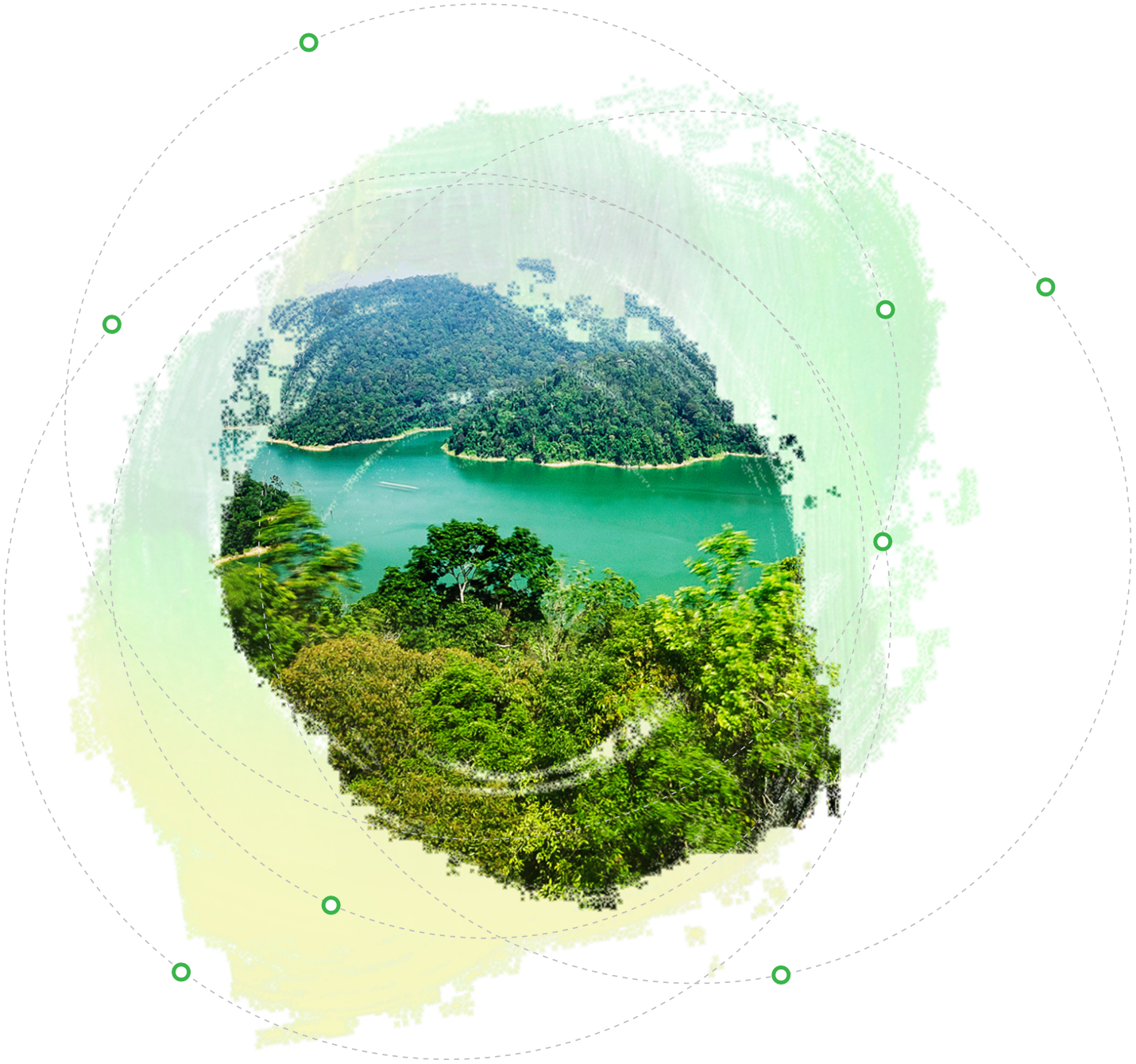


BAB 6
CHAPTER

INVENTORI PUNCA PENCEMARAN / POLLUTION SOURCES INVENTORY

PUNCA PENCEMARAN AIR

Punca punca pencemaran air terdiri dari punca-punca tetap dan punca-punca tidak tetap. Punca-punca pencemaran tetap adalah merujuk kepada pelepasan buangan cecair ke dalam sesuatu badan air di lokasi-lokasi tertentu melalui paip-paip atau pelepasan-pelepasan tertentu. Punca-punca tetap ini merangkumi pelepasan-pelepasan dari industri, loji pengolahan kumbahan dan ladang-ladang ternakan. Punca tidak tetap merupakan punca-punca yang berselerak dan tidak mempunyai takat pelepasan buangan yang tetap seperti aktiviti-aktiviti pertanian dan air larian dari pembukaan tanah.

Dalam tahun 2013, sebanyak 1,475,444 punca-punca pencemaran air telah dikenalpasti. Ianya terdiri dari 4,595 industri pembuatan, 10,336 loji kumbahan, 1,262,185 tangki septik individu (IST),

WATER POLLUTION SOURCES

The sources of water pollution can be categorised into point and non-point sources. Point sources are referred to sources with discharges entering the body of water at specific locations, such as from pipes or outfalls. Point sources include discharges from industries, sewage treatment plants and animal farms. Non-point sources are derieved from diffused sources that do not have specific discharge points, examples of which are from agricultural activities and surface run-offs.

In 2013, a total of 1,475,444 water pollution sources were identified. These sources include pollution from 4,595 manufacturing industries, 10,336 sewage treatment plants, 1,262,185 Individual Septic Tank (IST),

3,629 tangki septik berpusat (CST), 602 ladang ternakan (ladang babi), 508 industri berasaskan pertanian, 879 pasar basah dan 192,710 perkhidmatan penyediaan makanan. **(Jadual 6.1)**

3,629 Communal Septic Tank (CST), 602 animal farm (pig farming), 508 agro-based industries, 879 wet markets and 192,710 food services establishments. **(Table 6.1)**

Bil. / No	Jenis Punca / Type of sources	Bilangan punca / No. of sources
1	Industri pembuatan / Manufacturing Industries	4,595
2	Industri berasaskan pertanian / Agro-based Industries	
	a) Kilang getah / Rubber Mills	72
	b) Kilang kelapa sawit / Palm Oil Mills	436
3	Ladang ternakan (ladang babi) / Animal farms (Pig farming)^	602
4	Logi Pengolahan kumbahan / Sewage treatment plant@"	
	• Awam / Public	5,995
	• Swasta / Private	4,341
	• Tangki septik individu / Individual Septic Tank (IST)	1,262,185
	• Tangki septik Berpusat / Communal Septic Tank (CST)	3,629
5	Perkhidmatan penyediaan makanan / Food Services Establishments*	192, 710
6	Pasar basah / Wet markets"	879
	Jumlah / Total	**1,475,444**

Jadual 6.1 Malaysia : Pecahan Punca-Punca Pencemaran Mengikut Sektor, 2013
Table 6.1 Malaysia : Composition of Water Pollution Sources by Sector, 2013

Punca-punca maklumat / Sources of information:-

* Jabatan Perangkaan Malaysia (anggaran data berdasarkan data pada 2010) / Department of Statistics Malaysia (estimated data based on 2010 data)

@ Indah Water Konsortium

" Pihak Berkuasa Tempatan / Local Authorities

^ Jabatan Perkhidmatan Veterinar / Department of Veterinary Services

BEBAN PENCEMARAN

Tiga (3) parameter utama pencemaran yang mempunyai kesan signifikan kepada kualiti air sungai adalah Biologikal Oksigen Yang DiPerlukan (BOD_5), Pepejal Terampai (SS) dan Ammoniakal Nitrogen (AN). Beban pencemaran BOD_5, SS dan AN dihuraikan di bawah.

BEBAN BIOLOGIKAL OKSIGEN YANG DIPERLUKAN

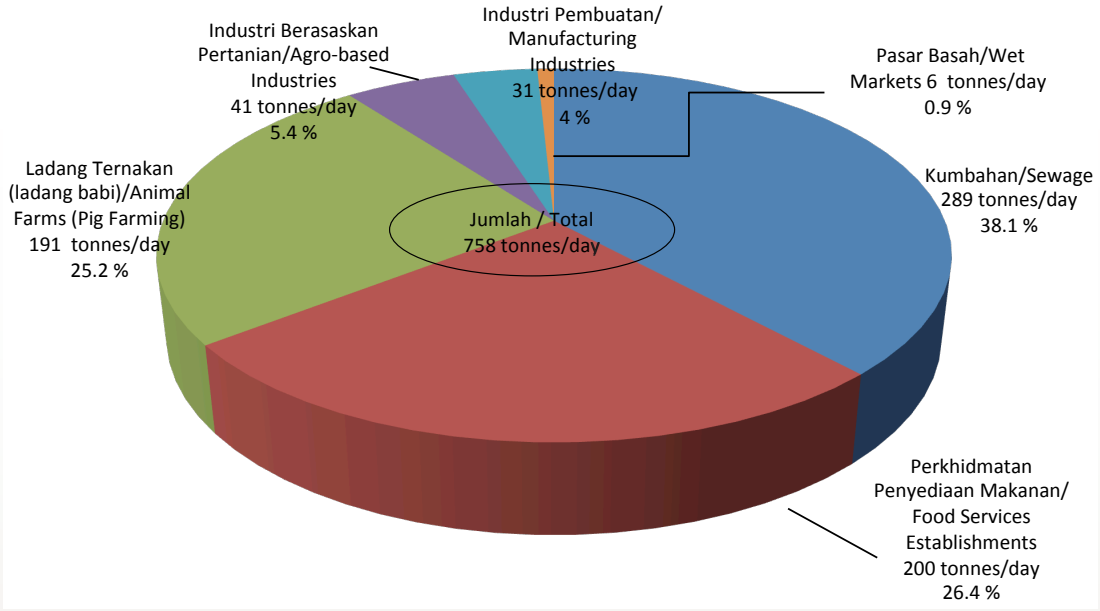
Anggaran Beban Biologikal Oksigen Yang DiPerlukan (BOD_5) yang dijana / dilepaskan dalam tahun 2013 adalah sebanyak 758 ton/hari dan kadar tersebut sebenarnya telah berkurangan sebanyak 10.6% dibandingkan pada tahun 2012 (848 ton/hari). Beban BOD_5 dari kumbahan pada tahun 2013 adalah berdasarkan kepada pelepasan yang sebenarnya, ia masih lagi merupakan penyumbang terbesar beban pencemaran ini dengan kadar sebanyak 289 ton/hari (38.1%), diikuti oleh perkhidmatan penyediaan makanan 200 ton/ hari (26.4%), ladang ternakan (ladang babi) 191 ton/hari (25.2%), industri berasaskan pertanian 41 ton/hari (5.4%), industri pembuatan 31 ton/hari (4%) dan pasar basah 6 ton/hari (0.9%) seperti ditunjukan dalam **Rajah 6.1.**

POLLUTION LOAD

The three (3) main parameters of pollutants that have significantly affected the quality of river water are Biological Oxygen Demand (BOD_5), Suspended Solids (SS) and Ammoniacal Nitrogen (AN). The BOD_5, SS and AN loadings are as described below.

