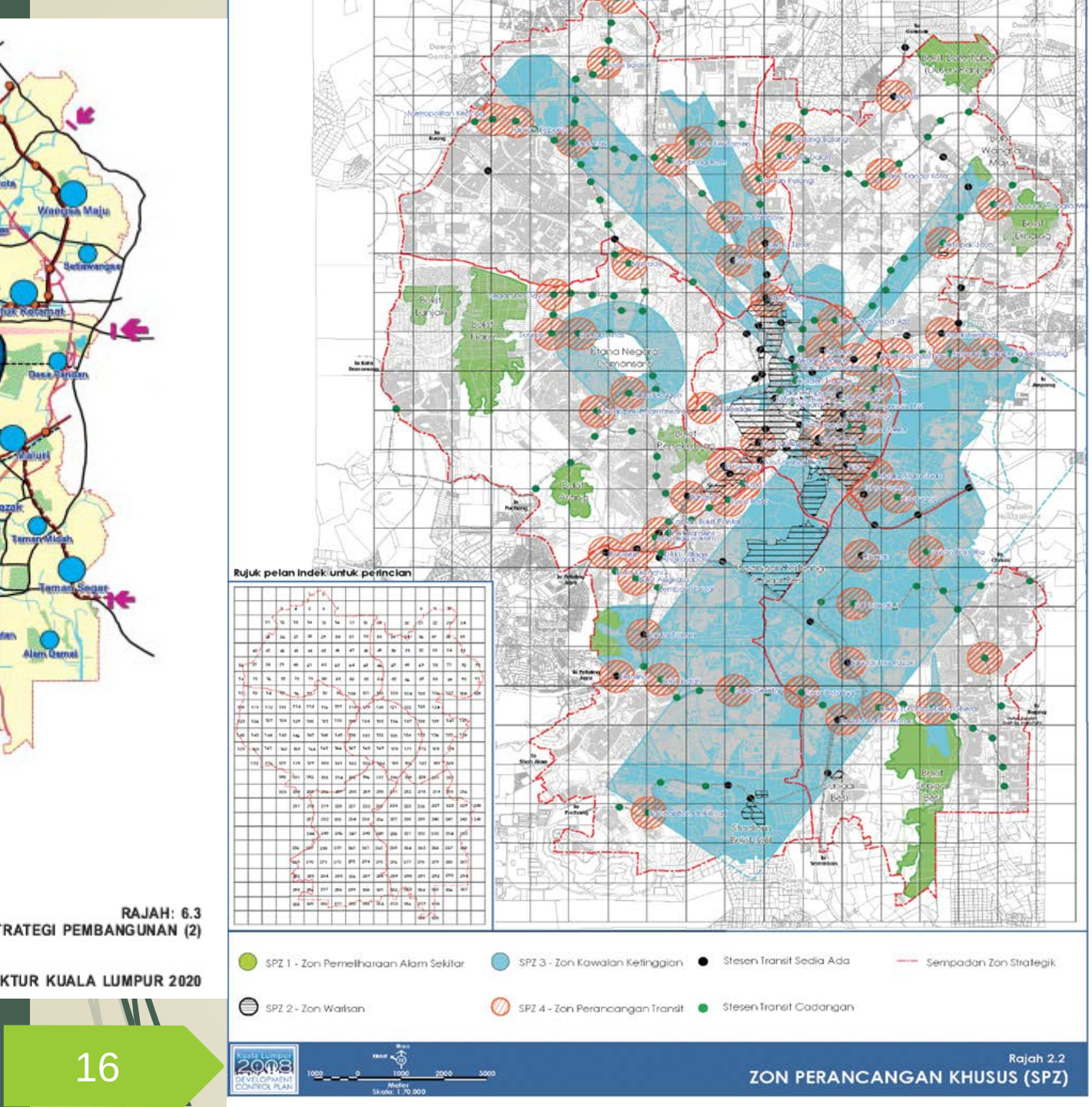


RAJAH: 6.4
PENDUDUK DAN PEKERJAAN, 2020

PELAN STRUKTUR KUALA LUMPUR 2020

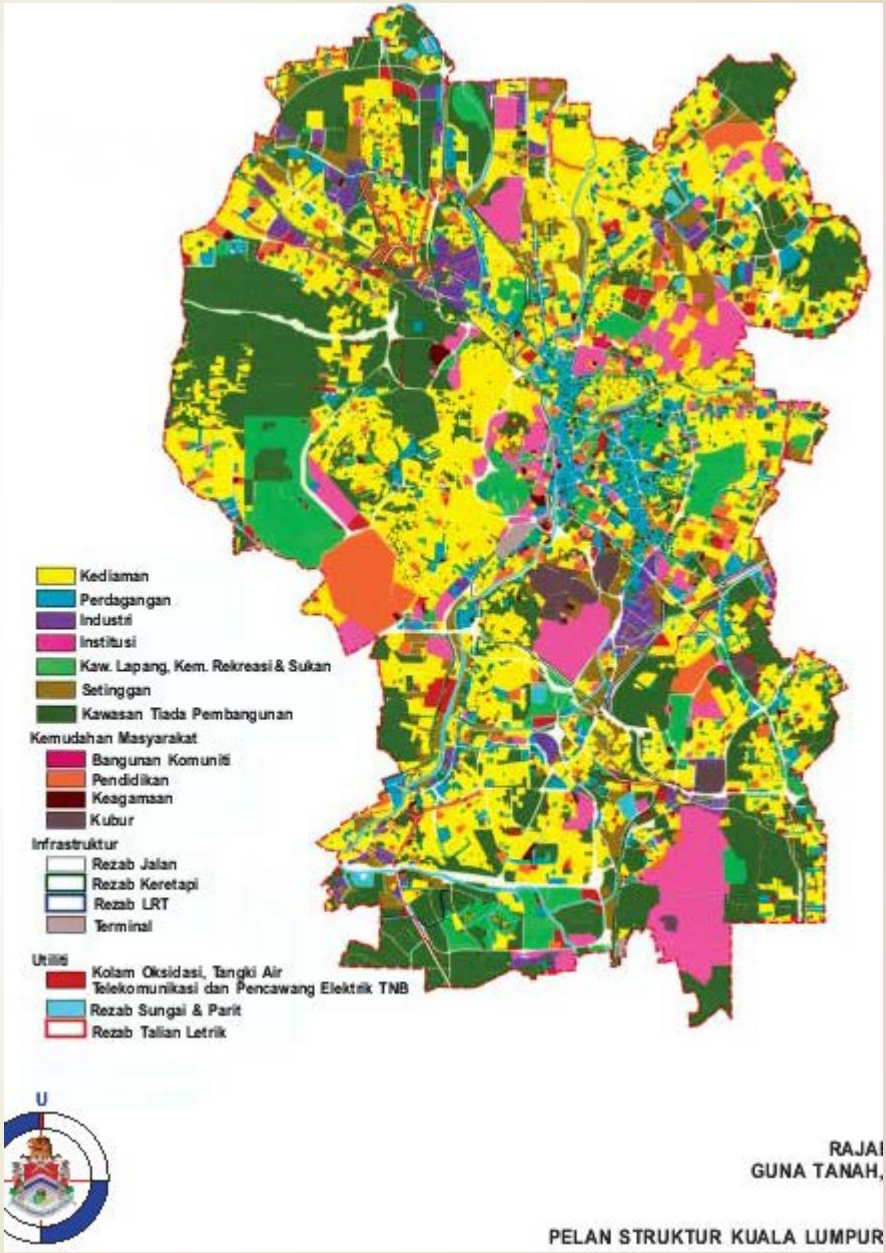
Specialized Development Zones (KL 2020 Development Plan)

