



BAB 6
Chapter 6

Inventori Punca Pencemaran
Pollution Sources Inventory





BAB 6 / CHAPTER 6

INVENTORI PUNCA-PUNCA PENCEMARAN

POLLUTION SOURCES INVENTORY

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PUNCA PENCEMARAN AIR WATER POLLUTION SOURCES

Pencemaran air berlaku apabila sifat kimia air mengalami perubahan langsung atau tidak langsung akibat pelepasan buangan atau kemasukan pencemar ke jasad air sehingga kegunaan berfaedah air terjejas, mungkin membahayakan kepada kesihatan, keselamatan atau kebajikan awam, haiwan, ikan atau hidupan-hidupan dalam air atau juga akibat melanggar apa-apa syarat, had atau sekatan yang ditetapkan dibawah Akta Kualiti Alam Sekeliling 1974.

Beban pencemaran air di pantau sebagai langkah awal bagi mengatur langkah-langkah awal serta merancang tindakan pencegahan dan mengawal pencemaran, dalam usaha meningkatkan kualiti air sungai demi mengekalkan pelbagai kegunaan berfaedah sungai seperti sumber bekalan air, rekreasi, ternakair (akuakultur), pertanian serta menampung keperluan sistem ekologi.

Tahun 2015, pengiraan beban pencemaran ditumpukan ke atas lima (5) jenis punca pencemaran air iaitu industri pembuatan, loji kumbahan termasuk tangki septik individu (IST), tangki septik berpusat (CST), aktiviti ternakan babi, industri berasaskan pertanian, dan pasar basah.

Tiga (3) parameter utama memberikan kesan ketara kepada kualiti air sungai adalah Keperluan Oksigen Biokimia (BOD), Pepejal Terampai (SS) dan Ammoniacal Nitrogen (AN). Penilaian beban pencemaran pada 2015 tidak mengambilkira sumbangan beban pencemaran dari aktiviti perkhidmatan penyediaan makanan.

Under the Environmental Quality Act 1974, changes of chemical nature in the waterbody, either directly or indirectly is considered as water pollution. Hence pollution load in waterbody due to the discharge of waste or pollutants that caused impaired beneficial use of water, hazardous to health, safety or welfare, animals, fish or aquatic life or violation of any condition, limitations or restrictions prescribed under the Environmental Quality Act 1974 are important to be determined.

The pollution loads are useful in strategizing and planning the course of action for the prevention and control of pollution, so as to maintain the beneficial use of rivers as a source of water supply, recreation, aquaculture, agriculture as well as meeting the needs of ecological system.

Year 2015, the calculation of pollution loads is focused to five (5) types of pollution. The accounted pollution sources were manufacturing industries, sewage treatment including individual septic tank (IST), centralized septic tank (CST), piggery, agricultural industries and wet market.

Three (3) main parameters that give the significant effects to water quality used are Biochemical Oxygen Demand (BOD), Suspended Solid (SS) and Ammoniacal Nitrogen (AN). Calculation of pollution loads in year 2015 do not include food services establishment.

BEBAN PENCEMARAN AIR WATER POLLUTION LOAD

Beban pencemaran air adalah kepekatan bahan cemar yang dibawa oleh jasad air pada sesuatu masa yang diberikan. Secara matematik, beban pada dasarnya adalah hasil daripada pelepasan air dan kepekatan bahan di dalam air.

Pengiraan beban pencemaran yang tertumpu kepada tiga (3) parameter pencemar yang nilai terbesar, iaitu Keperluan Oksigen Biokimia (BOD), Pepejal Terampai (SS) dan Ammoniakal Nitrogen (AN).

Keperluan Oksigen Biokima

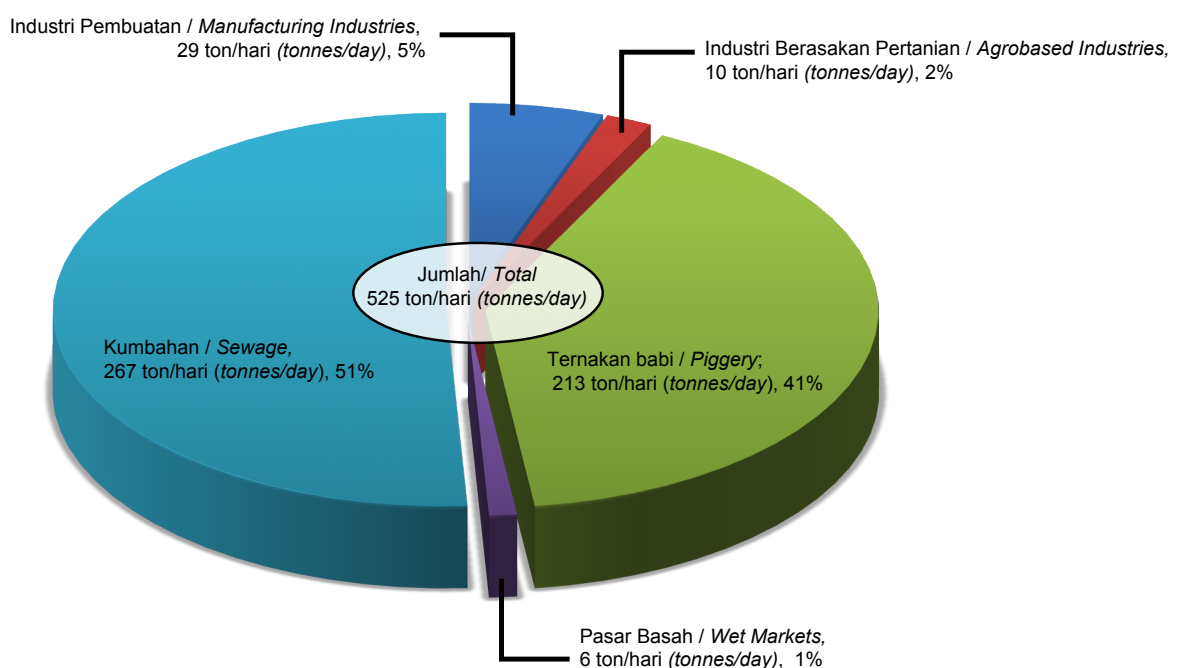
Pada tahun 2015, jumlah beban pencemaran Keperluan Oksigen Biokimia (BOD) adalah sebanyak 525 ton / hari. Discaj dari loji kumbahan adalah penghasil beban pencemaran BOD tertinggi iaitu sebanyak 267 ton / hari (51%), diikuti aktiviti ternakan babi 213 ton/ hari (41%), industri pembuatan 29 ton / hari (5%), industri berasaskan pertanian 10 ton / hari (2%) dan pasar basah 6 ton / hari (1%) ditunjukkan seperti dalam **Rajah 6.1**.