BIOLOGICAL OXYGEN DEMAND LOAD

The estimated Biological Oxygen Demand (BOD_5) load in 2013, was 758 tonnes/day, which was a decrease of 10.6% as compared to 2012 (848 tonnes/day). The number of BOD_5 load for sewage in the year 2013 was based on actual discharges. Sewage remained the largest contributor with a total load of 289 tonnes/day (38.1%), followed by food services establishments which produced 200 tonnes/day (26.4%), animal farms (pig farming) 191 tonnes/day (25.2%), agro-based industries 41 tonnes/day (5.4%), manufacturing industries 31 tonnes/day (4%) and wet markets 6 tonnes/day (0.9%) as shown in **Figure 6.1.**



Rajah 6.1 Malaysia : Beban BOD_5 Mengikut Punca Pencemaran Air, 2013

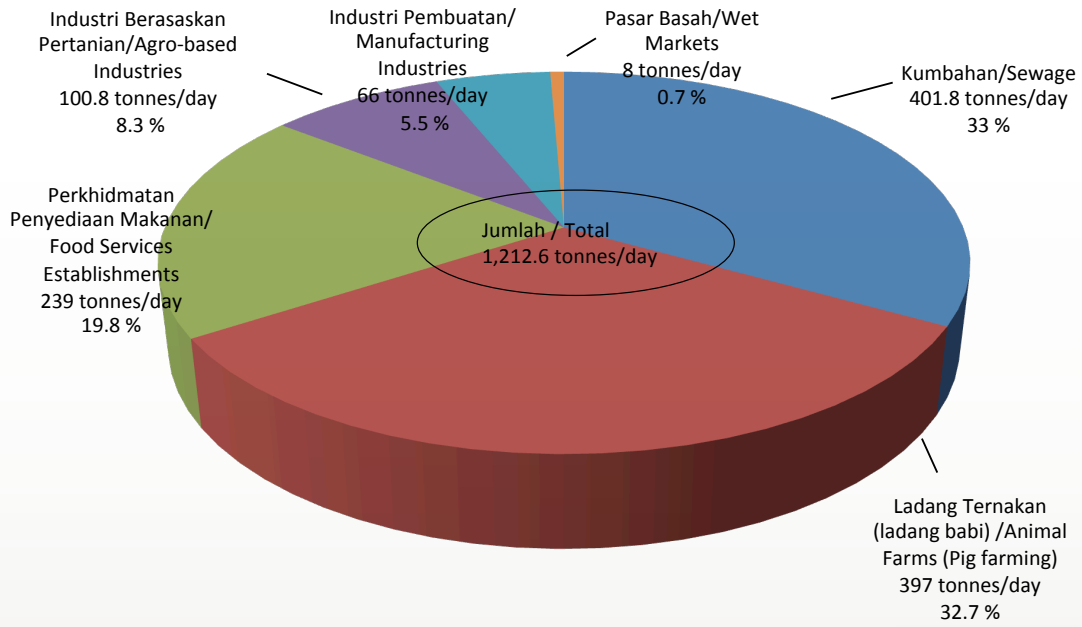
Figure 6.1 Malaysia : BOD_5 Loading by Water Pollution Sources, 2013

BEBAN PEPEJAL TERAMPAI

Anggaran Beban Pepejal Terampai (SS) dalam tahun 2013 adalah sebanyak 1,212.6 ton/hari di mana kumbahan merupakan penyumbang terbesar beban pencemaran ini dengan kadar sebanyak 401.8 ton/hari (33%), diikuti oleh ladang ternakan (ladang babi) 397 ton/hari (32.7%), perkhidmatan penyediaan makanan 239 ton/hari (19.8%), industri berasaskan pertanian 100.8 ton/hari (8.3%), industri pembuatan 66 ton/hari (5.5%) dan pasar basah 8 ton/hari (0.7%) seperti ditunjukkan dalam **Rajah 6.2**

SUSPENDED SOLIDS LOAD

The estimated total of Suspended Solids (SS) load in 2013 was 1,212.6 tonnes/day, sewage being the largest contributor with a total load of 401.8 tonnes/day (33%), followed by animal farms (pig farm) 397 tonnes/day (32.7%), food services establishments 239 tonnes/day (19.8%), agro-based industries 100.8 tonnes/day (8.3%), manufacturing Industries 66 tonnes/day (5.5%) and wet markets 8 tonnes/day (0.7%) as shown in **Figure 6.2.**



Rajah 6.2 Malaysia : Beban SS Mengikut Punca Pencemaran Air, 2013

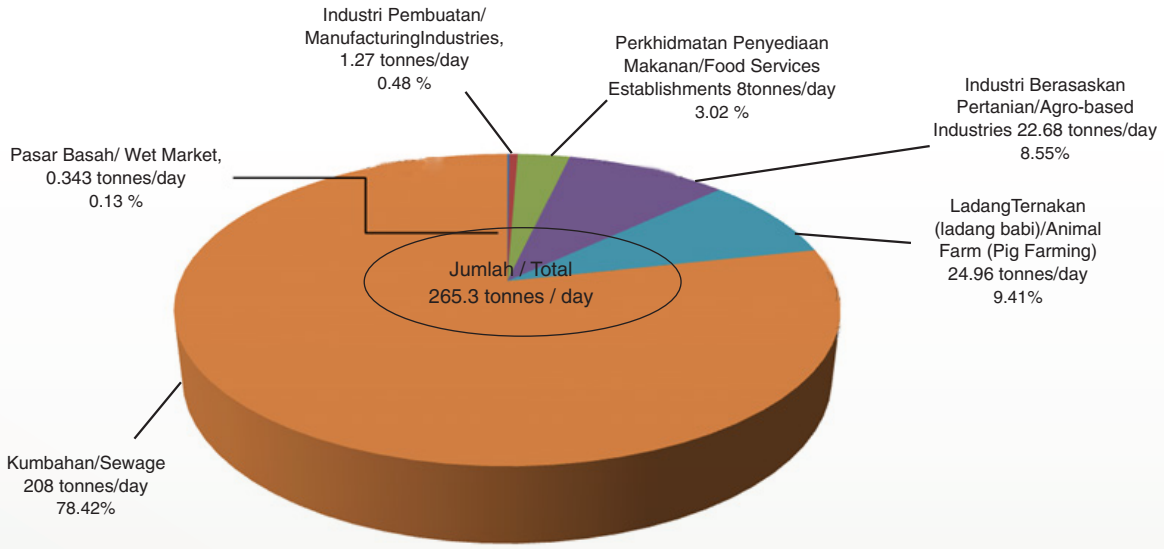
Figure 6.2 Malaysia : SS Loading by Water Pollution Sources, 2013

BEBAN AMMONIAKAL NITROGEN

Anggaran Beban Ammoniakal Nitrogen dalam tahun 2013 adalah sebanyak 265.3 ton/hari di mana kumbahan merupakan penyumbang terbesar beban pencemaran ini dengan kadar 208 ton/hari (78.4%), diikuti oleh ladang ternakan (ladang babi) 25 ton/hari (9.4%), industri berasaskan pertanian sebanyak 22.7 ton/hari (8.6%), perkhidmatan penyediaan makanan 8 ton/hari (3%), industri pembuatan 1.3 ton/hari (0.5%) dan pasar basah 0.3 ton/hari (0.1%) seperti ditunjukkan dalam **Rajah 6.3.**

AMMONIACAL NITROGEN LOAD

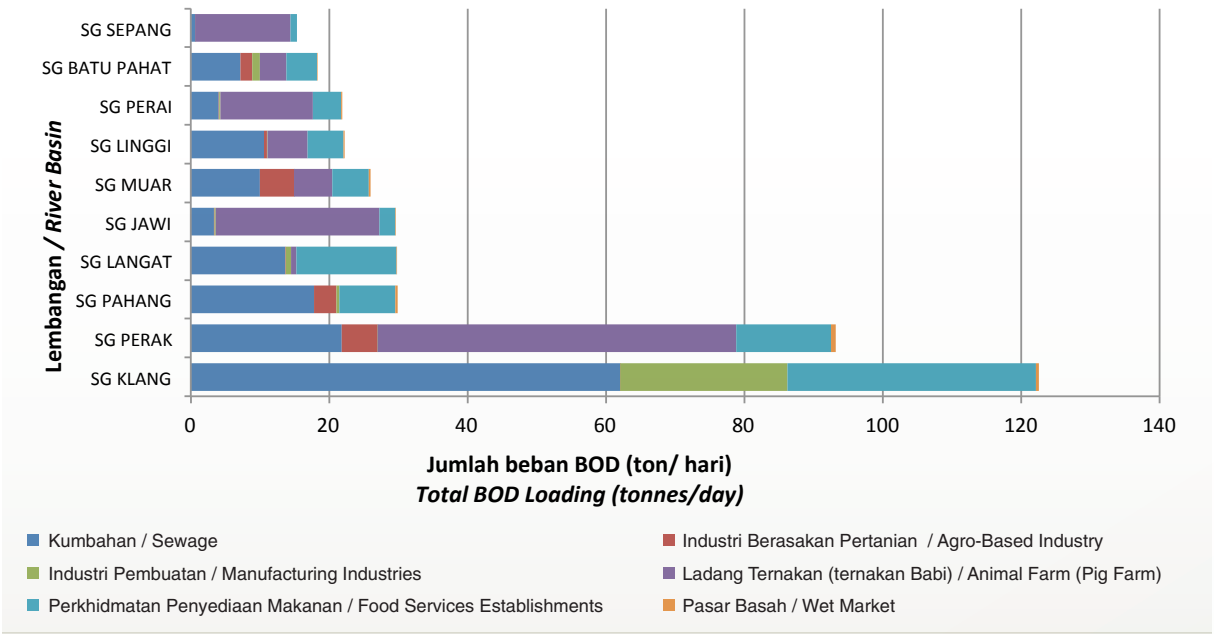
The estimated total of Ammoniacal Nitrogen (AN) load in 2013 was 265.3 tonnes/day, sewage being the largest contributor with a total load of 208 tonnes/day (78.4%), followed by animal farms (pig farming) 25 tonnes/day (9.4%), agro-based industries 22.7 tonnes/day (8.6%), food services establishments 8 tonnes/day (3%), manufacturing industries 1.3 tonnes/day (0.5%) and wet markets 0.3 tonnes/day (0.1%) as shown in **Figure 6.3.**



Rajah 6.3 Malaysia : Beban AN Mengikut Punca Pencemaran Air, 2013
Figure 6.3 Malaysia : AN Loading by Water Pollution Sources, 2013

Melalui perbandingan dengan lembangan lembangan yang ada di negara ini, Lembangan Klang (Kuala Lumpur dan Selangor) merupakan lembangan yang tertinggi telah menerima beban BOD_5 (122.5 ton/hari), diikuti Lembangan Perak (Perak) 93.2 ton/hari, Lembangan Pahang (Pahang dan Negeri Sembilan) 29.9 ton/hari, Lembangan Langat (Selangor dan Negeri Sembilan) 29.8 ton/hari, dan Lembangan Sungai Jawi (Pulau Pinang) 29.6 ton/hari. Beban BOD_5 untuk 10 lembangan tertinggi ditunjukkan di **Rajah 6.4**. Beban BOD_5 untuk lain-lain lembangan adalah dianggarkan kurang dari 26 ton/hari.

In comparison to the other river basins in the country, the Klang River Basin (Kuala Lumpur and Selangor) received the highest BOD_5 load (122.5 tonnes/day), followed by the Perak River Basin (Perak) 93.2 tonnes/day, the Pahang River Basin (Pahang and Negeri Sembilan) 29.9 tonnes/day, the Langat River Basin (Selangor and Negeri Sembilan) 29.8 tonnes/day and the Jawi River Basin (Pulau Pinang) 29.6 tonnes/day. The BOD_5 loading of the highest 10 river basins is as shown in **Figure 6.4.** The BOD_5 load for the rest of the river basins was estimated to be less than 26 tonnes/day.

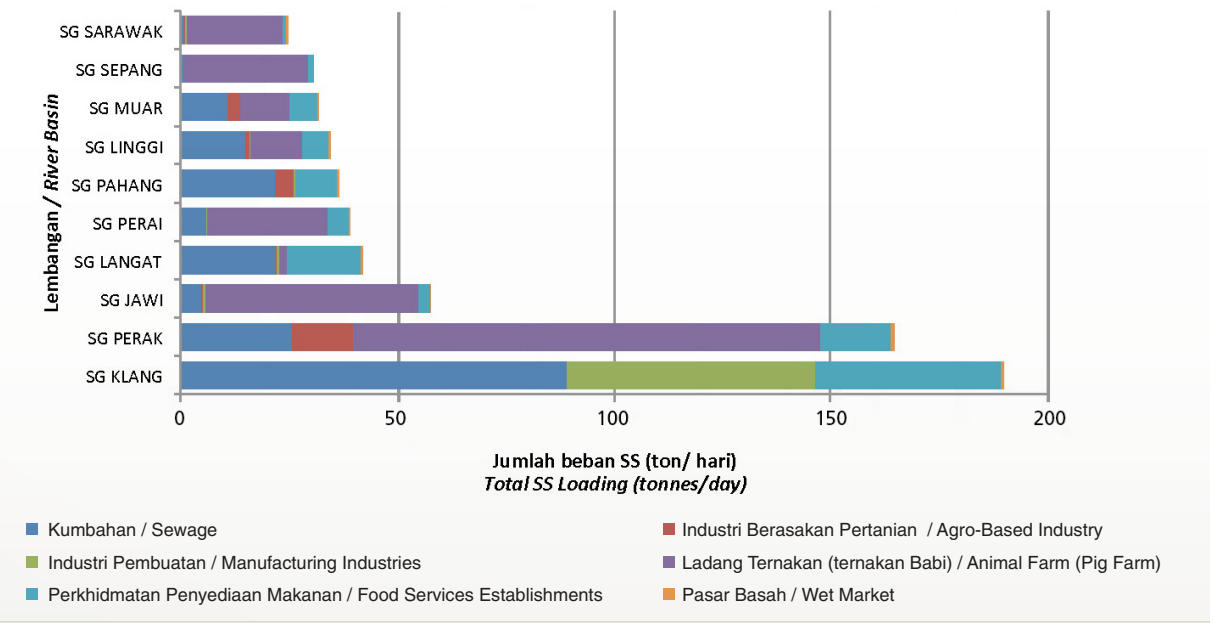


Rajah 6.4 Malaysia : Taburan Beban BOD_5 ke Dalam Lembangan dan Punca Punca Pencemaran Air, 2013

Figure 6.4 Malaysia : Distribution of BOD_5 Load by River Basin and Water Pollution Sources, 2013

Lembangan Klang telah menerima Beban SS yang tertinggi (189.7 ton/hari), diikuti Lembangan Perak 164.6 ton/hari, Lembangan Jawi 57.7 ton/hari, Lembangan Langat 41.9 ton/hari dan Lembangan Perai (Negeri Pulau Pinang) 39 ton/hari. Beban SS untuk10 lembangan tertinggi ditunjukkan di **Rajah 6.5.** Beban SS untuk lain-lain lembangan adalah dianggarkan kurang dari 37 ton/hari.