Environmental Protection Zone



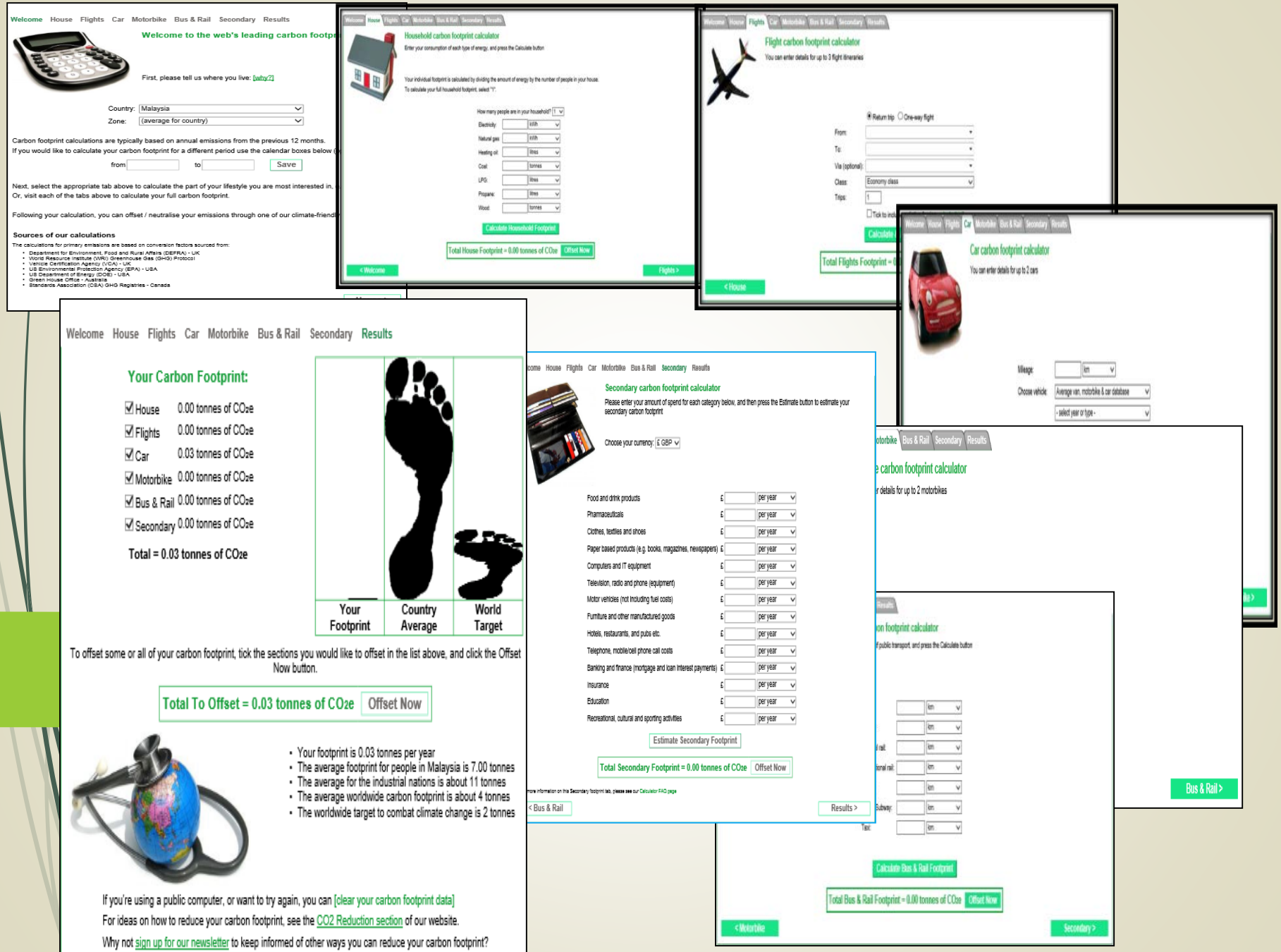
Land use in Kuala Lumpur

Categories of Land Use	Area (ha)	(%)
Residential	5,489.56	22.66
Commercial	1,091.71	4.51
Industry	553.05	2.28
Leisure & Recreation Area	1,579.56	6.52
Community Facilities	1,382.44	5.71
Public Utilities	38.5	0.16
Education	964.84	3.98
Religious	104.56	0.43
Cemetery	274.54	1.13
Land not yet developed	5,740.61	23.7
Squeeze	570.63	2.36
Other uses	6,192.69	25.57
Road & Rail Reserves	5,672.21	23.42
Utility	378.32	1.56
Agriculture / Fisheries	16.13	0.07
Terminals	126.03	0.52
Institution	1,620.80	6.69
TOTAL	24,221.05	100%



METHODOLOGY

- Emission of carbon footprint from Households in Six Strategic Zones in Kuala Lumpur (Kuala Lumpur Development Plan): Online Carbon footprint Calculator
- This study uses a non-probability sampling. The sample of the study consisted of randomly selected civilians separated by residential areas based on six strategic Kuala Lumpur zones.
- A total of 162 respondents surveyed.
- The calculation of CO2 absorption. The amount of CO2 absorbable from the large gardens found in each zone by assuming all the green areas are composed of trees.