Water pollution load is the amount of polluting material that a waterbody is actually carrying at a given time. Mathematically, load is essentially the product of water discharge and the concentration of a substance in the water.

Assessments were focused on three (3) prime parameters that shows high values, namely Biochemical Oxygen Demand (BOD), Suspended Solids (SS) and Ammoniacal Nitrogen (AN).

Biochemical Oxygen Demand

*In year 2015, a total of 525 tonnes/day pollution load for Biochemical Oxygen Demand (BOD) were generated. Sewage remained the largest BOD loads generator with a total load of 267 tonnes / day (51%), followed by piggery which precipitating 213 tonnes / day (41%), while manufacturing Industries contributed 29 tonnes / day (5%), agro-based industries 10 tonnes / day (2%) and wet markets 6 tonnes / day (1%), as shown in **Figure 6.1**.*



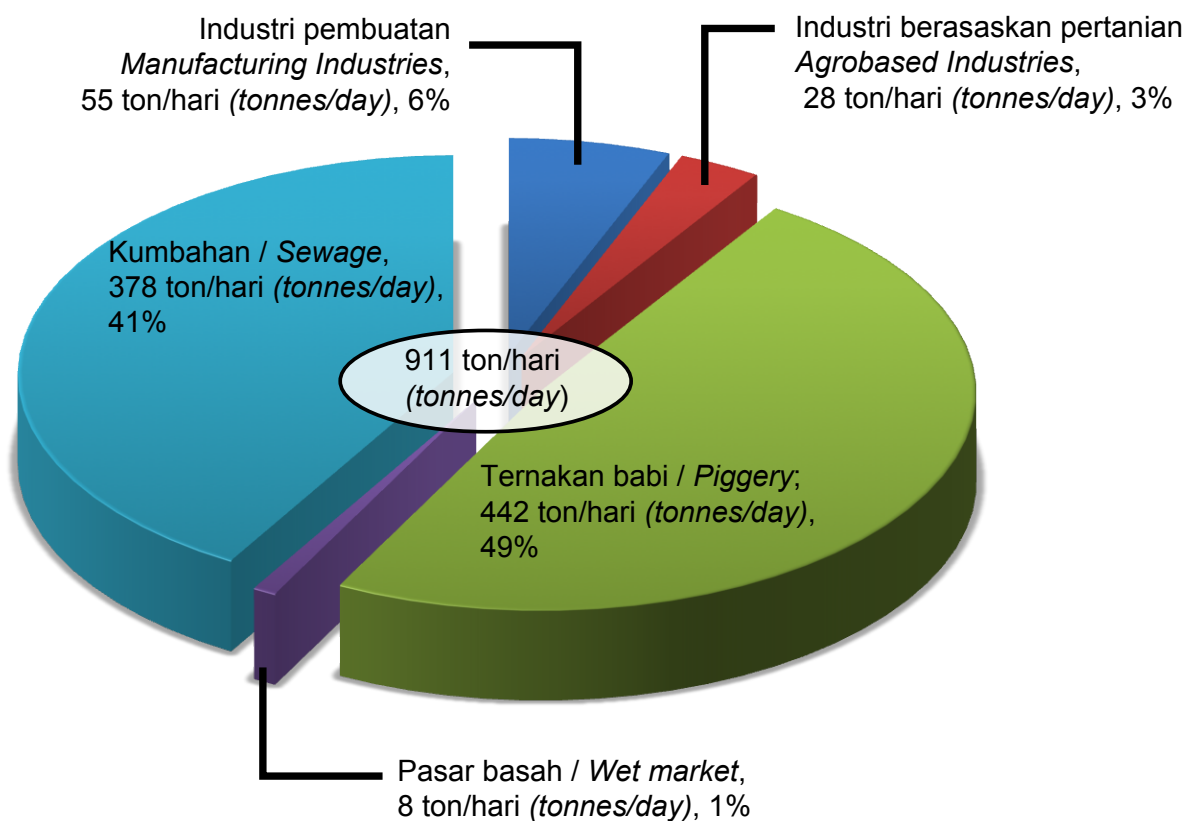
Rajah 6.1 Malaysia: Beban Keperluan Oksigen Biokimia Mengikut Punca Pencemaran Air, 2015
Figure 6.1 Malaysia: Biochemical Oxygen Demand Loads against Water Pollution Sources, 2015