The Klang River Basin continued to receive the highest SS Load (189.7 tonnes/day), followed by the Perak River Basin 164.6 tonnes/day, the Jawi River Basin 57.7 tonnes/ day, the Langat River Basin 41.9 tonnes/day and the Perai River Basin Pulau Pinang 39 tonnes/day. The SS loading for the highest 10 river basins is as shown in **Figure 6.5**. The SS load for the rest of the river basins was estimated to be less than 37 tonnes/ day.

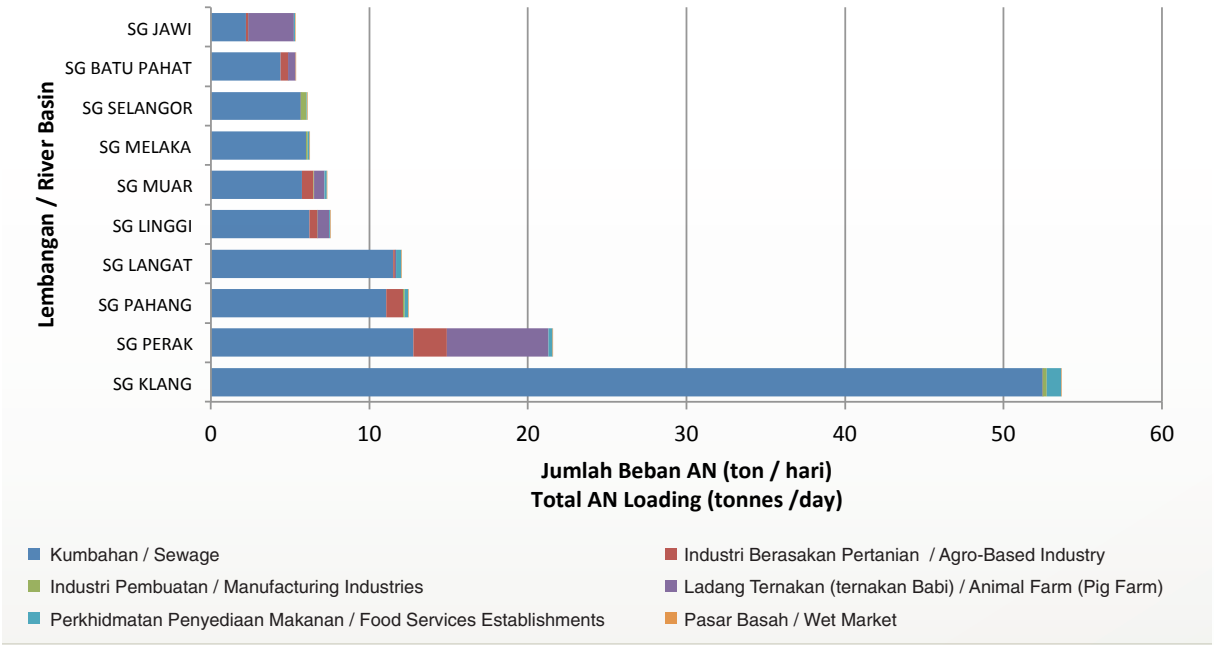


Rajah 6.5 Malaysia : Taburan Beban SS ke dalam lembangan dan punca punca pencemaran air, 2013

Figure 6.5 Malaysia : Distribution of SS Load by river basin and water pollution sources, 2013

Lembangan Klang telah menerima beban AN yang tertinggi (54.1 ton/hari), diikuti Lembangan Perak 21.8 ton/hari, Lembangan Pahang 12.5 ton/hari, Lembangan Langat (Selangor & Negeri Sembilan) 12.2 ton/ hari dan Lembangan Linggi (Negeri Sembilan & Melaka) 7.6 ton/hari. Beban AN untuk 10 lembangan tertinggi ditunjukkan di dalam **Rajah 6.6.** Beban AN untuk lain-lain lembangan adalah dianggarkan kurang dari 7.5 ton/hari.

The Klang River Basin received the highest AN Load (54.1 tonnes/day), followed by Perak River Basin 21.8 tonnes/day, Pahang River Basin 12.5 tonnes/day, Langat River Basin (Selangor & Negeri Sembilan) 12.2 tonnes/day and Linggi River Basin (Negeri Sembilan & Melaka) 7.6 tonnes/day. The AN loading for the same 10 river basins is as shown in **Figure 6.6.** The AN load for the rest of the river basins was estimated to be less than 7.5 tonnes/day.



Rajah 6.6 Malaysia : Taburan Beban AN ke dalam lembangan dan punca punca pencemaran air, 2013

Figure 6.6 Malaysia : Distribution of AN Load by river basin and water pollution sources, 2013

PENYEDIAAN GEO-INFORMATION SPATIAL (GIS)

Sehingga tahun 2013, kemasukan data-data inventori ke dalam Geo-Information Spatial (GIS) sedang dilaksanakan untuk lembangan Langat, Lembangan Muar, Lembangan Muda, Sungai Bertam (Cameron Highlands) dan Lembangan Klang (River of Life) seperti dalam **Jadual 6.2.**

GEO-INFORMATION SPATIAL (GIS) PROVISION

Until 2013, the entry of inventory data into the Geo-Spatial Information (GIS) was implemented for the Langat River Basin, the Muar River Basin, the Muda River Basin, the Bertam River (Cameron Highlands) and the Klang River Basin (River of Life), as shown in **Table 6.2.**

	KATEGORI / CATEGORY	LANGAT	MUAR	MUDA	BERTAM (Cameron Highlands)	KLANG (RoL)
1	Perkhidmatan Makanan / Food Services Establishments	3,562	2,085	228	175	5,564
2	Ternakan babi / Pig Farms	4	11	0	0	0
3	Pasar basah/ Wet Markets	27	38	11	3	29
4	Loji kumbahan / Sewage plants	487	178	32	58	455
5	Kilang kelapa sawit / Palm Oil Mills	10	14	4	0	0
6	Kilang getah / Rubber Factories	0	14	6	0	0
7	Kemudahan Pengolahan BT / BT Processing Facilities	33	3	2	0	9
8	Industri / Industries	367	700	190	8	577
9	Tapak pelupusan sampah / Landfill	8	10	5	1	29
10	Kuari / Quarries	11	10	4	1	5
	JUMLAH / TOTAL	**4,550**	**3,067**	**557**	**316**	**6,677**

Jadual 6.2 Malaysia : Punca Pencemaran Mengikut Kategori dan Lembangan Sungai

Table 6.2 Malaysia : Pollution Source Categories by River Basins

PUNCA - PUNCA PENCEMARAN UDARA

Industri termasuklah loji janakuasa, kenderaan bermotor dan aktiviti pembakaran terbuka merupakan punca utama pencemaran udara di negara ini.

Sehingga bulan Disember 2013, jumlah punca industri yang tertakluk di bawah Peraturan-Peraturan Kualiti Alam Sekeliling (Udara Bersih) 1978 adalah sebanyak 14,011. Jumlah ini berkurangan sebanyak 1,470 berbanding pada tahun 2012 (15,481). Ini jelas menunjukkan penurunan yang ketara dari segi bilangan punca industri yang telah direkodkan pada tahun 2012 iaitu sebanyak 15,481. Pecahan punca industri berdasarkan negeri adalah seperti **Rajah 6.7.** Bilangan punca pencemar yang tertinggi adalah di Selangor (2,910: 20.8%) diikuti Johor (2,270:16.2%) dan Sarawak (1,681:12.0%)

SOURCES OF AIR POLLUTION

Industries including power plants, motor vehicles and open burning activities are still the major sources of air pollution in the country.

As of December 2013, a total of 14,011 industrial sources were identified to be subjected to the Environmental Quality (Clean Air) Regulations, 1978, down by 1,470 as compared to 2012, that recorded a total of 15,481 sources. The distribution of industrial sources by states is as shown in **Figure 6.7.** The highest number of stationary pollution sources was found in Selangor (2,910: 20.8%), followed by Johor (2,270: 16.2%) and Sarawak (1,681: 12.0 %).

Seperti tahun-tahun yang lepas, kenderaan bermotor merupakan punca utama yang menyumbang kepada pencemaran udara terutamanya di kawasan bandar. Pada tahun 2013, terdapat peningkatan bagi jumlah keseluruhan kenderaan bermotor yang didaftarkan. Bilangan pendaftaran yang direkodkan bagi kenderaan penumpang meningkat sebanyak 1.74%, motosikal 4.70%, kenderaan barangan 8.16% dan teksi 7.40% berbanding pada tahun 2012, manakala bilangan bagi bas berkurangan sebanyak 14.62% (73,536:2012), (62,784:2013). Pendaftaran kenderaan bermotor yang direkodkan oleh Jabatan Pengangkutan Jalan pada tahun 2012 dan 2013 adalah seperti yang ditunjukkan dalam **Rajah 6.8.** Walau bagaimanapun, bilangan bagi kenderaan terpakai dan yang masih aktif menunjukkan tren penurunan, di mana bilangan bagi motosikal berkurangan sebanyak 3.46%, kenderaan barangan 2.0% pengurangan, teksi 0.28% pengurangan dan bas 10.42% pengurangan jika dibandingkan dengan tahun 2012 **(Rajah 6.9).** Manakala, bagi kenderaan penumpang, ianya masih menunjukkan peningkatan sebanyak 2.99% berbanding tahun 2012.

Motor vehicles remained the major source of air pollution especially in urban areas, over the past years. In 2013, there was an overall increase in the number of motor vehicles registered. The number of registered passenger cars increased by 1.74%, motorcycles 4.70%, goods vehicles 8.16% and taxi 7.40%, as compared to 2012, while the number of buses decreased by 14.62% (73,536:2012), (62,784:2013). The total number of registered vehicles in Malaysia, as reported by the Road Transport Department for 2012 and 2013, is shown in **Figure 6.8.** In addition to this, the number of in-use vehicles or vehichels that are active on the road also showed a downward trend, with motorcycles recording a decrease of 3.46%, goods vehicles by 2.0%, taxis by 0.28% and buses which showed a decrease of 10.42%, as compared to 2012 **(Figure 6.9).** Meanwhile, passenger vehicles trended upwards by 2.99% in 2013, as compared to 2012.

BEBAN PENCEMARAN PENCEMAR UDARA

Beban Pencemaran Secara Menyeluruh

Dianggarkan pada tahun 2013, keseluruhan beban pencemaran yang terkumpul bagi pencemar karbon monoksida (CO) adalah

AIR POLLUTANT EMISSION LOAD

Overall Emission Load

It was estimated in 2013 that the combined air pollutant emission load accumulated to 1,874,836 metric tonnes of carbon

1,874,836 metrik tan; 858,048 metrik tan bagi nitrogen dioksida (NO_2); 198,920 metrik tan bagi sulfur dioksida (SO_2) dan 24,006 metrik tan bagi jirim zarah terampai (PM). Perbezaan keseluruhan beban pencemaran bagi tahun 2012 dan 2013 adalah ditunjukkan dalam **Rajah 6.10.**

Beban pencemaran bagi NO_2 adalah berkurangan pada tahun 2013 berbanding dengan tahun 2012 disebabkan pengurangan jumlah kenderaan yang beroperasi atau yang masih aktif terutamanya bas. Peningkatan sebanyak 0.06% beban pencemaran CO dan 0.2% bagi SO_2 berbanding dengan tahun 2012 adalah disebabkan penggunaan arang batu sebagai bahan api dalam industri manakala peningkatan ketara beban pencemar PM pula mungkin disebabkan penggunaan bahan api minyak dan arang batu yang tinggi sebagai bahan api dalam industri dan loji janakuasa. (Sumber: National Energy Balance, 2011)

Punca Beban Pencemaran

Loji janakuasa merupakan penyumbang utama kepada beban pencemar SO_2 (50%), diikuti dengan lain-lain kategori (34%), industri (9%) dan kenderaan bermotor (7%) **(Rajah 6.11).** Bagi beban pencemar PM pula, penyumbang terbesar adalah daripada industri (30%), diikuti oleh loji janakuasa (27%), lain-lain kategori (25%) dan kenderaan bermotor (18%) **(Rajah 6.12).** Seperti yang ditunjukkan dalam **Rajah 6.13**, penyumbang terbesar bagi

monoxide (CO); 858,048 metric tonnes of nitrogen oxides (NO_2); 198,920 metric tonnes of sulphur dioxide (SO_2) and 24,006 metric tonnes of particulate matter (PM). A comparison of the combined air pollutant emission load in 2012 and 2013 is as shown in **Figure 6.10.**

The emission load for NO_2 had improved in 2013 as compared to 2012 due to the decrease in the number of in-use or active motor vehicles on the roads, especially buses. The increased of 0.06% in CO emission load and 0.2% in SO_2 emission load, compared to 2012, was due to the consumption of coal as a form of fuel within industries, while the significant increase in emission load for PM could be due to high usage of fuel oil and coal, used as fuel in industries such as power and heat generation plants. (Sources: National Energy Balance 2011).