Welcome House Flights Car Motorbike Bus & Rail Secondary Results
Welcome to the web's leading carbon footpr
First, please tell us where you live: [why?]
Country: Malaysia
Zone: (average for country)
Carbon footprint calculations are typically based on annual emissions from the previous 12 months.
If you would like to calculate your carbon footprint for a different period use the calendar boxes below (
from
to
Save
Next, select the appropriate tab above to calculate the part of your lifestyle you are most interested in.
Or, visit each of the tabs above to calculate your full carbon footprint.
Following your calculation, you can offset / neutralise your emissions through one of our climate-friendl
Sources of our calculations
The calculations for primary emissions are based on conversion factors sourced from:
Department for Environment, Food and Rural Affairs (DEFRA) - UK
World Resource Institute (WRI) Greenhouse Gas (GHG) Protocol
Vehicle Certification Agency (VCA) - UK
US Environmental Protection Agency (EPA) - USA
US Department of Energy (DOE) - USA
Green House Office - Australia
Standards Association (CSA) GHG Registries - Canada
Household carbon footprint calculator
Enter your consumption of each type of energy, and press the Calculate button
Your individual footprint is calculated by dividing the amount of energy by the number of people in your house.
To calculate your full household footprint, select "1".
How many people are in your household?
Electricity
Natural gas
Heating oil
Coal
LPG
Propane
Wood
Calculate Household Footprint
Total House Footprint = 0.00 tonnes of CO2e
Offset Now
< Welcome
Flights >
Flight carbon footprint calculator
You can enter details for up to 3 flight itineraries
Return trip
One-way flight
From:
To:
Via (optional):
Class:
Economy class
Trips:
Tick to
Calculate
Total Flights Footprint =
< House
Car carbon footprint calculator
You can enter details for up to 2 cars
Mileage:
Choose vehicle:
Average van, motorbike & car database
- select year or type -
Bus & Rail
Secondary
Results
carbon footprint calculator
details for up to 2 motorbikes
Bus & Rail >
Welcome House Flights Car Motorbike Bus & Rail Secondary Results
Your Carbon Footprint:
House 0.00 tonnes of CO2e
Flights 0.00 tonnes of CO2e
Car 0.03 tonnes of CO2e
Motorbike 0.00 tonnes of CO2e
Bus & Rail 0.00 tonnes of CO2e
Secondary 0.00 tonnes of CO2e
Total = 0.03 tonnes of CO2e
Your Footprint
Country Average
World Target
To offset some or all of your carbon footprint, tick the sections you would like to offset in the list above, and click the Offset Now button.
Total To Offset = 0.03 tonnes of CO2e
Offset Now
Your footprint is 0.03 tonnes per year
The average footprint for people in Malaysia is 7.00 tonnes
The average for the industrial nations is about 11 tonnes
The average worldwide carbon footprint is about 4 tonnes
The worldwide target to combat climate change is 2 tonnes
If you're using a public computer, or want to try again, you can [clear your carbon footprint data]
For ideas on how to reduce your carbon footprint, see the CO2 Reduction section of our website.
Why not sign up for our newsletter to keep informed of other ways you can reduce your carbon footprint?
< Secondary
Secondary carbon footprint calculator
Please enter your amount of spend for each category below, and then press the Estimate button to estimate your secondary carbon footprint
Choose your currency: £ GBP
Food and drink products
Pharmaceuticals
Clothes, textiles and shoes
Paper based products (e.g. books, magazines, newspapers)
Computers and IT equipment
Television, radio and phone (equipment)
Motor vehicles (not including fuel costs)
Furniture and other manufactured goods
Hotels, restaurants, and pubs etc.
Telephone, mobile/cell phone call costs
Banking and finance (mortgage and loan interest payments)
Insurance
Education
Recreational, cultural and sporting activities
per year
Estimate Secondary Footprint
Total Secondary Footprint = 0.00 tonnes of CO2e
Offset Now
< Bus & Rail
Results >
Calculate Bus & Rail Footprint
Total Bus & Rail Footprint = 0.00 tonnes of CO2e
Offset Now
< Motorbike
Secondary >