Beban Pepejal Terampai

Pada tahun 2015, penghasilan beban pencemaran Pepejal Terampai (SS) adalah sebanyak 911 ton / hari, di mana aktiviti ternakan babi kekal sebagai penghasil beban pepejal terampai utama dengan jumlah 442 ton / hari (49%), diikuti discaj daripada kumbahan sebanyak 378 ton / hari (41%), industri pembuatan 55 ton / hari (6%), industri berasaskan pertanian 28 ton / hari (3%), dan pasar basah 8 ton / hari (1%), seperti ditunjukkan dalam **Rajah 6.2**.

Suspended Solids Load

In year 2015, summing-up the Suspended Solids (SS) loads gave in a total of 911 tonnes/day in which piggery remained the largest contributor with a total load of 442 tonnes/ day (49%), followed by sewage 378 tonnes/ day (41%), manufacturing Industries 55 tonnes/ day (6%), agro-based industries 28 tonnes/ day (3%) and wet market 8 tonnes/ day (1%), as shown in **Figure 6.2**.



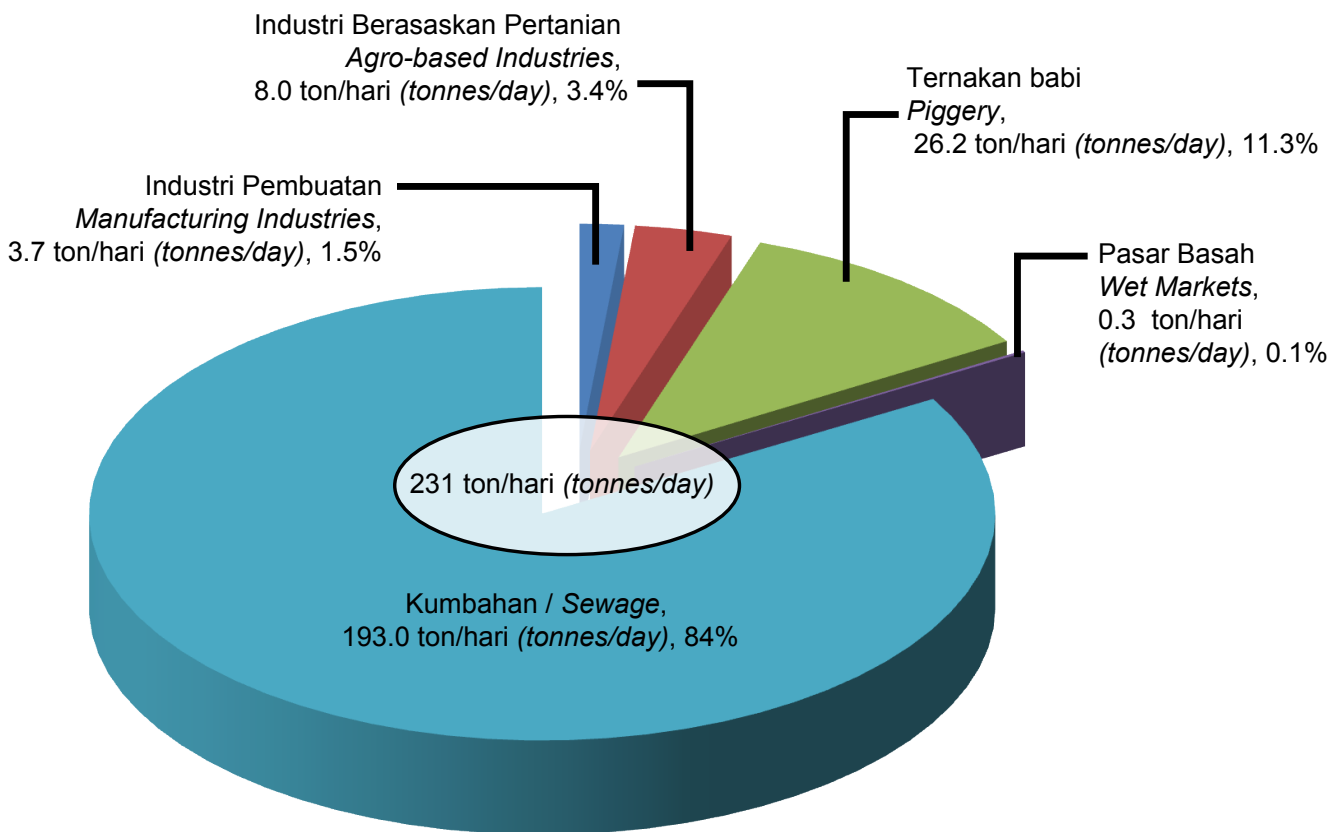
Rajah 6.2 Malaysia: Beban Pepejal Terampai Mengikut Punca Pencemaran Air, 2015
 Figure 6.2 Malaysia: Suspended Solid Loading by Water Pollution Sources, 2015

Beban Ammonikal Nitrogen

Pada tahun 2015, beban pencemar Ammonikal Nitrogen (AN) sebanyak 231 ton/hari di mana discaj kumbahan adalah penghasil terbesar beban AN dengan jumlah sebanyak 193 ton/ hari (84%), diikuti aktiviti ternakan babi 26.2 ton/hari (11.3%), industri berasaskan pertanian sebanyak 8 ton/ hari (3.4%), industri pembuatan 3.7 ton/ hari (1.5%) dan pasar basah 0.3 ton/ hari (0.1%), ditunjukkan seperti dalam Rajah 6.3.