Emission Load by Sources

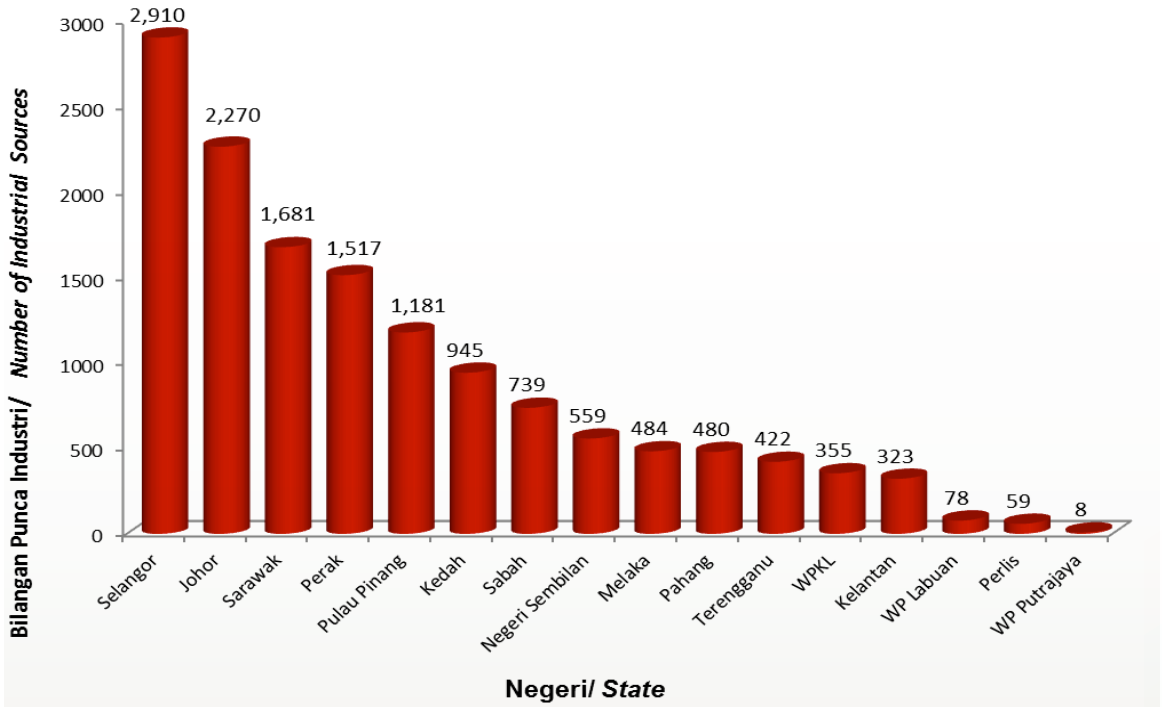
Power plants contributed the highest SO_2 emission loads (50%), followed by others (34%), industries (9%) and motor vehicles (7%) **(Figure 6.11).** As for PM, the highest contributors were industries (30 %) followed by power plants (27%), others (25%) and motor vehicles (18%) **(Figure 6.12)**. As shown in **Figure 6.13**, the highest contributor of NO_2 was power plants (61%) followed by motor vehicles (26%), others (7%) and industries (6 %). Motor vehicles,

NO_2 adalah daripada loji janakuasa (61%) diikuti kenderaan bermotor (26%), lain-lain kategori (7%) dan industri (6%). Walau bagaimanapun, kenderaan bermotor masih merupakan penyumbang terbesar kepada CO (95.3%) **(Rajah 6.14).**

Anggaran pencemaran yang dihasilkan oleh beban pencemar udara iaitu HC, CO, PM, NO_2 dan CO_2 daripada kenderaan bermotor pada tahun 2012 dan 2013 ditunjukkan dalam **Rajah 6.15.** Pada tahun 2013, beban pencemaran bagi pencemar HC dan CO dianggarkan 417,953 metrik tan dan 1,786,411 metrik tan masing-masing. Terdapat peningkatan sebanyak 0.39% bagi beban pencemaran CO jika dibandingkan dengan tahun 2012. Walau bagaimanapun, beban pencemaran bagi HC berkurangan sebanyak 1.99% pada tahun 2013. Tren penurunan yang sama juga dilihat bagi beban pencemaran yang dihasilkan oleh SO_2, NO_2, PM daripada kenderaan bermotor pada tahun 2013. Beban pencemaran yang dihasilkan oleh pencemar PM adalah 4,339 metrik tan pada tahun 2013 berbanding 4,584 metrik tan pada tahun 2012 (berkurangan sebanyak 5.37%); SO_2 sebanyak 14,053 metrik tan pada tahun 2013 berbanding pada 14,391 metrik tan pada tahun 2012 (berkurangan sebanyak 2.35%) dan NO_2 sebanyak 220,789 metrik tan pada tahun 2013 berbanding 226,209 metrik tan pada tahun 2012 (berkurangan sebanyak 2.40%)

however, remained the highest contributor of CO (95.3 %) **(Figure 6.14).**

The estimated annual air pollutant emission load of HC, CO, PM, NO_2 and SO_2 from motor vehicles for 2012 and 2013, are shown in **Figure 6.15**. In 2013, the emission load of HC and CO were estimated to be 417,953 metric tonnes and 1,786,411 metric tonnes, respectively. This was an increase of 0.39% of CO emission load compared to 2012. However, the emission load of HC decreased by 1.99% in 2013. A similar decreasing trend was also observed for SO_2, NO_2 and PM emission load from motor vehicles in 2013. Emission load from PM was recorded at 4,339 metric tonnes in 2013 as compared to 4,584 metric tonnes in 2012 (5.37% decrease); SO_2 was 14,053 metric tonnes in 2013 as compared to 14,391 metric tonnes in 2012 (2.35% decrease); and NO_2 was 220,789 metric tonnes as compared to 226,209 metric tonnes in 2012 (2.40% decrease).

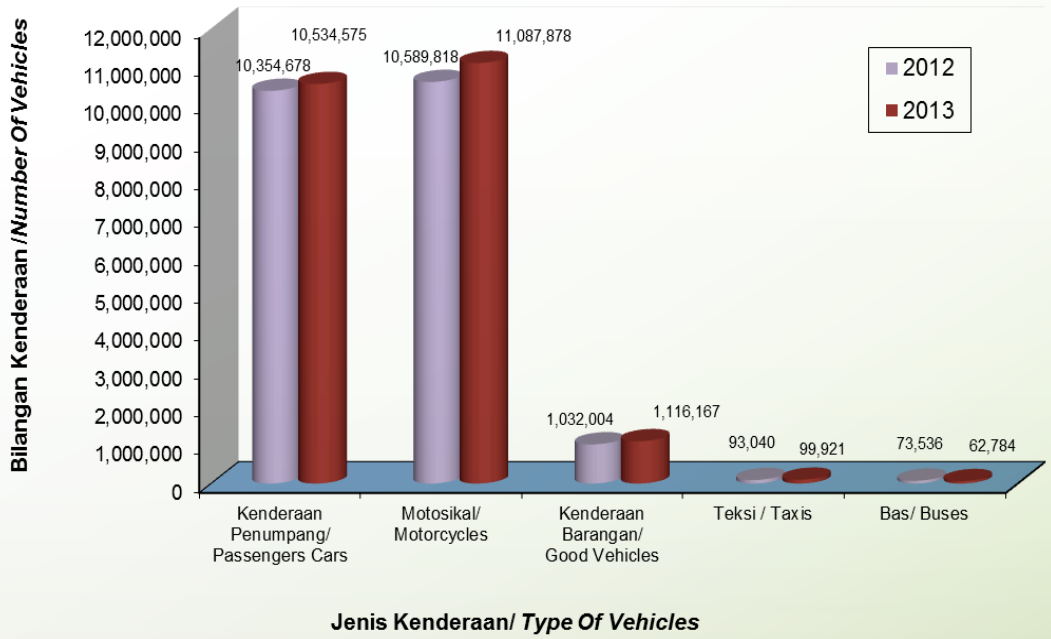


(Sumber: Sistem Inventori Pencemaran Alam Sekitar (SIMPAS), Jabatan Alam Sekitar)

(Sources: Environmental Pollution Inventory System (SIMPAS), Department of Environment, 2013)

Rajah 6.7 Malaysia: Punca Pencemaran Udara Mengikut Negeri, 2013

Figure 6.7 Malaysia: Industrial Air Pollution Sources by State, 2013

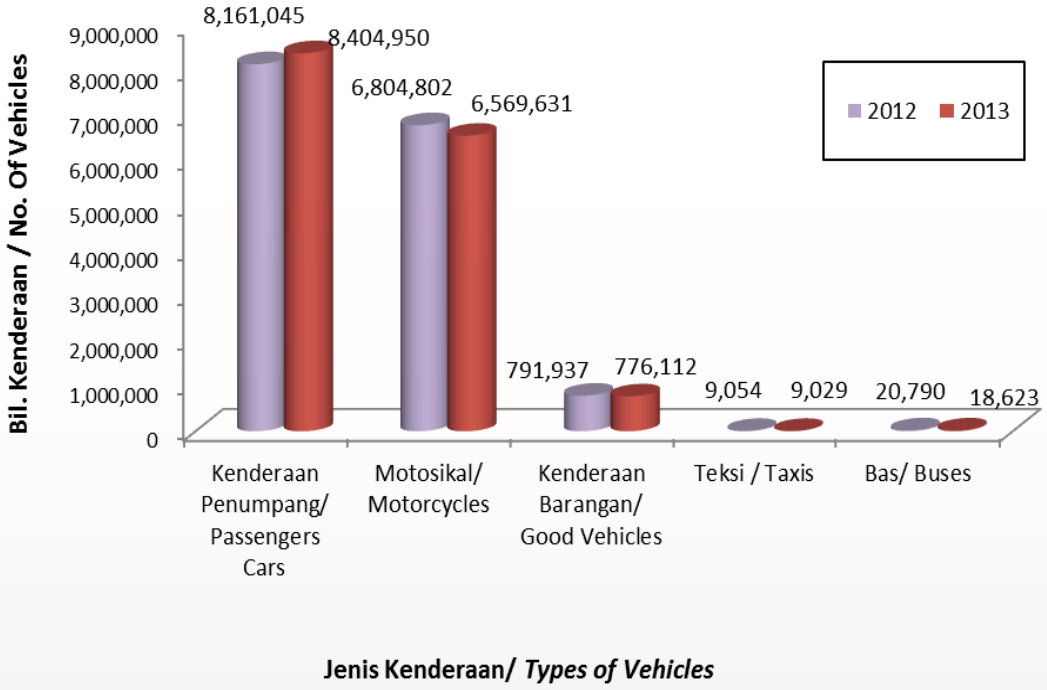


(Sumber: Jabatan Pengangkutan Jalan , Malaysia 2013)

(Source: Road Transport Department, Malaysia, 2013)