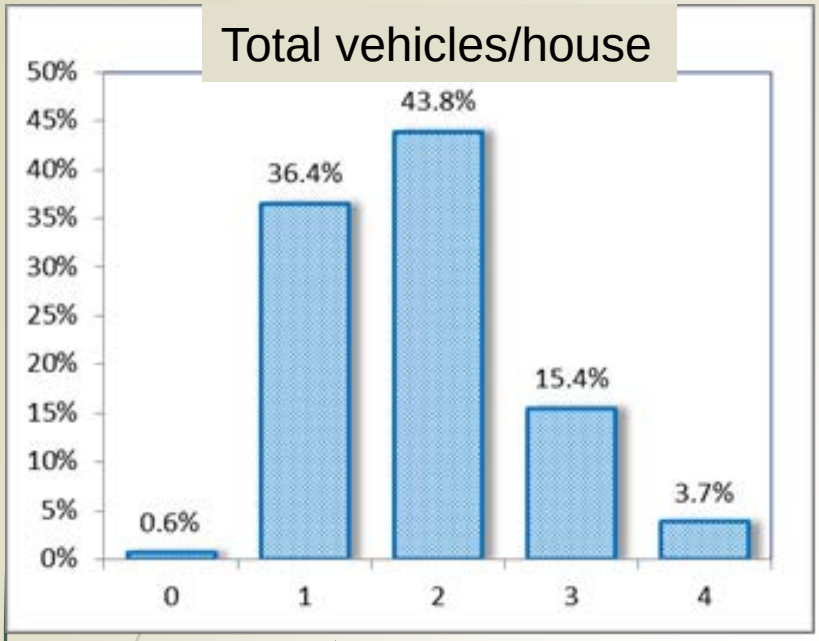
RESULTS

✓ Demography background

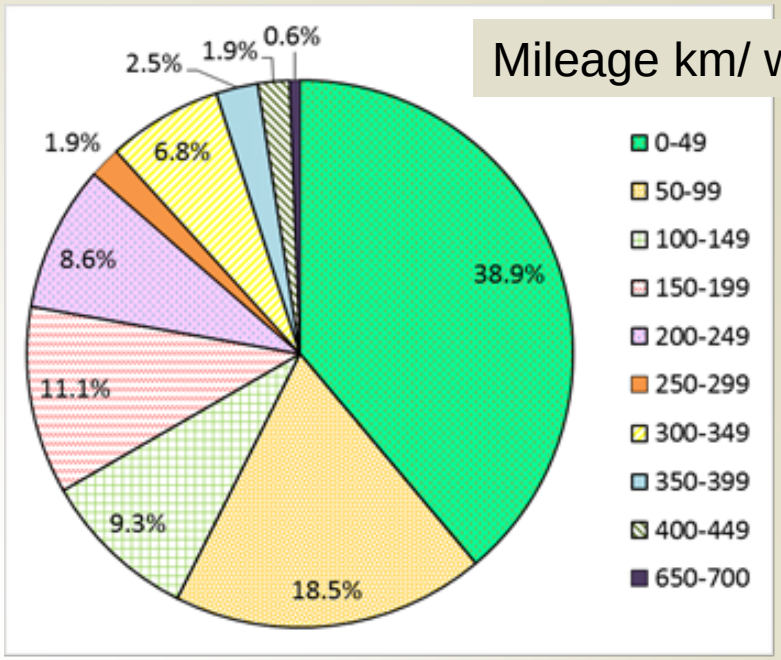
Information	%
Gender	
▪Men	68
▪ Women	32
Age	
20 to 29	15
30 to 39	34
40 to 49	21
50 to 59	28
Religion	
▪Islam	75
▪Hindu	11
▪Buddha	10
▪Kristian	4
Race	
▪Malay	76
▪Chinese	12
▪Indian	12

Information	%
Residential Areas	
▪Kuala Lumpur Centre	25
▪Wangsa Maju-Maluri	13
▪Sentul-Manjalara	15
▪Damansara-Penchala	9
▪Bukit Jalil-Seputih	10
▪Bandar Tun Razak-Sungai Besi	28
Postcodes	
▪55800 to 56799	34.6
▪52800 to 53799	14.8
▪47800 to 48799	0.6
Cost of types of accommodation	
▪ Below RM42,000.00	31.5
▪RM42,001 to RM75,000	17.9
▪RM75,001 to RM250,000	27.8
▪RM250,001 to RM500,000	17.3
▪RM500,001 to RM1,000,000	5.6
▪ Above RM1,000,001	0
Persons per Household	
▪5	29
▪3	19.8