Ammoniacal Nitrogen Load

In year 2015, assessment on Ammoniacal Nitrogen (AN) loads resulted in a total of 231 tonnes/day. Analysis showed that sewage is the largest AN loads with 193 tonnes/ day (84%), followed by piggery generating 26.2 tonnes/ day (11.3%), agro-based industries 8 tonnes/ day (3.4%), manufacturing industries 3.7 tonnes/ day (1.5%) and wet market 0.3 tonnes/ day (0.1%), as shown in Figure 6.3.



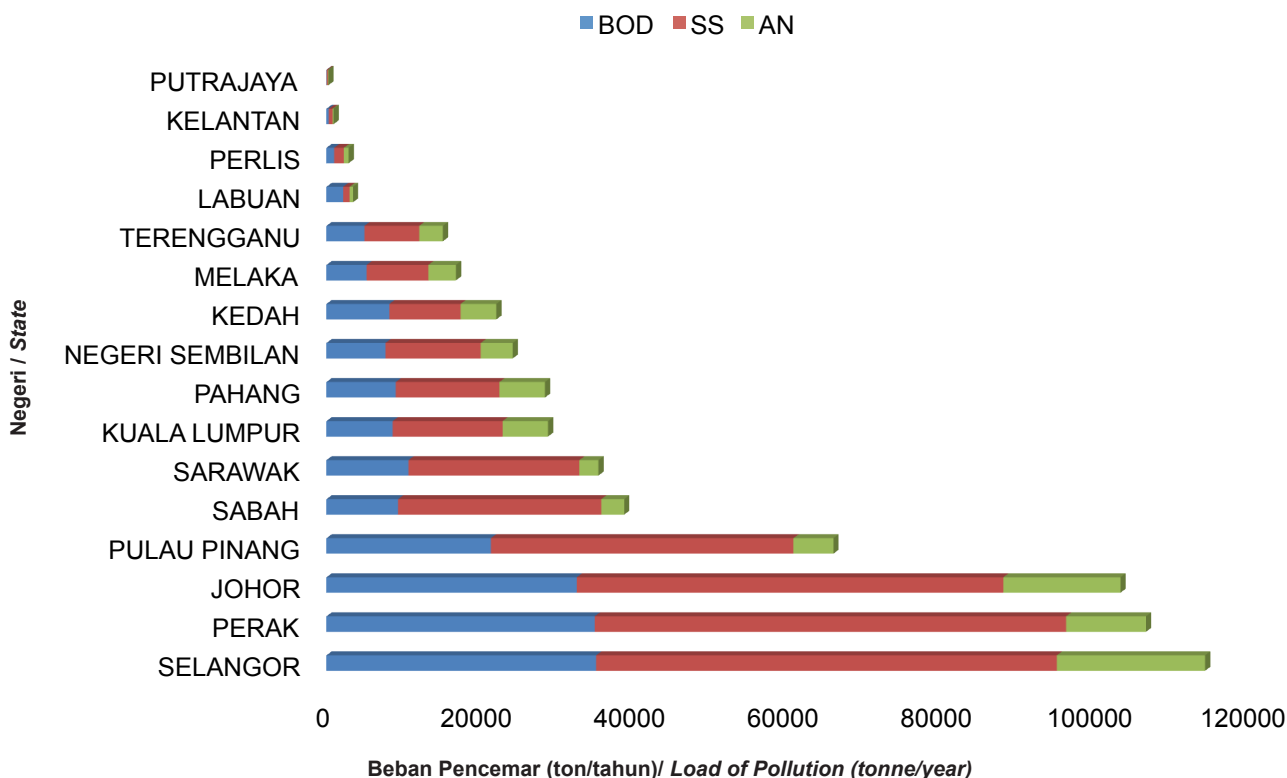
Rajah 6.3 Malaysia: Beban Ammoniakal Nitrogen Mengikut Punca Pencemaran Air, 2015
 Figure 6.3 Malaysia: Ammoniacal Nitrogen Loading by Water Pollution Sources, 2015

Beban Pencemaran Mengikut Negeri

Anggaran penjaan beban pencemaran setahun di keseluruhan Negeri adalah sebanyak 608,455 ton / tahun. Beban pencemaran hasil aktiviti-aktiviti di Negeri Selangor adalah tertinggi iaitu sebanyak 114,463 ton / tahun, diikuti Perak 106,773.4 ton / tahun, Negeri Johor 103,441 ton / tahun, Pulau Pinang 66,054 ton / tahun, Sabah 38,802.5 ton / tahun dan Sarawak 35,443.5 ton / tahun, Wilayah Persekutuan Kuala Lumpur 28,882.5 ton / tahun, Negeri Pahang 28,484.4 ton / tahun, Negeri Sembilan 24,285.9 ton / tahun, Negeri Kedah 22,149.2 ton / tahun, Negeri Melaka 16,884.6 ton / tahun, Negeri Terengganu 15,180.6 ton / tahun, Wilayah Persekutuan Labuan 3,477.6 ton / tahun, Negeri Perlis 2,906.2 ton / tahun, Negeri Kelantan 947.5 ton / tahun, Wilayah Persekutuan Putrajaya 279.1 ton / tahun. Carta bar beban pencemaran mengikut Negeri-negeri seluruh Malaysia ditunjukkan seperti dalam Rajah 6.4.