Rajah 6.8 Malaysia: Bilangan Kenderaan Berdaftar Tahun 2012-2013

Figure 6.8 Malaysia: Number of Registered Vehicles in 2012 – 2013

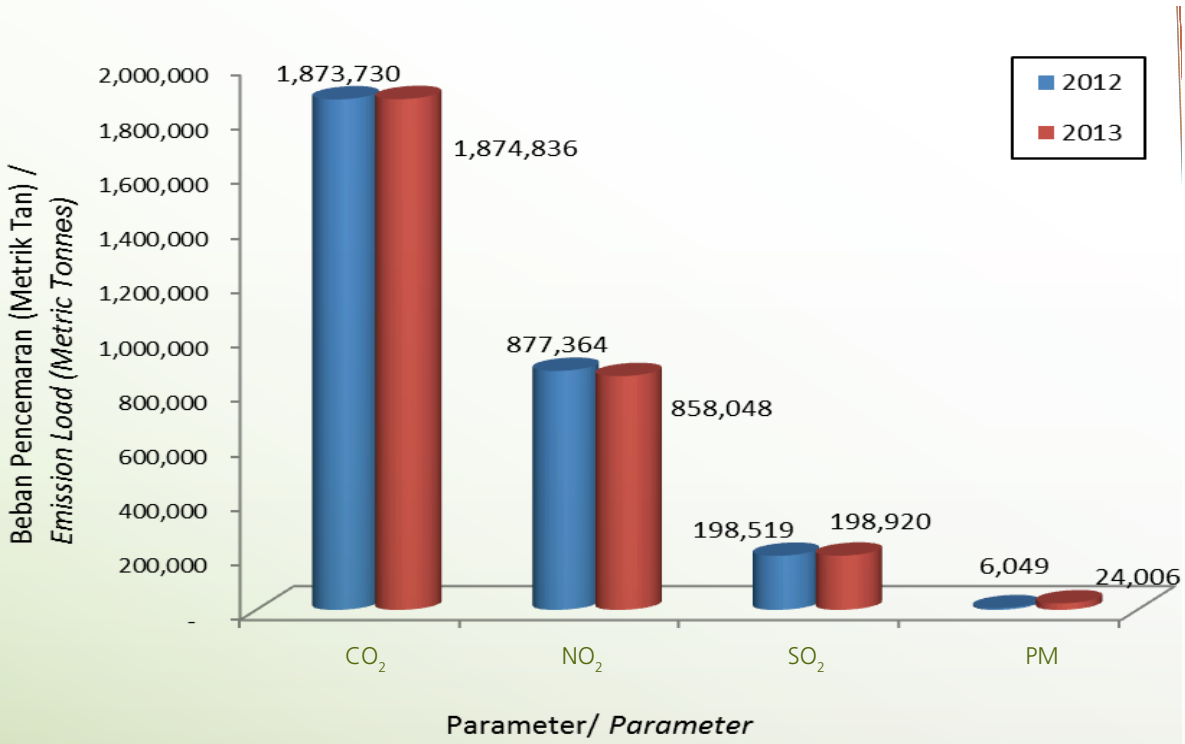


(Sumber: Jabatan Pengangkutan Jalan, Malaysia 2013)

(Source: Road Transport Department, Malaysia, 2013)

Rajah 6.9 Malaysia: Bilangan Kenderaan Terpakai Tahun 2012-2013

Figure 6.9 Malaysia: Number of in Use Vehicles in 2012-2013

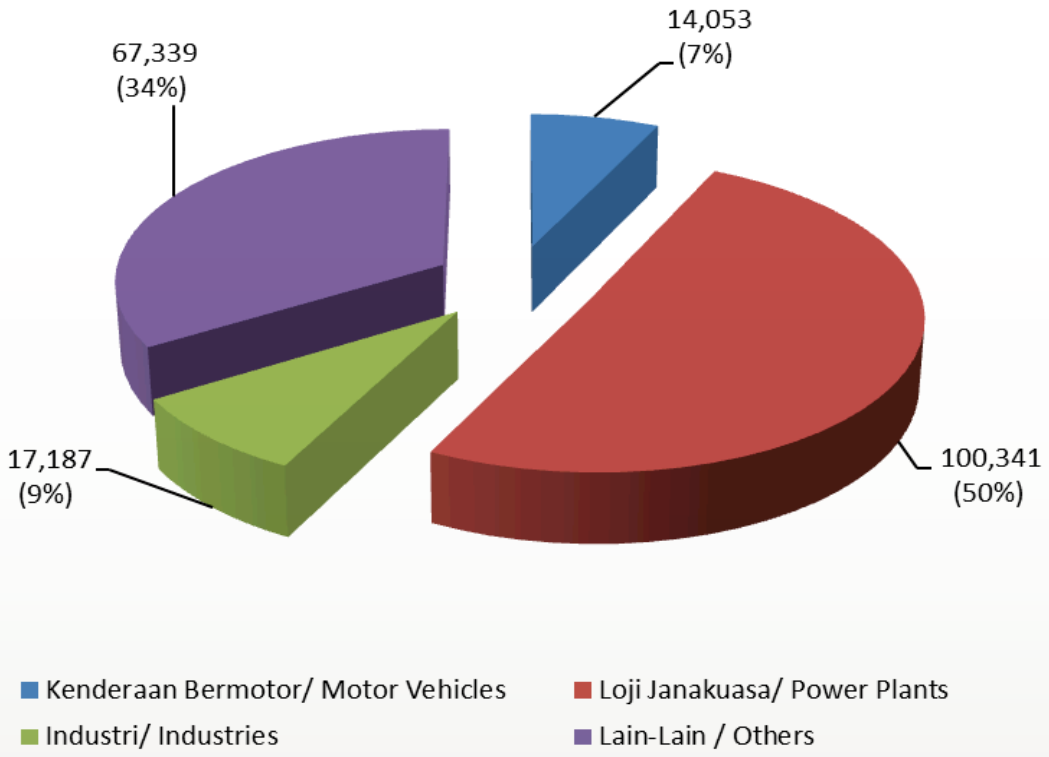


(Sumber: Dari National Energy Balance 2011)

(Sources: From National Energy Balance 2011)

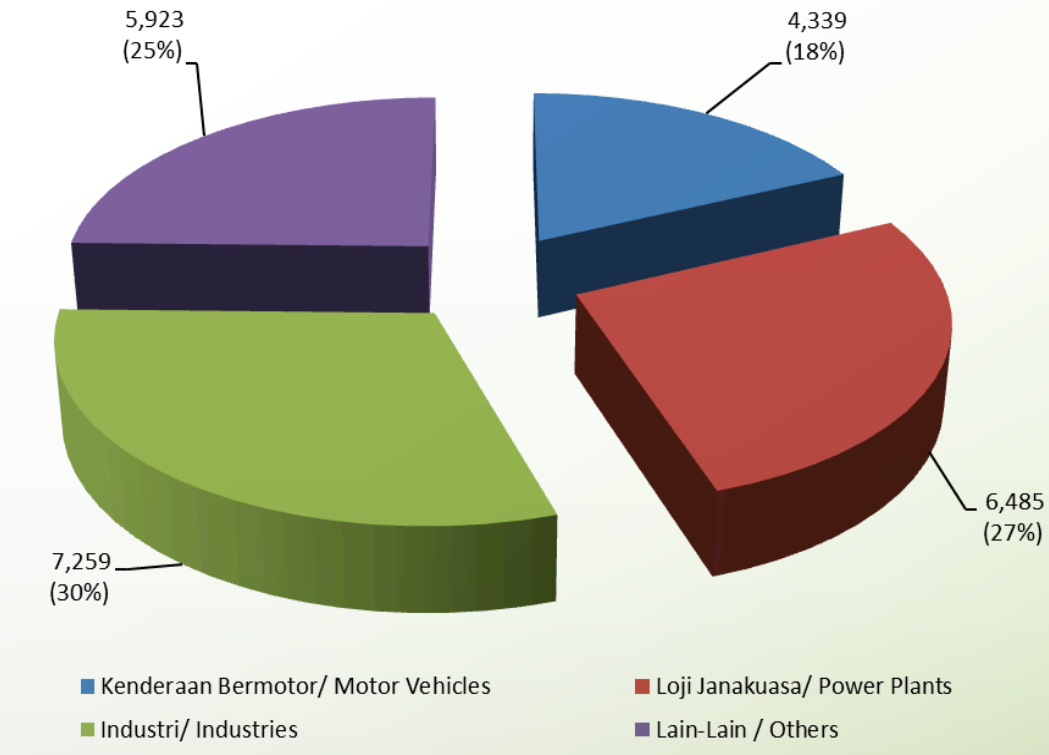
Rajah 6.10 Malaysia: Beban Pencemaran Bahan Pencemar Udara Dari Semua Punca, 2012-2013

Figure 6.10 Malaysia: Air Pollutant Emission Load from All Sources, 2012-2013



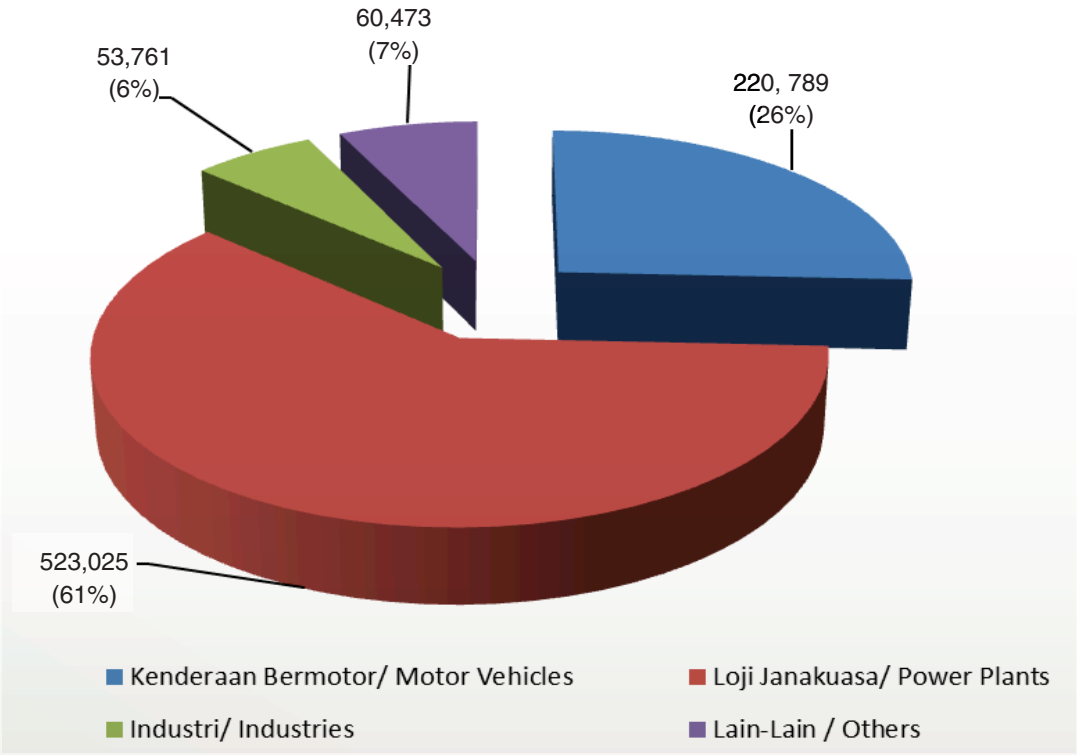
Rajah 6.11 Malaysia: Punca Pecemaran SO_2 (Metrik Tan), 2013

Figure 6.11 Malaysia: SO_2 Emission by Sources (Metric Tonnes), 2013



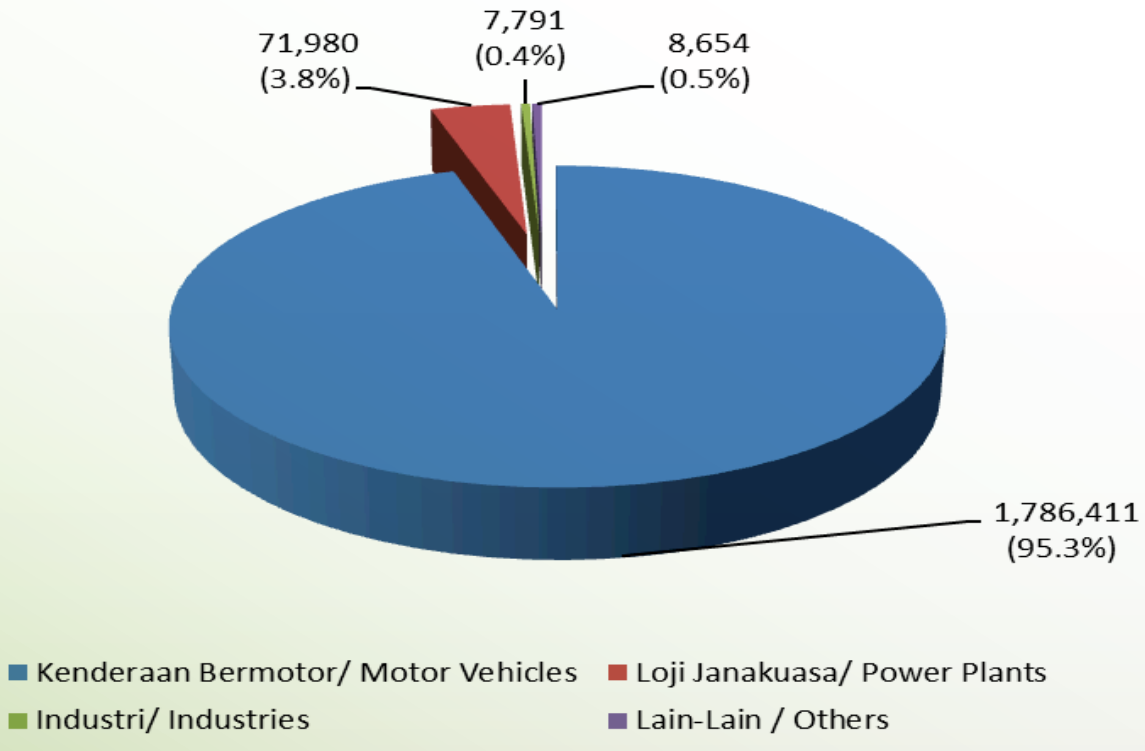
Rajah 6.12 Malaysia: Punca Beban Pencemaran Jirim Zarahan (PM) (Metrik Tan), 2013