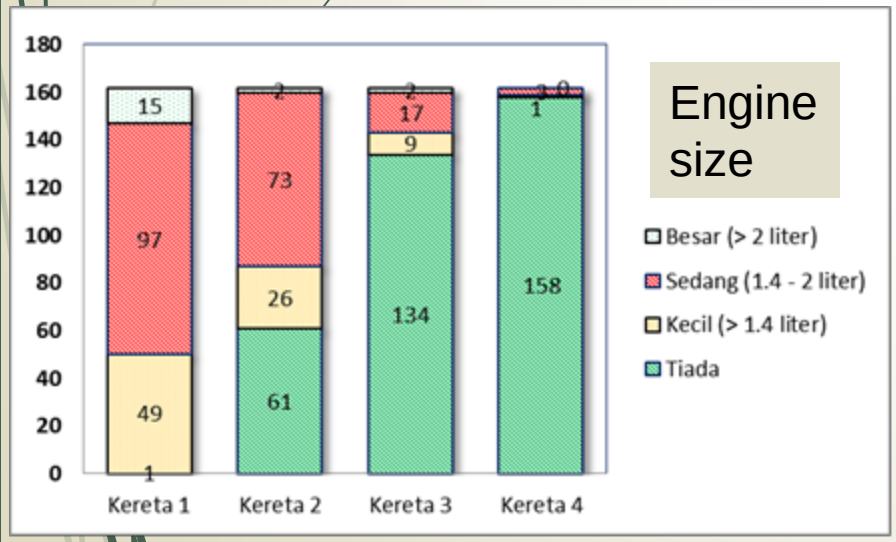
Total vehicles/house

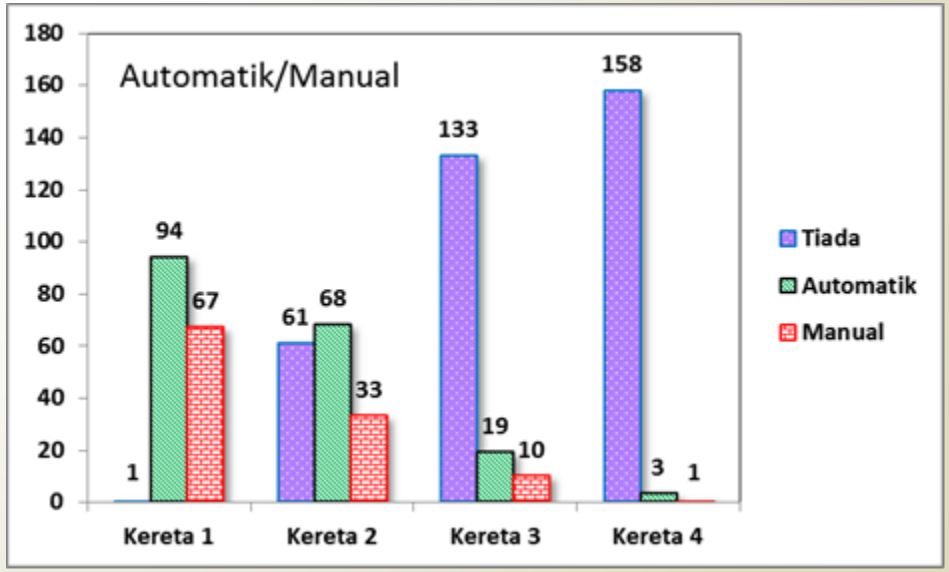


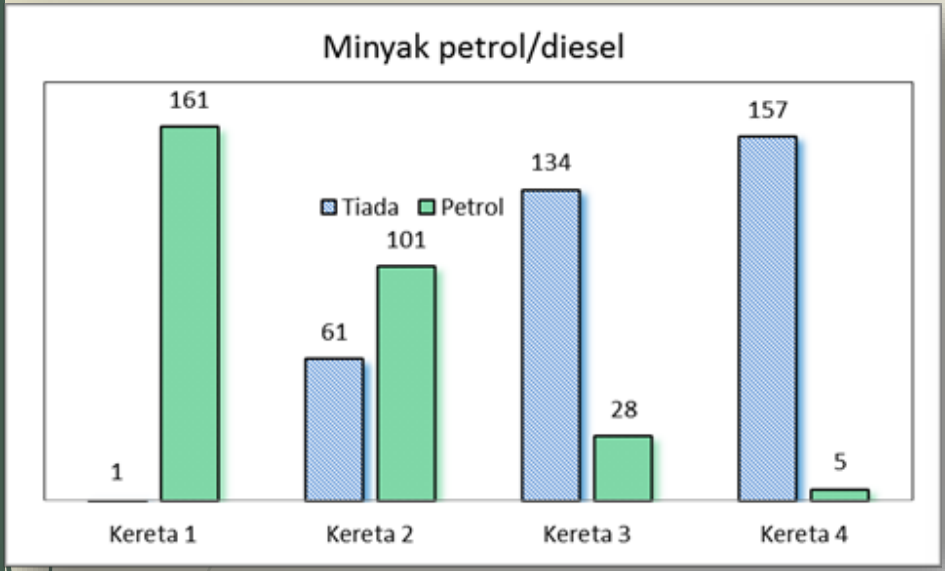
Mileage km/ week

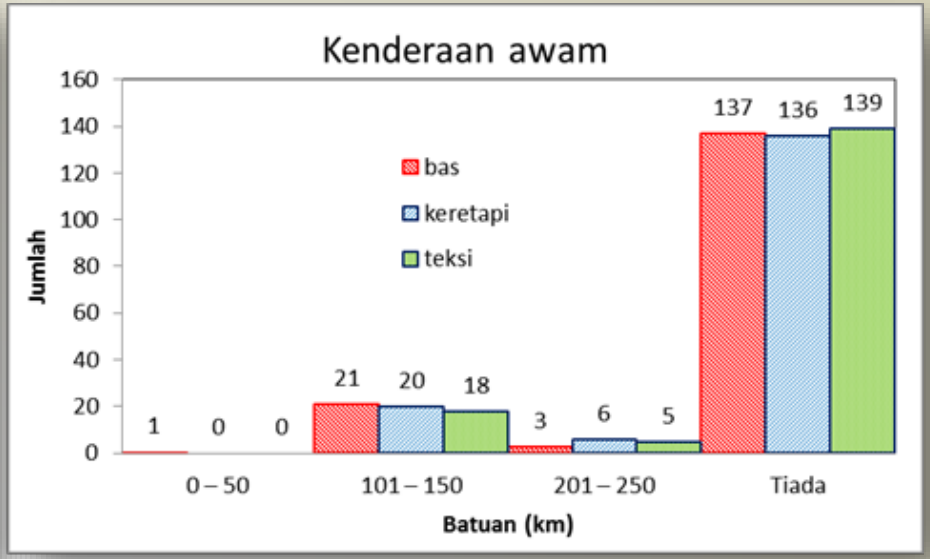


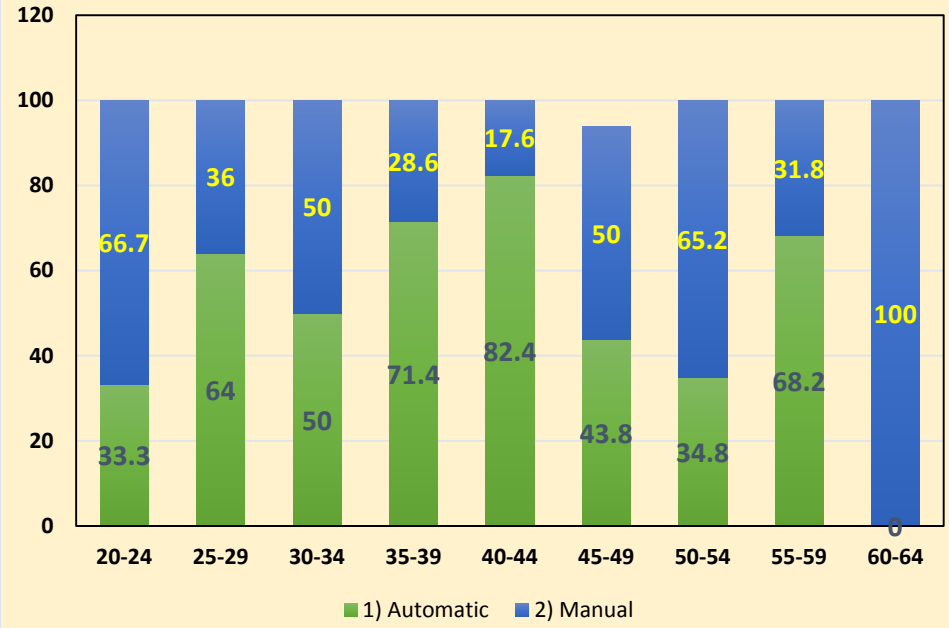
Engine size

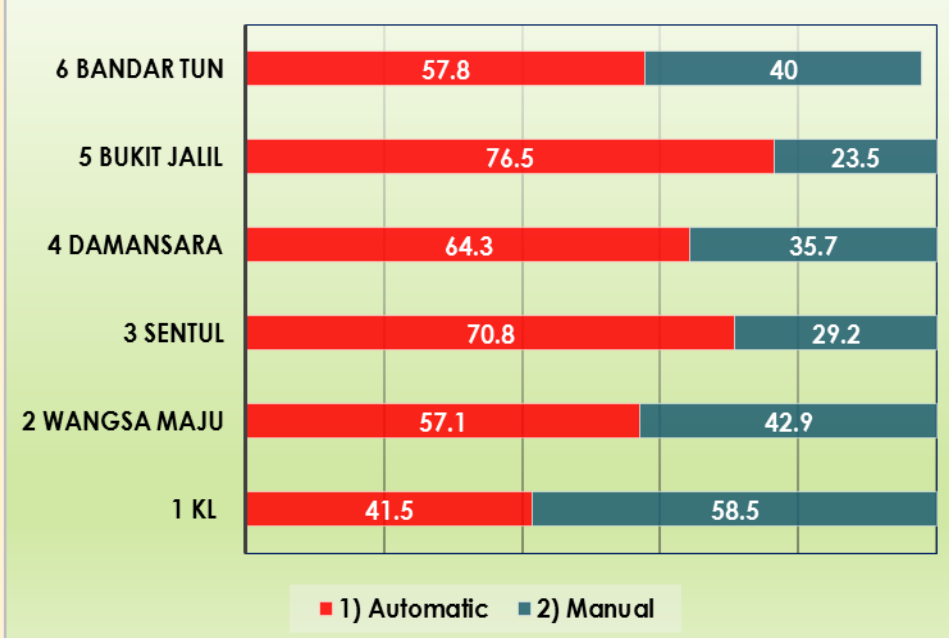