Pollution Loads in Accordance With States

Pollution load generated annually throughout Malaysia is estimated to total 608,455 tonnes / year. Comparatively, activities in the State of Selangor generates the highest pollution loads with a totalled 114,463 tonnes / year, followed by State of Perak 106,773.4 tonnes / year, Negeri Johor 103,441 tonnes / year, Pulau Pinang 66,054 tonnes / year, Sabah 38,802.5 tonnes / year dan Sarawak 35,443.5 tonnes / year, federal Territory of Kuala Lumpur 28,882.5 tonnes / year, Negeri Pahang 28,484.4 tonnes / year, Negeri Sembilan 24,285.9 tonnes / year, Negeri Kedah 22,149.2 tonnes / year, Negeri Melaka 16,884.6 tonnes / year, Negeri Terengganu 15,180.6 tonnes / year, federal Territory of Labuan 3,477.6 tonnes / year, Negeri Perlis 2,906.2 tonnes / year, Negeri Kelantan 947.5 tonnes / year, federal Territory of Putrajaya 279.1 tonnes / year. Pollution load in accordance with states is shown in Figure 6.4.



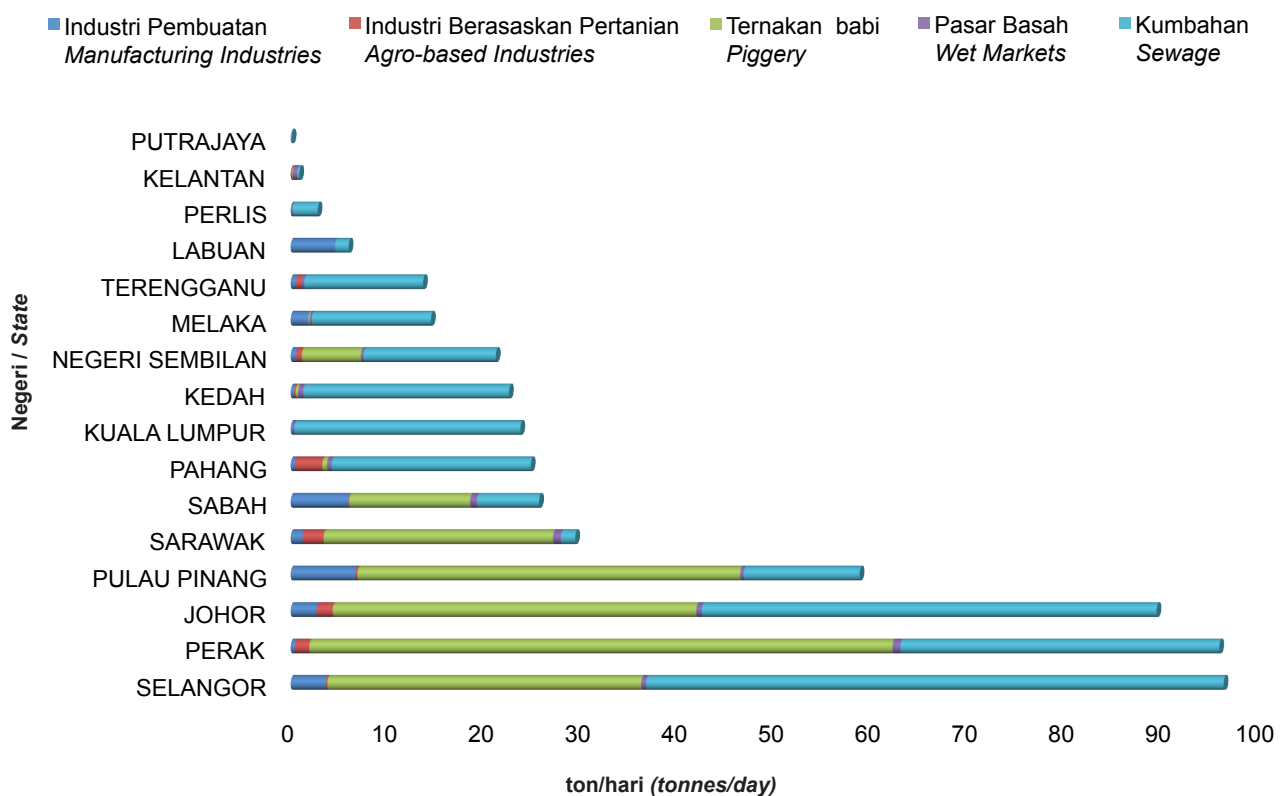
Rajah 6.4 : Carta Bar Beban Pencemaran Mengikut Negeri-negeri Seluruh Malaysia, 2015
Figure 6.4: Pollution Load in Malaysia Accordance With States 2015

Beban Pencemaran Keperluan Oksigen Biokimia Mengikut Negeri

Beban BOD di Negeri Selangor adalah tertinggi iaitu sebanyak 96.3 ton/ hari, diikuti Negeri Perak 95.8 ton/ hari, Negeri Johor 89.4 ton/ hari, Pulau Pinang 58.7 ton/ hari, dan Sarawak 29.3 ton/ hari. Beban BOD untuk 11 negeri termasuk Labuan dan Putrajaya adalah kurang dari 26 ton/ hari. Senarai beban pencemar BOD mengikut Negeri ditunjukkan seperti di **Rajah 6.5**.