Figure 6.12 Malaysia: Particulate Matter (PM) Emission Load by Sources (Metric Tonnes), 2013



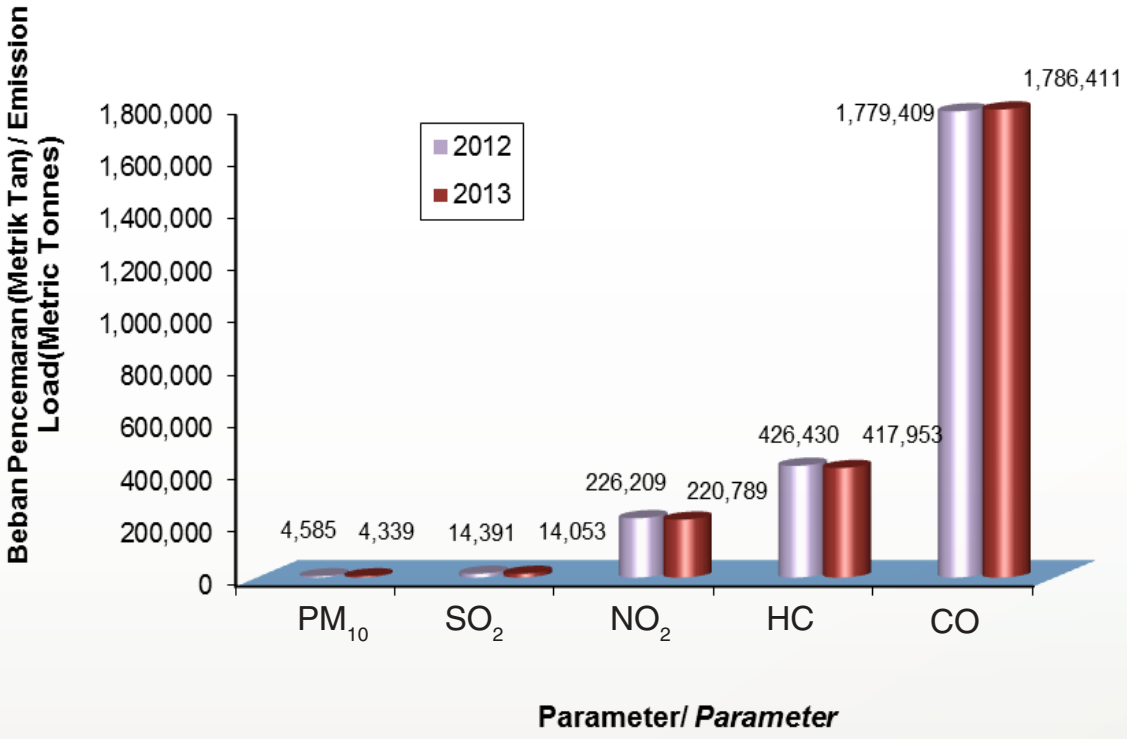
Rajah 6.13 Malaysia: Punca Pencemaran NO_2 (Metrik Tan), 2013

Figure 6.13 Malaysia: NO_2 Emission by Sources (Metric Tonnes), 2013



Rajah 6.14 Malaysia: Punca Pencemaran CO (Metrik Tan), 2013

Figure 6.14 Malaysia: CO Emission by Sources (Metric Tonnes), 2013



Rajah 6.15 Malaysia: Beban Pencemaran Pencemar Udara Dari Kenderaan Bermotor, 2012-2013

Figure 6.15 Malaysia: Air Pollutant Emission Load from Motor Vehicles, 2012-2013

INVENTORI BUANGAN TERJADUAL

Pada tahun 2013, sebanyak 2,965,611.65 tan metrik buangan terjadual telah dihasilkan. Ini mewakili peningkatan keseluruhan sebanyak 3.89% berbanding 2,854,516.78 tan metrik yang dilaporkan pada 2012. Buangan gipsum, dros / sanga / klinker / abu, minyak pelincir terpakai, enapcemar logam berat dan bekas tercemar merupakan kategori utama dalam kategori buangan yang dihasilkan**(Jadual 6.3).** Merujuk kepada **Rajah 6.16**, Negeri Terengganu menjana jumlah terbesar buangan terjadual (29.78%), diikuti oleh Negeri Perak (17.98%), Selangor (16.68%), Johor (12.28%), Pulau Pinang (9.99%), manakala 10 negeri-negeri yang lain menghasilkan sebanyak 13.28%.

Sebanyak 570,214.58 tan metrik (19.23%) daripada jumlah buangan yang dihasilkan diperoleh kembali di dalam dan luar negara.

SCHEDULED WASTES INVENTORY

In 2013, the total number of scheduled wastes produced was 2,965,611.65 metric tonnes, which shows an overall increase of 3.89% as compared to 2012, where only 2,854,516.78 metric tonnes of scheduled wastes was reported. Gypsum, dross/slag/clinker/ash, spent lubricating oil, heavy metal sludge and contaminated containers, were the main categories of the total number of wastes generated **(Table 6.3).** The state of Terengganu produced the largest volume of scheduled wastes (29.78%), followed by Perak (17.98%), Selangor (16.68%), Johor (12.28%) and Pulau Pinang (9.99%), whilst the other remaining 10 states generated a total of 13.28%, collectively **(Figure 6.16)**.

A total of 570,214.58 metric tonnes (19.23%) of wastes were being recovered locally and abroad. This showed a decrease

Ini menunjukkan penurunan sebanyak 5.07% berbanding 600,672.99 tan metrik pada tahun 2012. Daripada jumlah itu, 566,506.51 tan metrik (19.10%) daripada buangan terjadual yang diperolehkembali di kemudahan pemerolehan kembali luar tapak tempatan dan 3,708.07 tan metrik (0.13%) telah dieksport untuk pemerolehan kembali di kemudahan di luar negara.

of 5.07% as compared to 600,672.99 metric tonnes in 2012. Overall, 566,506.51 metric tonnes (19.10%) of scheduled wastes were recovered at local off-site facilities and 3,708.07 metric tonnes (0.13%) were exported for recovery at foreign facilities.

Sebanyak 131,190.20 tan metrik (4.42%) daripada jumlah buangan terjadual yang dihasilkan, dirawat dan dilupuskan untuk pelupusan akhir, iaitu di Kualiti Alam Sdn. Bhd (111,860.20 MT), Trienekens (Sarawak) Sdn. Bhd (19,330.00 MT) dan 18,201.05 tan metrik (0.61%) daripada buangan klinikal telah dibakar di kemudahan luar tapak yang dilesenkan **(Jadual 6.5)**. Jumlah ini menunjukkan penurunan sebanyak 5.66% daripada sejumlah 139,084.41 tan metrik sisa berjadual dilupuskan pada tahun 2012.

A total of 131,190.20 metric tonnes (4.42%) of wastes were treated and placed for final disposal at Kualiti Alam Sdn. Bhd. (111,860.20 MT) and Trienekens (Sarawak) Sdn. Bhd. (19,330.00 MT) and 18,201.05 metric tonnes (0.61%) of clinical wastes were incinerated at licensed off-site facilities **(Table 6.5).** This amount indicates a decrease of 5.66% from a total of 139,084.41 metric tonnes of scheduled wastes disposed in 2012.

Sebanyak 630,221.40 tan metrik (21.25%) daripada buangan terjadual terhasil telah diolah di tapak; manakala 41,742.48 tan metrik (1.41%) telah distor di premis pengeluar buangan **(Jadual 6.5)**. Dua (2) kemudahan pengolahan di atas tanah dan 15 insinerator dalam tapak telah dilesenkan oleh Jabatan Alam Sekitar bagi membolehkan rawatan dan pembakaran dalam tapak.

The total of scheduled wastes treated on-site were 630,221.40 metric tonnes; (21.25%) while 41,742.48 metric tonnes (1.41%) were stored on-site at wastes generator's premises **(Table 6.5)**. To allow for on-site treatment and incineration, the DOE have licensed two (2) land farms and 15 on-site wastes incinerators, respectively.

Daripada jumlah buangan terjadual yang dihasilkan pada tahun 2013, 1,574,041.95

Of the total wastes produced in 2013, 1,574,041.95 metric tonnes (53.08%) were

tan metrik (53.08%) telah diberi kelulusan bersyarat di bawah pengurusan khas seperti yang ditetapkan di bawah Peraturan 7, Peraturan Kualiti Alam Sekeliling (Buangan Terjadual), 2005 **Jadual 6.5**. Jumlah ini merupakan peningkatan sebanyak 37.37% berbanding 1,145,808.05 tan metrik pada tahun 2012. Kebanyakan buangan dihasilkan dari loji jana kuasa arang batu (55.10%), enap cemar daripada kemudahan rawatan air minuman (31.25%) dan lain-lain (13.65%) .

granted conditional approval to be managed under special management as stipulated under Regulation 7, Environmental Quality (Scheduled Wastes) Regulations, 2005 **Table 6.5**. The amount represented an increase of 37.37% as compared to only 1,145,808.05 metric tonnes in 2012. These waste streams were mostly generated from coal-fired power plant (55.10%), sludges from drinking water treatment facilities (31.25%) and others (13.65%).

No	Jenis Industri / Name of Waste	Kod Buangan / Waste Code	Jumlah Buangan / Quantity of Waste	
			(MT/Year / Tahun)	Peratus / Percentage (%)
1	Gipsum / Gypsum	SW 205	577,801.55	41.6327
2	Dros/ sanga/ klinker/ abu / Dross/Slag/Dust/Ash	SW 104	122,262.25	8.8094
3	Minyak Pelincir Terpakai / Spent Lubricating oil	SW 305	105,482.65	7.6004
4	Enap cemar logam berat / Heavy Metal Sludge	SW 204	103,944.37	7.4896
5	Bekas tercemar / Contaminated Container	SW 409	609,62.17	4.3925
6	Buangan elektronik / E-Waste	SW 110	52,978.13	3.8173
7	Asid Terpakai / Spent Acids	SW 206	50,563.34	3.6433
8	Emulsi minyak mineral-air terpakai / Spent mineral oil-water emulsion	SW 307	35,551.00	2.5616
9	Buangan pelarut organik bukan terhalogen / Waste of Non-Halogenated Solvent	SW 322	34,390.16	2.4779
10	Buangan getah atau lateks yang mengandungi logam berat / Rubber/ Latex Waste Containing Heavy Metal	SW 321	28,066.75	2.0223
11	Enap cemar mineral / Mineral Sludge	SW 427	21,811.41	1.5712
12	Campuran buangan terjadual dan buangan tidak terjadual / Mixture of Scheduled Waste & Non-Scheduled Waste	SW 422	19,967.23	1.4387
13	Campuran buangan terjadual / Mixture of Scheduled Waste	SW 421	19,083.09	1.3750
14	Buangan patogenik / klinikal / Pathogenic / Clinical Waste	SW 404	18,152.95	1.3080
15	Sisa dari pengolahan atau pemerolehan kembali buangan terjadual / Residue From Recovery of Scheduled Waste	SW 501	16,807.26	1.2110
16	Enap cemar dakwat dan cat / Ink & Paints Sludge	SW 416	15,233.83	1.0977
17	Buangan dakwat dan cat / Waste of Inks & Paints	SW 417	14,513.62	1.0458
18	Kain buruk, plastik, kertas atau turas tercemar Rags / Plastics / Papers contaminated with Scheduled Waste	SW 410	13,429.22	0.9676
19	Produk dakwat, cat, pigmen atau lakuer yang tidak mengikut spesifikasi yang mengandungi pelarut organik / Discarded of Ink/Paint/ Pigment/Lacquer Containing Organic Solvent	SW 418	8,117.06	0.5849