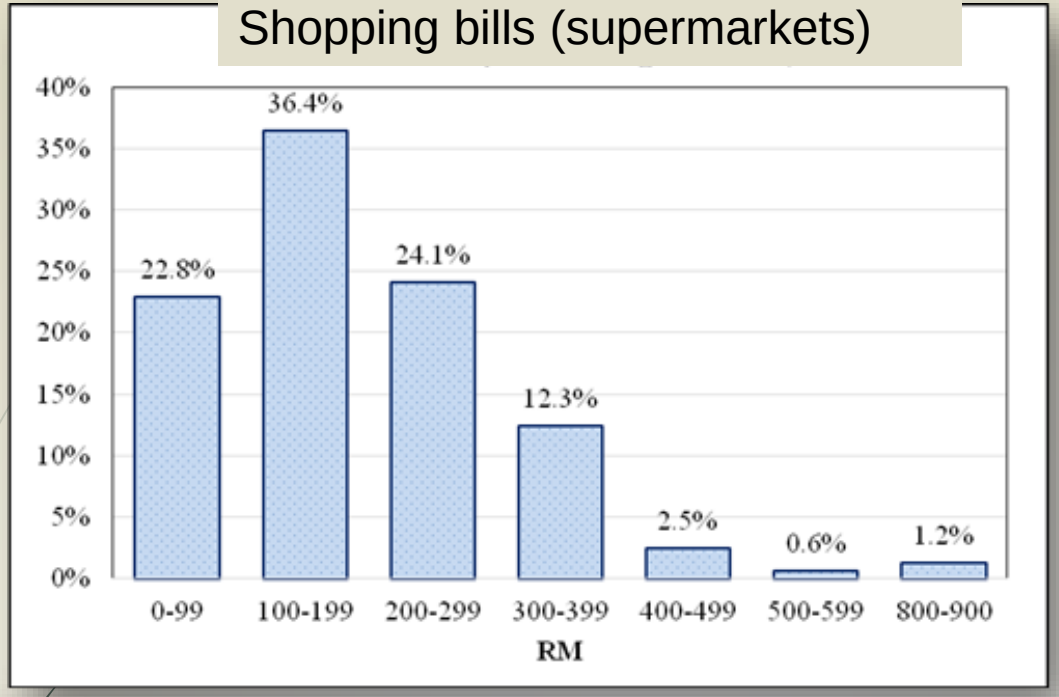

Minyak petrol/diesel
Tiada
Petrol
1
161
61
101
134
28
157
5
Kereta 1
Kereta 2
Kereta 3
Kereta 4


Kenderaan awam
bas
keretapi
teksi
Jumlah
160
140
120
100
80
60
40
20
0
1
0
0
21
20
18
3
6
5
137
136
139
0 – 50
101 – 150
201 – 250
Tiada
Batuan (km)