Biochemical Oxygen Demand Load in Accordance With States

BOD loads generated in the State of Selangor recorded the highest value with 96.3 tonnes/day, followed by State of Perak 95.8 tonnes/ day, State of Johore 89.4 tonnes/ day, State of Penang 58.7 tonnes/ day and Sarawak State 29.3 tonnes/ day. Other states including Federal Territory of Labuan and Putrajaya generated less than 26 tonnes/ day, as shown in **Figure 6.5**.



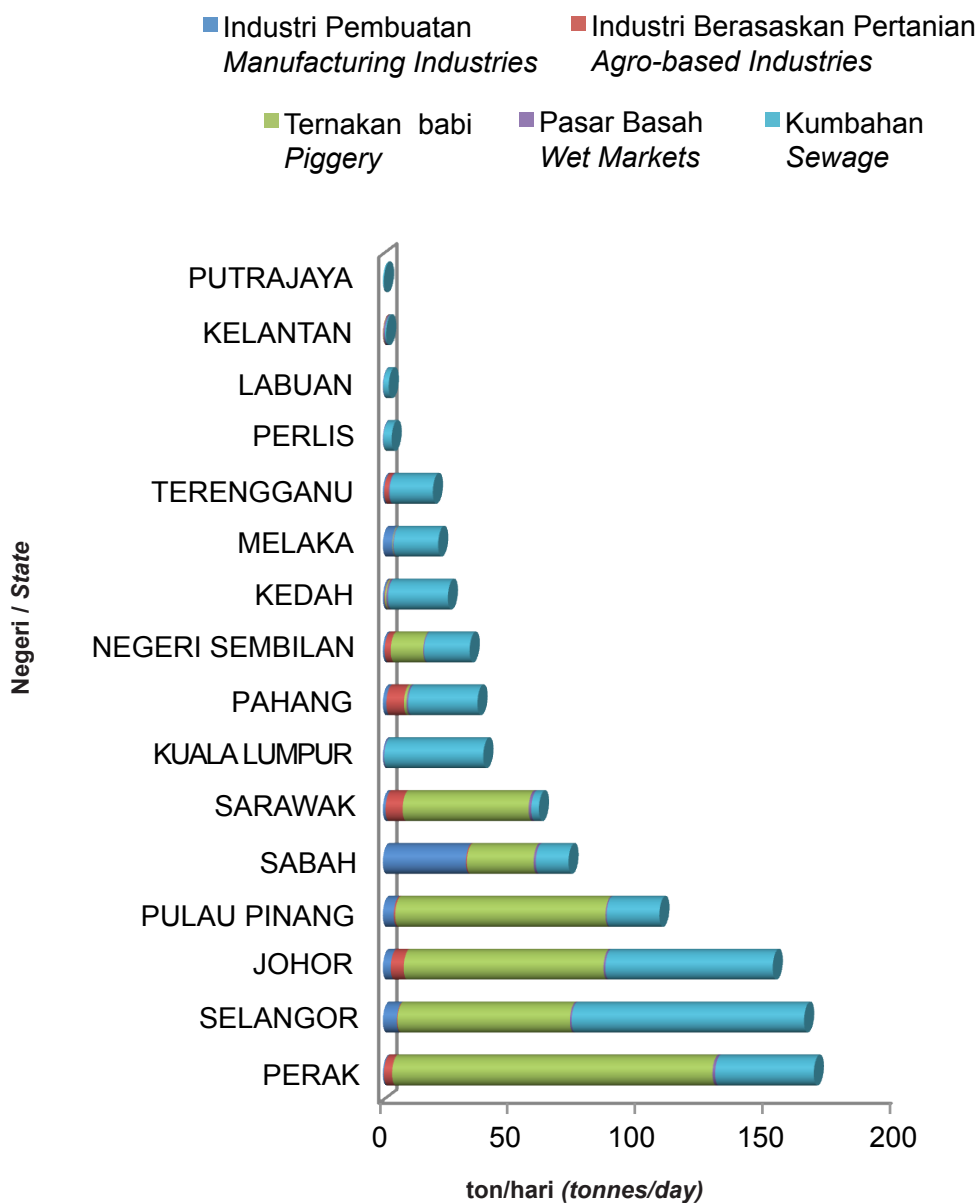
Rajah 6.5 Malaysia: Taburan Beban BOD Mengikut Negeri dan Punca-Punca Pencemaran Air, 2015
 Figure 6.5 Malaysia: Distribution of BOD Load By States and Water Pollution Sources, 2015

Beban Pencemaran Pepejal Terampai Mengikut Negeri

Penjanaan beban pepejal terampai di Negeri Perak didapati tertinggi dengan jumlah 168 ton / hari, diikuti Negeri Selangor 164 ton / hari, Negeri Johor 152 ton / hari, Pulau Pinang 108 ton/hari dan Sabah 73 ton / hari. Lain-lain Negeri didapati menghasilkan kurang daripada 61 ton / hari ditunjukkan di dalam **Rajah 6.6**.

Suspended Solid Load Accordance With State

Activities in the State of Perak was found to pollute their watercourses with suspended solids loads of 168 tonnes / day), followed by State of Selangor 164 tonnes / day, State of Johor 152 tonnes / day, State of Penang 108 tonnes / day and Sabah State 73 tonnes day. Other States generated less than 61 tonnes / day, as shown in **Figure 6.6**.