Jadual 6.3 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2013

Table 6.3 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2013

20	Buangan kimia / Lab Waste	SW 429	7,338.01	0.5287
21	Buangan minyak atau enap cemar berminyak / Waste oil / Oily sludge	SW 311	5,277.57	0.3803
22	Enap cemar yang mengandungi fluorida / Sludge Containing Fluoride	SW 207	5,277.52	0.3803
23	Buangan mangkin / Waste Catalyst	SW 202	4,818.20	0.3472
24	Minyak hidraulik terpakai / Spent Hydraulic oil	SW 306	4,641.05	0.3344
25	Buangan cecair terma / Waste Of Thermal Fluids	SW 327	3,520.16	0.2536
26	Diisosianat terpakai / Spent di-isocyanates	SW 419	3,146.78	0.2267
27	Buangan mengandungi merkuri / Waste containing Mercury	SW 109	2,986.31	0.2152
28	Alkali terpakai / Spent Alkalis	SW 401	2,397.45	0.1727
29	Alkali terpakai dengan pH ≥ 11.5 / Spent Alkalis With PH > 11.5	SW 402	2,356.11	0.1698
30	Tanah/puing tercemar / Contaminated Land/Soil	SW 408	2,303.60	0.1660
31	Klinker, sanga dan abu dari penunu buangan terjadual / Clinker/Slag/Ashes From Incinerator	SW 406	2,231.85	0.1608
32	Buangan pelarut organik terhalogen / Waste Of Halogenated Solvents	SW 323	2,208.63	0.1591
33	Enap cemar asid / Acid Sludge	SW 316	2,066.05	0.1489
34	Buangan resin yang mengandungi pelarut organik / Waste of Resin Containing Organic	SW 325	1,965.74	0.1416
35	Asid organik terpakai / Spent Organic Acids	SW 301	1,922.64	0.1385
36	Buangan bateri asid plumbum / Waste of lead acid batteries	SW 102	1,645.70	0.1186
37	Dadah terbuang / Expired Drug	SW 403	1,470.14	0.1059
38	Sisa berminyak dari bengkel automotif / Oily Residue from Workshop	SW 312	1,299.17	0.0936
39	Buangan fotografi / Photographic Waste	SW 423	1,220.84	0.0880
40	Buangan bateri yang mengandungi cadmium dan nikel / Waste Of Batteries Containing Cadmium/ Hg/ Lithium	SW 103	1,120.03	0.0807
41	Campuran minyak-air / Oil -Water mixture	SW 309	1,078.61	0.0777
42	Karbon teraktif terpakai / Contaminated Active Carbon	SW 411	1,036.77	0.0747
43	Minyak/Enapcemar daripada loji penapisan minyak / Oil Sludge from Oil Refinery	SW 314	935.81	0.0674
44	Buangan makmal / Chemical Waste	SW 430	706.01	0.0509

Jadual 6.3 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2013

Table 6.3 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2013

45	Enap cemar dari tangki penyimpanan minyak mineral / Sludge from mineral oil storage tank	SW 310	615.56	0.0444
46	Buangan mengandungi formaldehid / Waste Containing Formaldehyde	SW 320	573.67	0.0413
47	Tar atau sisa bertar dari loji penapisan minyak / Tar Residue From Oil Refinery / Petrochemical Plant	SW 315	540.80	0.0390
48	Buangan fenol / Waste Of Phenols Its Compound	SW 319	463.44	0.0334
49	Buangan pelekat / glu yang mengandungi pelarut organik / Adhesive / Glue Containing Organic Solvent	SW 303	442.57	0.0319
50	Larutan alkali berair terpakai yang mengandungi sianida / Spent Aqueous alkaline Containing Cyanide	SW 414	207.50	0.0150
51	Tanah yang dicemari dengan minyak daripada penapisan semula minyak pelincir terpakai / Contaminated Oil from re-refining \ used lubricating Oil	SW 313	200.49	0.0144
52	Enap cemar yang distabilkan / Stabilized Sludge	SW 203	139.45	0.0100
53	Buangan sisa penyulingan tidak berair terhalogen atau bukan terhalogen / Waste both Halogenated or Non Halogenated From Recovery	SW 324	126.14	0.0091
54	Buangan farmaseutikal / Discarded Drug	SW 405	120.36	0.0087
55	Buangan asbestos / Asbestos	SW 201	102.85	0.0074
56	Buangan racun perosak / Pesticide	SW 425	80.52	0.0058
57	Buangan fluks / Flux Waste	SW 302	68.75	0.0050
58	Buangan sebatian fosforus organik / Waste of Organic phosphorus compound	SW 326	18.50	0.0013
59	Buangan dari pengilangan bahan letupan / Waste From Manufacturing / Processing or use of explosive	SW 431	17.26	0.0012
60	Sisa dari pemerolehan kembali likuor penjerukan asid / Residue from Recovery of Acid Pickling Liquor	SW 106	16.01	0.0012
61	Produk racun perosak yang tidak mengikut spesifikasi / Used Pesticide / Herbicides /Biocides	SW 426	11.34	0.0008
62	Enap cemar yang mengandungi sianida / Sludges Contaning Cyanide	SW 412	8.06	0.0006
63	Buangan yang mengandungi peroksida / Waste Containing Peroxides	SW 432	7.89	0.0006
64	Sanga kuprum / Slag of Copper	SW 107	3.88	0.0003

Jadual 6.3 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2013

Table 6.3 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2013

65	Buangan daripada operasi pengawetan kayu / Waste From Wood Containing Heavy Metals	SW 428	3.00	0.0002
66	Buangan yang mengandungi arsenik / Waste containing arsenic	SW 101	1.99	0.0001
67	Agen pengoksidaan terpakai / Spent Oxidizing Agent	SW 424	1.07	0.0001
68	Sebatian organologam terpakai / Spent Of Organometallic compound	SW 317	1.03	0.0001
69	Garam terpakai yang mengandungi sianida / Spent salt containing Cyanide	SW 413	0.56	0.0000
70	Sisa dari pemprosesan zink / Zink Residue	SW 108	0.11	0.0000
71	Buangan yang mengandungi BFT dan TFT / Waste containing PCB or PCT	SW 318	0.08	0.0000
		Total	**1,387,861.64**	**100.00**

Jadual 6.3 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2013

Table 6.3 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2013

No	Jenis Industri / Name of Waste	Jumlah Buangan / Quantity of Waste	
		(MT/Year / Tahun)	Peratus / Percentage (%)
1	Kemudahan Pemerolehan Kembali / Recovery Facilities	502,556.51	36.21
2	Elektrik Dan Elektronik / Electrical And Electronic	173,555.38	12.51
3	Industri Kimia / Chemical Industry	162,781.28	11.73
4	Pengilangan Logam / Metal Refinery	83,518.84	6.02
5	Kenderaan / Vehicle	64,090.40	4.62
6	Loji Janakuasa / Power Plant	50,765.10	3.66
7	Fabrikasi Logam / Metal Fabrication	47,871.54	3.45
8	Bengkel / Workshop	41,203.87	2.97
9	Berasaskan Getah / Rubber Base	38,584.28	2.78
10	Penyudahan Logam Dan Sadur Elektrik / Metal Finishing and Coating	35,155.35	2.53
11	Penapisan Petroleum / Petroleum Refinery	34,305.35	2.47
12	Percetakan / Printing	31,704.96	2.28

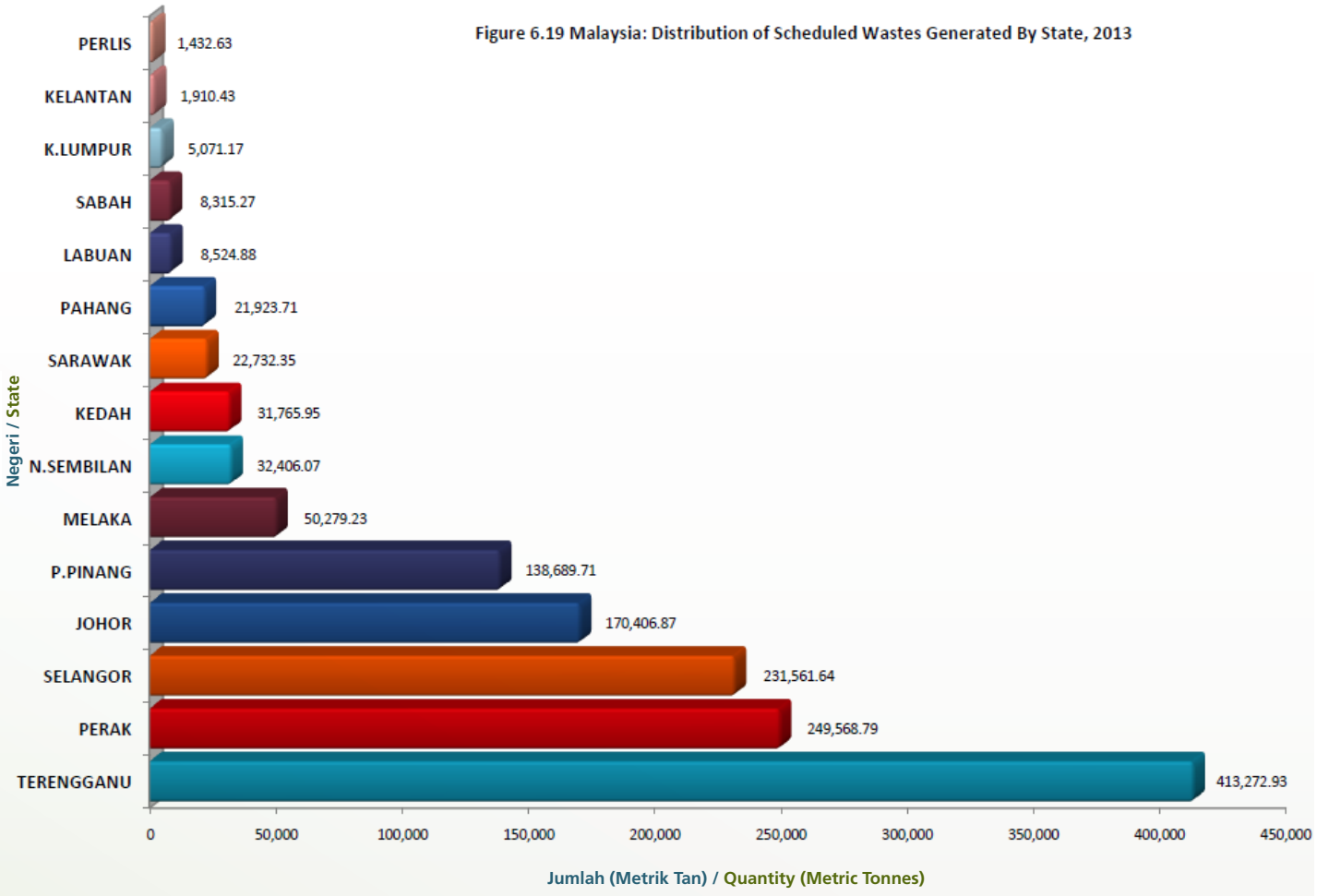
Table 6.4 Malaysia: Quantity of Scheduled Wastes Generated by Industry, 2013

Jadual 6.4 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Jenis Industri, 2013

13	Kertas / Paper	25,816.43	1.86
14	Perubatan / Health Care Services	18,206.68	1.31
15	Plastik / Plastic	12,162.64	0.88
16	Jentera / Machinery	11,523.44	0.83
17	Galian Bukan Logam / Non Metallic Mineral	11,045.76	0.80
18	Makanan & Minuman / Food & Drink	9,411.04	0.68
19	Penapisan Minyak Makan / Edible Oil Refinery	8,425.78	0.61
20	Berasaskan Kayu / Wood Base	7,520.46	0.54
21	Lain-lain / Others	4,564.81	0.33
22	Tekstil / Textiles	2,933.90	0.21
23	Kilang Kelapa Sawit (PYDT) / Palm Oil Mill	2,091.90	0.15
24	Perlombongan / Mining	2,024.69	0.15
25	Gudang / Warehouse	2,009.89	0.14
26	Simen / Cement	1,049.88	0.08
27	Kilang Getah (PYDT) / Rubber Factory	772.92	0.06
28	Loji Pengolahan Kumbahan Persendirian / Waste Water Treatment Plant	587.68	0.04
29	Kulit / Leather	434.01	0.03
30	Rokok Dan Tembakau / Cigarettes and Tobacco	379.22	0.03
31	Peralatan Pejabat dan Alat Tulis / Office Supplies and Stationery	305.05	0.02
32	Kuari / Quarry	218.71	0.02
33	Peralatan Sukan Dan Permainan / Sports Equipment and Games	189.42	0.01
34	Perkhidmatan / Services	94.45	0.01
	TOTAL	**1,387,861.64**	**100.00**