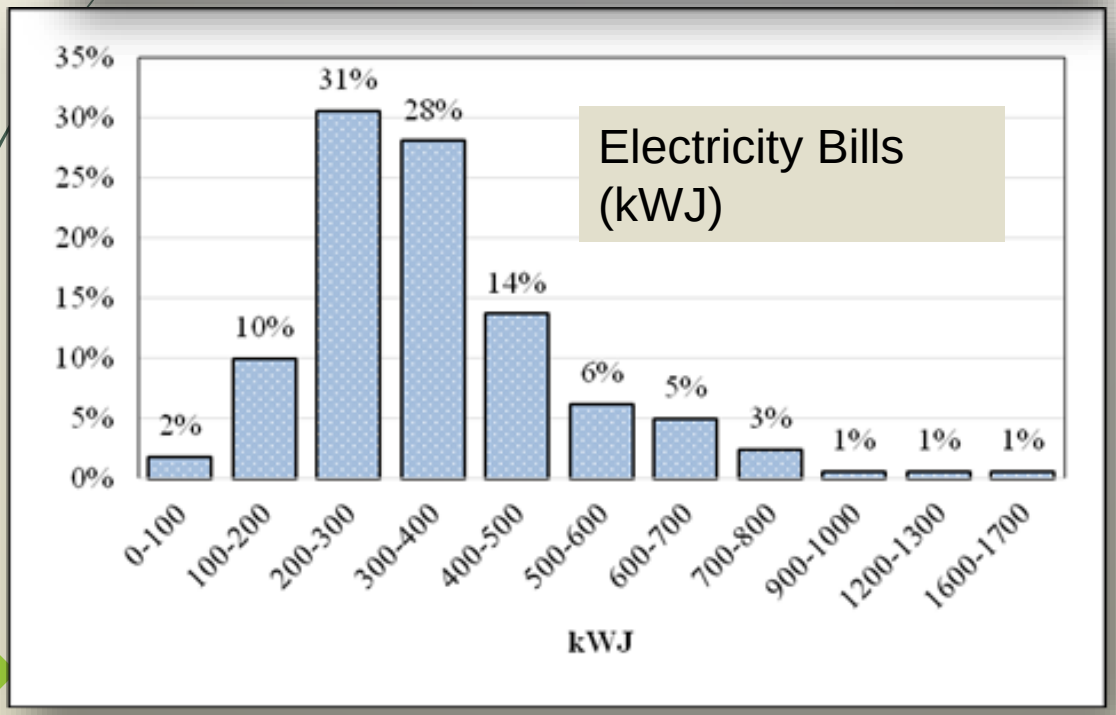

Types of cars versus age range
120
100
80
60
40
20
0
66.7
33.3
36
64
50
50
28.6
71.4
17.6
82.4
50
43.8
65.2
34.8
31.8
68.2
100
0
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
1) Automatic
2) Manual


Cars versus 6 zones
6 BANDAR TUN
57.8
40
5 BUKIT JALIL
76.5
23.5
4 DAMANSARA
64.3
35.7
3 SENTUL
70.8
29.2
2 WANGSA MAJU
57.1
42.9
1 KL
41.5
58.5
1) Automatic
2) Manual

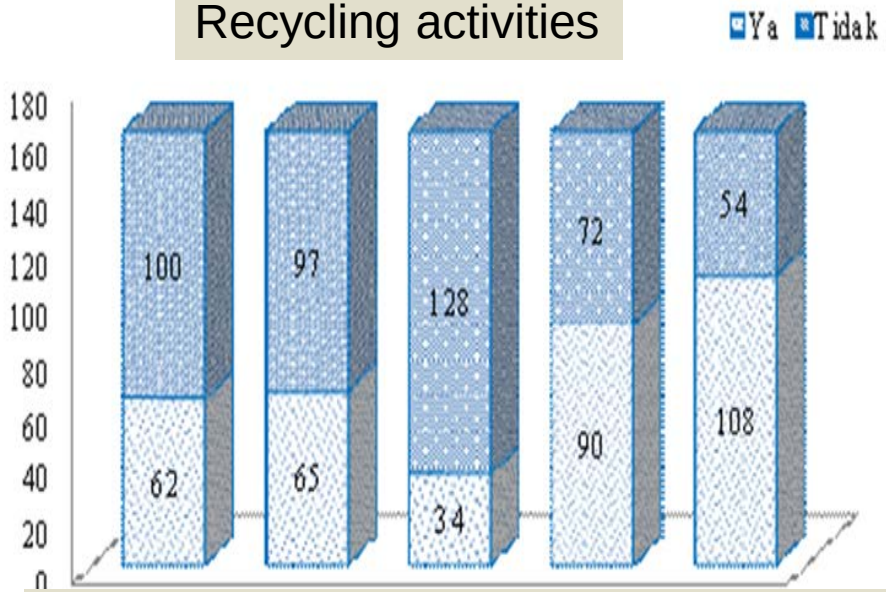
Shopping bills (supermarkets)

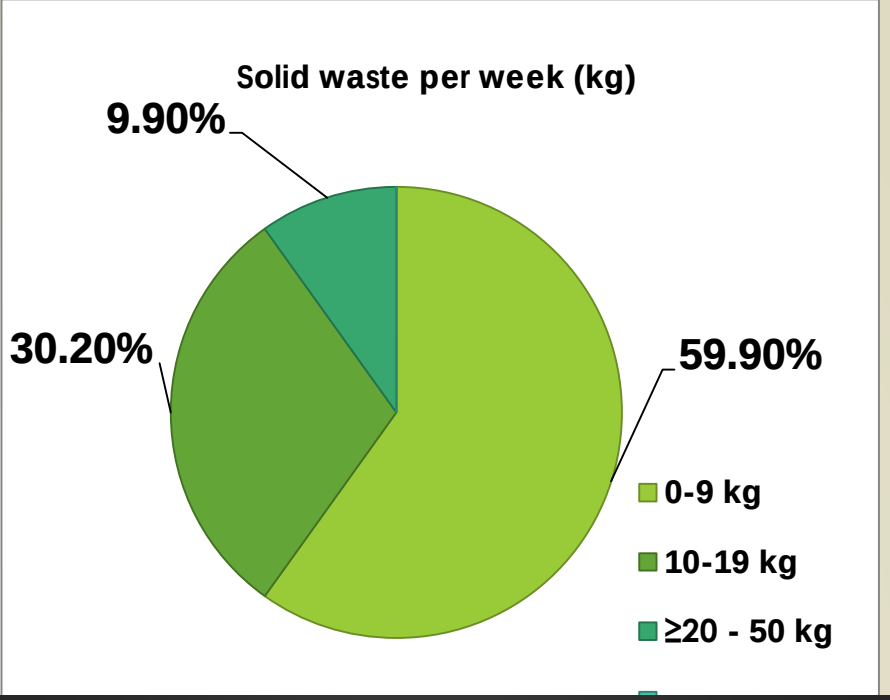


Electricity Bills (kWJ)