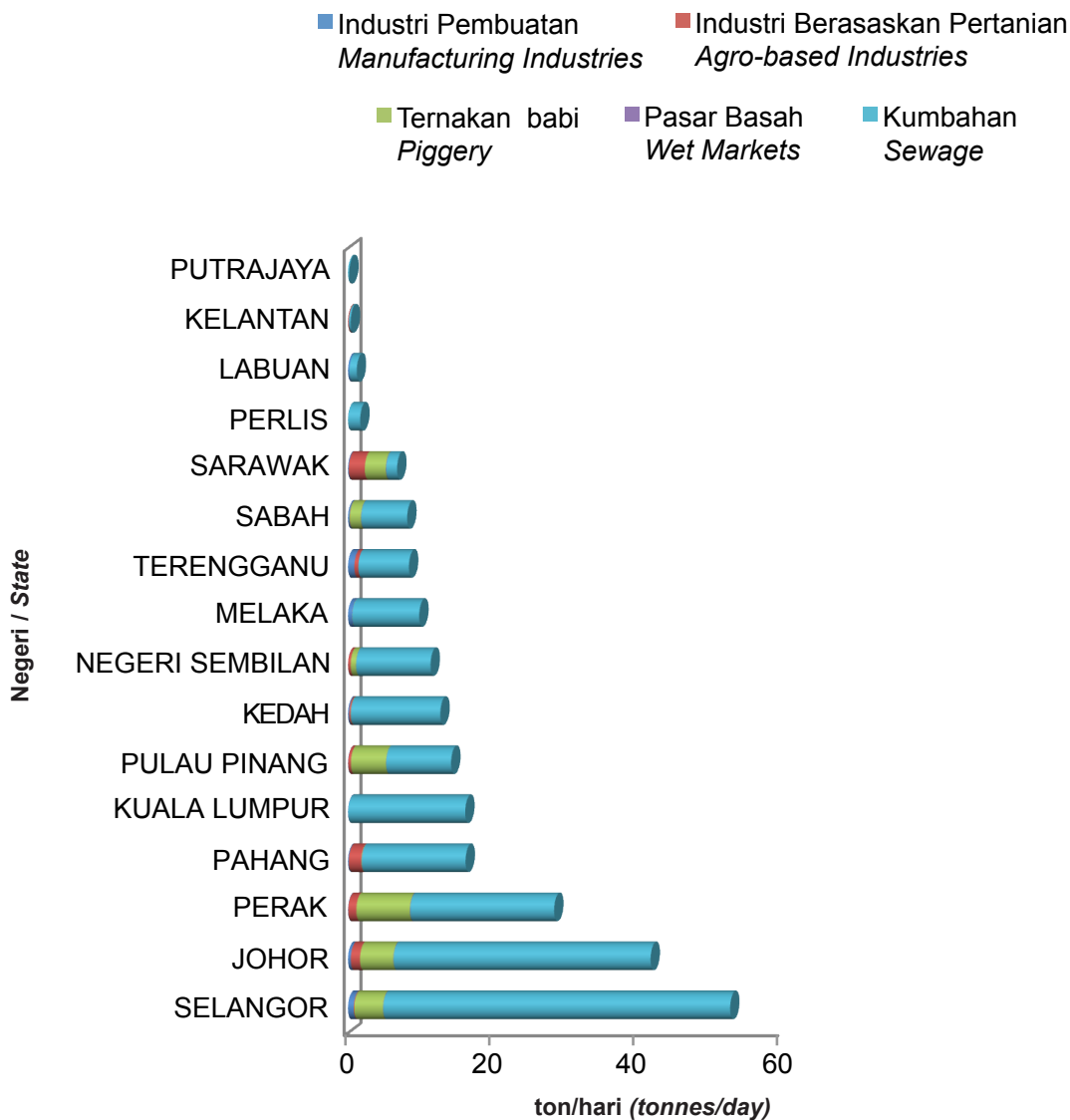
Rajah 6.6 Malaysia: Taburan Beban SS Mengikut Negeri dan Punca-Punca Pencemaran Air, 2015
 Figure 6.6 Malaysia: Distribution of SS Load By States and Water Pollution Sources, 2015

Beban Pencemaran Ammonikal Nitrogen Mengikut Negeri

Penghasilan beban Ammonikal Nitrogen (AN) di Negeri Selangor adalah tertinggi dengan jumlah 53 ton / hari, diikuti Negeri Johor 42 ton / hari, Negeri Perak 28.5 ton / hari, Negeri Pahang 16.3 ton / hari dan Wilayah Persekutuan Kuala Lumpur 16.2 ton / hari. Lain-lain Negeri didapati menyumbangkan kurang dari 14 ton / hari beban amoniakal nitrogen, ditunjukkan sepertimana dalam **Rajah 6.7**.

Ammoniacal Nitrogen Load Accordance With State

State of Selangor was found to generate the highest Ammoniacal Nitrogen load with a totalled of 53 tonnes / day, followed by States of Johor 42 tonnes / day, State of Perak 28.5 tonnes / day, State of Pahang 16.3 tonnes / day and federal Territory of Kuala Lumpur 16.2 tonnes / day. Other States showed to generate less than 14 tonnes / day, as shown in **Figure 6.7**.