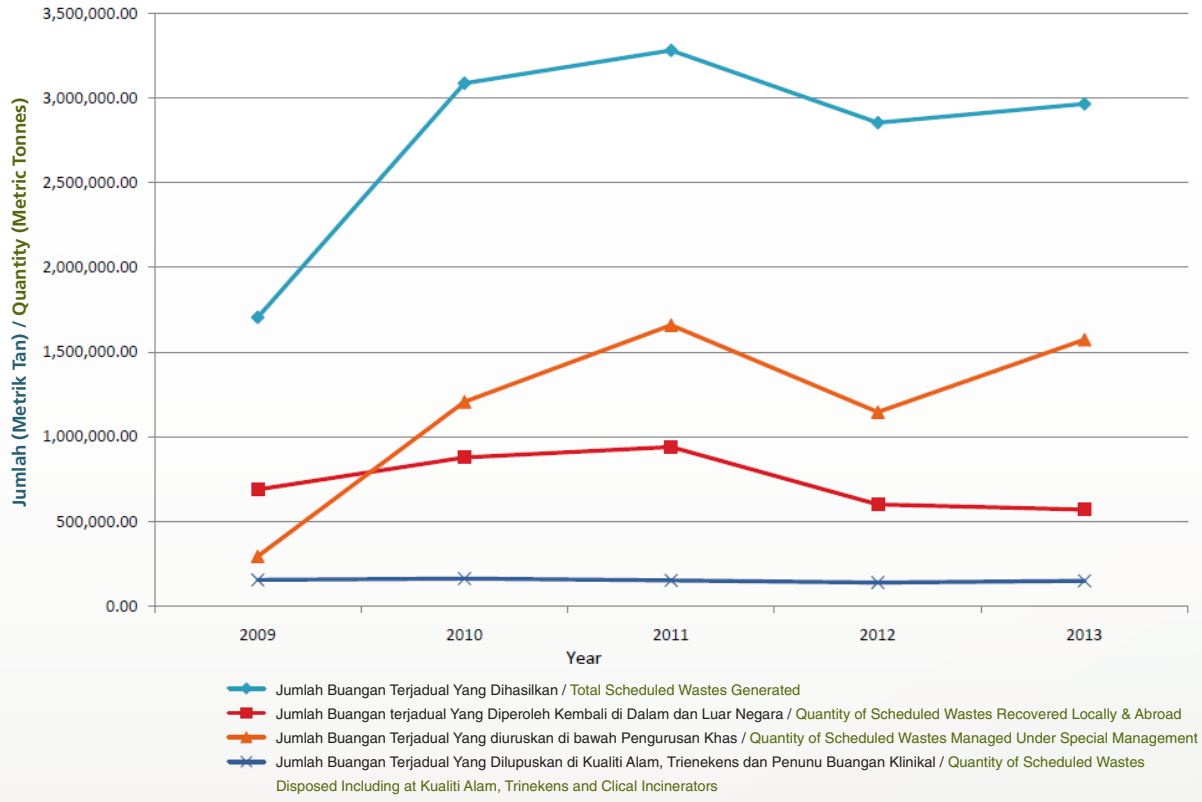
Table 6.4 Malaysia: Quantity of Scheduled Wastes Generated by Industry, 2013

Jadual 6.4 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Jenis Industri, 2013



Rajah 6.16 Malaysia: Penghasilan Buangan Terjadual mengikut negeri, 2013

Figure 6.16 Malaysia: Distribution of Scheduled Wastes Generated By State, 2013



Rajah 6.17 Malaysia: Trend Pengurusan Buangan Terjadual, 2009 - 2013

Figure 6.17 Malaysia: Trend of Scheduled Wastes Management, 2009 - 2013

No	Kemudahan / Facility	Metrik Tan / Tonnes	Peratusan / Percentage (%)
1	Pengurusan Khas / Special Waste Management	1,574,041.95	53.08
2	Pengolahan DalamTapak / On-Site Treatment	630,221.40	21.25
3	Kemudahan Pemerolehan Kembali Luar Tapak Tempatan / Local Off-site Recovery Facilities	566,506.51	19.10
4	Kualiti Alam Sdn Bhd / Kualiti Alam Sdn Bhd	111,860.20	3.77
5	Penstoran Dalam Tapak / On-Site Storage	41,742.48	1.41
6	Trienekens (Sarawak) Sdn Bhd / Trienekens (Sarawak) Sdn Bhd	19,330.00	0.65
7	Penunu Buangan Klinikal Off-site Clinical Waste Incinerators	18,201.05	0.61
8	Kemudahan Luar Negara (Export) / Foreign Facilities (Export)	3,708.07	0.13
	TOTAL	**2,965,611.65**	**100.00**

Jadual 6.5 Malaysia: Kemudahan Yang Mengendalikan Buangan Terjadual, 2013

Table 6.5 Malaysia: Facilities Handling Scheduled Wastes, 2013

No.	Kategori Buangan / Waste Category	Kod Buangan / Waste Code	Sumber / Source	Metrik Tan / Tonnes	Peratus / Percent (%)	Kaedah Pelupusan / Method of Disposal
1	Enap cemar Logam Berat / Heavy Metal Sludge	SW 204	Loji Rawatan Air Minuman / Drinking Water Treatment Plant	491,902.87	31.25	Tapak Pelupusan Sanitari / Sanitary Landfill
			Industri / Industry	107,958.53	6.86	
2	'Fly Ash' & 'Bottom Ash' / Fly Ash & Bottom Ash	SW 104	Loji Janakuasa elektrik / Coal-Fired Power Plant	867,358.18	55.10	Guna semula sebagai bahan mentah pembuatan produk /Reuse as raw material for product
			Industri / Industry	17,496.16	1.11	
3	Gipsum / Gypsum	SW 205	Industri / Industry	81,382.97	5.17	Tapak Pelupusan Sanitari / Sanitary landfill
4	Glu / Glue	SW 303	Industri / Industry	0	0.00	Guna semula sebagai bahan mentah pembuatan produk /Reuse as raw material for product
5	Produk sampingan Petroleum / Petroleum By Product	SW 322	Industri / Industry	121.93	0.01	Diperolehi kembali Recovered
6	Buangan yang mengandungi formaldehid, resin, serbuk epoksi terbuang / Waste Containing Formaldehyde, resin, discarded epoxy powder	SW 320, 325, 418	Industri / Industry	4,475.14	0.28	Tapak Pelupusan Sanitari / Sanitary landfill
7	Produk farmasi terbuang, Produk terbuang / Discarded Pharmaceutical Product, Discarded Product	SW 405, 429	Industri / Industry	60.757	0.00	Tapak Pelupusan Sanitari / Sanitary landfill
8	Abu dari enapcemar kertas / Ash of Paper Sludge	SW 406	Industri / Industry	3,277.01	0.21	Tapak Pelupusan Sanitari / Sanitary landfill
9	Campuran minyak terpakai / Spent Mixed Oil	SW 421	Industry	8.4	0.00	Guna semula sebagai agen 'releasing' untuk acuan simen/ Reuse as rel easing agent for mould cement
TOTAL				**1,574,041.95**	**100.00**	

Table 6.6 Malaysia: Generated Scheduled Waste Managed Under Special Management, 2013

Jadual 6.6 Malaysia: Buangan Terjadual Yang Diuruskan Di Bawah Pengurusan Khas

Sebanyak 445 kemudahan pemerolehan kembali luar tapak telah dilesenkan oleh Jabatan ini untuk pemerolehan kembali pelbagai kategori buangan terjadual. Kemudahan yang paling banyak dilesenkan mengikut kategori buangan terjadual adalah buangan elektrik dan elektronik (150 kemudahan) diikuti dengan enapcemar minyak / mineral / agen penyejuk terpakai (56 kemudahan), dross / abu / sanga / pemangkin (62 kemudahan), enapcemar logam berat / getah (47 kemudahan), bekas terpakai / Buangan yang tercemar / dakwat / cat / lakuer (34 kemudahan), pelarut (31 kemudahan) dan asid / alkali (17 kemudahan), manakala empat (4) kategori buangan terjadual yang lain berjumlah 48 kemudahan seperti di **Jadual 6.7.**

A total of 445 off-site recovery facilities have been licensed by the department to recover various categories of scheduled wastes. The most licensed facilities according to categories of waste are electronic and electrical wastes (150 facilities) followed by oil/ mineral sludge/spent coolant (56 facilities), dross/ ash/ slag/ catalyst (62 facilities), heavy metal sludge/ rubber (47 facilities), used container/ contaminated waste/ ink/ paint/ lacquer (34 facilities), solvent (31 facilities) and acid/ alkaline (17 facilities), whilst four (4) other wastes categories totaling of 48 facilities as shown in **Table 6.7**.

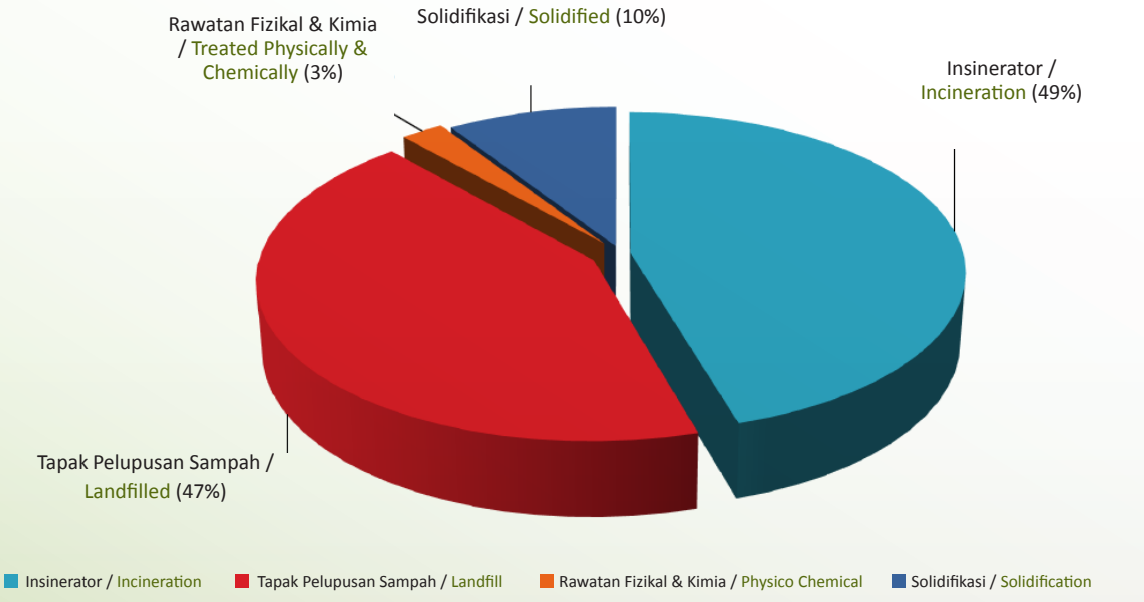
Kategori Buangan / Waste Category	Recovery Facility
Buangan elektrik dan elektronik / Electronic and Electrical Wastes	150
Minyak / Enap cemar Mineral / Agen Penyejuk Terpakai Oil / Mineral Sludge / Spent Coolant	56
Dros / Abu / Sanga / Pemangkin / Dross / Ash / Slag / Catalyst	62
Enap cemar logam berat / Getah / Heavy Metal Sludge / Rubber	47
Bekas terpakai / Buangan tercemar / Dakwat / Cat / Lakuer / Used Container / Contaminated Waste / Ink / Paint /Lacquer	34
Pelarut / Solvent	31
Asid / Alkali / Acid / Alkaline	17
Fenol / Pelekat / Resin / Phenol / Adhesive / Resin	23
Fotografi / Photographic	12
Bateri / Battery	6
Gipsum / Gypsum	7
TOTAL	**445**

Jadual 6.7 Malaysia: Bilangan Kemudahan Pemerolehan Kembali Luar Tapak, 2013

Table 6.7 Malaysia: Numbers of Off-site Recovery Facilities, 2013

Kategori buangan terjadual yang dihantar ke premis berlesen (Kualiti Alam Sdn Bhd dan Trinekens (Sarawak) Sdn Bhd) untuk pelupusan akhir adalah seperti enapcemar yang mengandungi satu atau beberapa logam berat, campuran buangan terjadual, debu / sanga / dros atau abu yang mengandungi arsenik / merkuri dan asid bukan organik terpakai. Buangan tersebut sama ada dibakar, dirawat secara fizikal dan kimia, distabilkan atau dilupuskan di tapak pelupusan selamat bergantung kepada ciri-ciri tertentu. Seperti yang ditunjukkan dalam **Rajah 6.18**, kebanyakan sisa dihantar ke Kualiti Alam Sdn Bhd dan Trienekens Sdn Bhd adalah dibakar (49%), diikuti ke tapak pelupusan (47%), solidifikasi (10%) dan rawatan secara fizikal dan kimia (3%).

The categories of wastes sent to the licensed premises (Kualiti Alam Sdn Bhd and Trinekens (Sarawak) Sdn Bhd) for final disposal are sludge containing one or several heavy metals, mixed wastes, dust/slag/ dross or ash containing arsenic/ mercury and spent inorganic acid. Such wastes were either incinerated, treated physically and chemically, solidified or disposed off in secured landfill depending on their characteristics. As shown in **Figure 6.18,** most wastes sent to Kualiti Alam Sdn Bhd and Trienekens Sdn Bhd were incinerated (49%), followed by landfilled (47%), solidified (10%) and treated physically and chemically (3%).



Rajah 6.18 Kualiti Alam and Trienekens: Jenis Rawatan dan Pelupusan Buangan Terjadual, 2013
Figure 6.18 Types of Treatment and Disposal of Waste, 2013