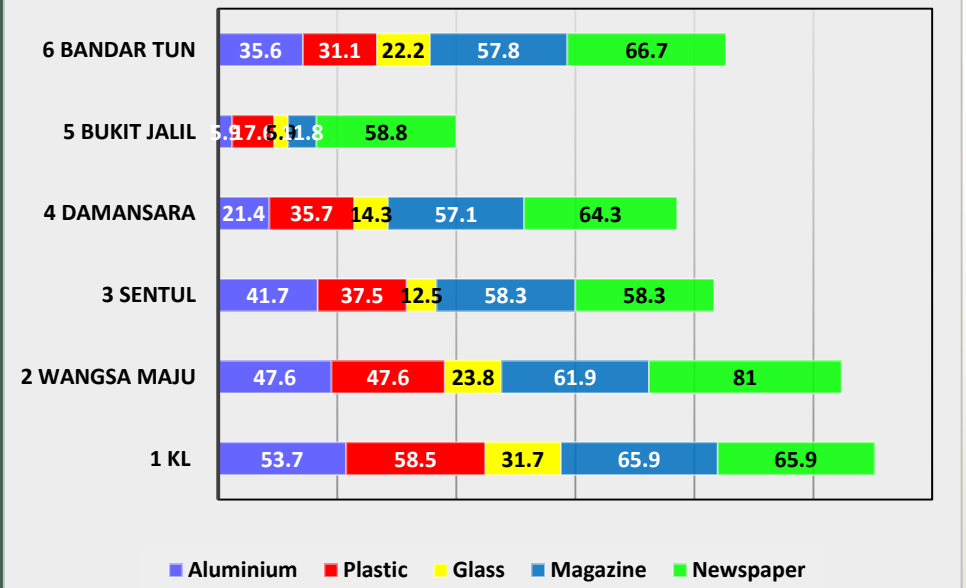


Recycling activities

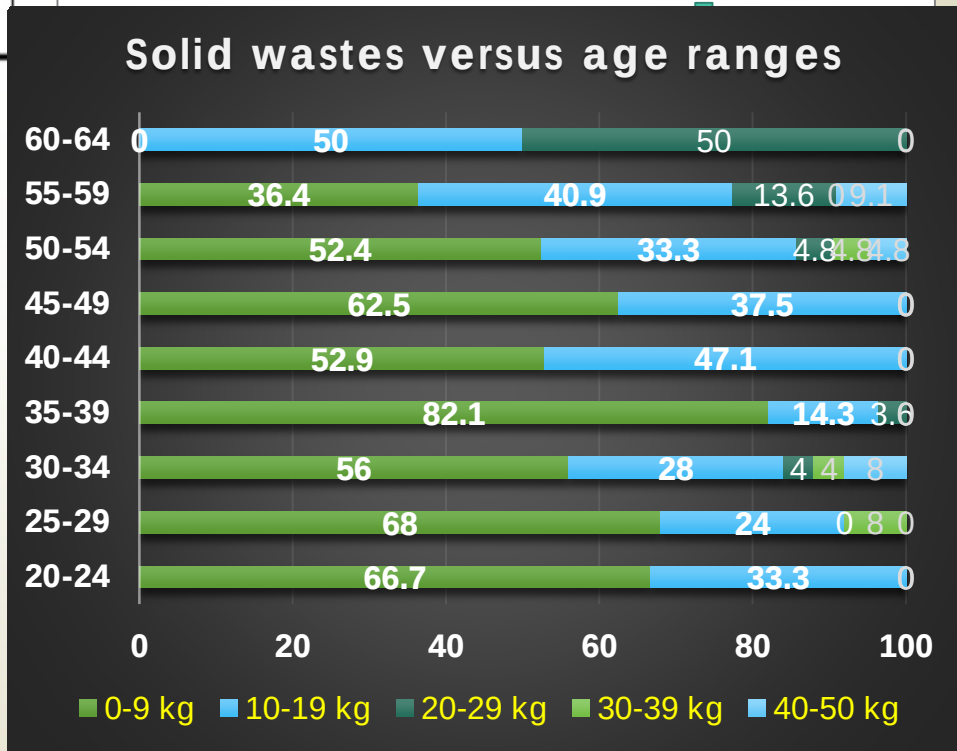




Recycling versus 6 zones



Solid wastes versus age ranges



Zones	Household emissions (ton/person/yr)	Respiration (ton/person/yr)
KL Centre	2.80	0.65
Wangsa Maju - Maluri	0.36	0.35
Sentul - Menjalara	1.1	0.40
Damansara - Penchala	0.34	0.20
Bukit Jalil - Seputeh	0.53	0.23
Bandar Tun Razak- Sg. Besi	0.97	0.63
TOTAL	**6.09**	**2.48**

Population of in KL (2016)	Household emissions (ton/yr)	Respiration (ton/yr)	CO_2 Sequestered (ton/ha/yr) 381 ha
1.79 million	**10,901,100**	**4,454,075**	**14,004**

CONCLUSION

- The release of carbon footprint in each zone is particularly alarming as every human activity in daily life produces CO_2.
- This study focuses only on the C footprint from household only and not other sources.
- While the ability of green space to absorb CO_2 is only calculated from large parks that are available in every zone.
- LULUCF sector plays a key role in Malaysia's action to address climate change, as it acts as a net sink. The Govt allocated USD30 million for forest reserves projects between 2010-2015, where 53,700 ha have been gazetted as Permanent Reserved Forest, contributing to 13,797 kt CO_2 eq.

Implications & Solutions:

- Investigation into the habits of inhabitants in Kuala Lumpur.
- Results can be used by local authorities into planning for a green living concept
- **CITIES ARE OUR FUTURE. C40 Cities:**
  - "We believe that a better global future lies in urban innovation and action. As the majority of future humans will live in cities, it just makes sense that our solution to climate change will reside there too."
- "When properly planned, capacitated, and managed through the appropriate governance structures, cities can be places of innovation and efficiency.
- Together with their local authorities, they have the potential to diminish the causes of climate change (mitigation) and effectively protect themselves from its impacts (adaptation)" (UN Habitat for a Better Urban Future)

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THANK YOU