Rajah 6.7 Malaysia: Taburan Beban AN Mengikut Negeri dan Punca-Punca Pencemaran, 2015
 Figure 6.7 Malaysia: Distribution of AN Load By States and Water Pollution Sources, 2015

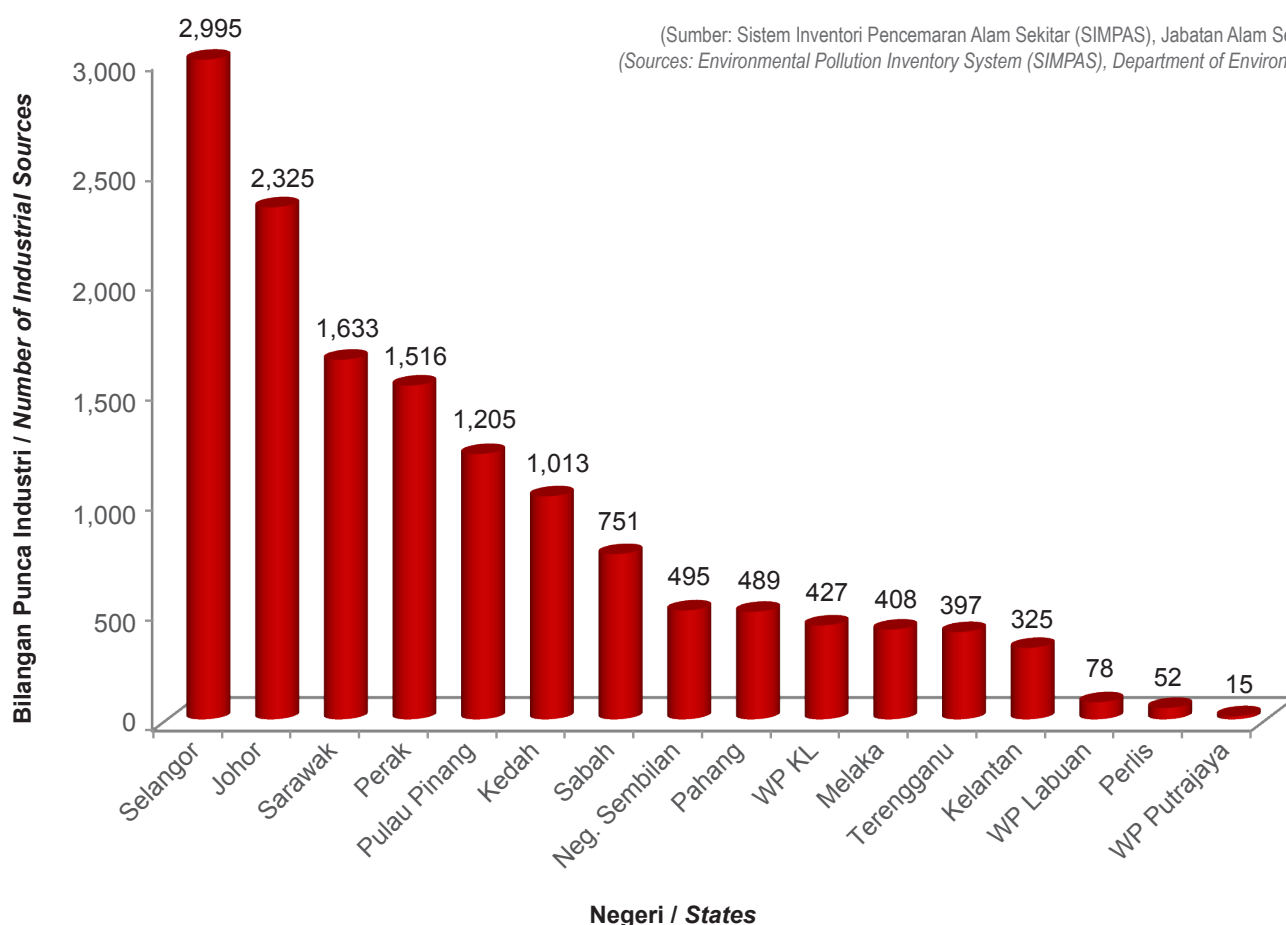
PUNCA-PUNCA PENCEMARAN UDARA SOURCES OF AIR POLLUTION

Peningkatan punca industri dan bilangan kenderaan bermotor boleh menyebabkan pencemaran udara yang teruk jika pelepasan pencemar termasuk pelepasan asap daripada kedua-dua aktiviti ini tidak dikawal dengan berkesan.

Sehingga bulan Disember 2015, jumlah punca industri yang tertakluk di bawah Peraturan-Peraturan Kualiti Alam Sekeliling (Udara Bersih) 2014 adalah sebanyak 14,124. Jumlah ini bertambah berbanding pada tahun 2014. Pecahan punca industri berdasarkan negeri adalah seperti **Rajah 6.8**. Bilangan punca pencemar yang tertinggi adalah di negeri Selangor (2,995: 21.2%) diikuti negeri Johor (2,325:16.5%) dan negeri Sarawak (1,633:11.6%).

The increasing trend of industrial sources and number of motor vehicles can cause severe air pollution if the emission including smoke emission from both the sources are not effectively controlled.

*As of December 2015, a total of 14,124 industrial sources were recorded to be subjected to the Environmental Quality (Clean Air) Regulations 2014, 1978, declining compared to 2014. The distribution of industrial sources by states is as shown in **Figure 6.8**. The highest number of stationary pollution sources was in Selangor (2,995:21.2%) followed by Johor (2,325:16.5%) and Sarawak (1,633:11.6%).*

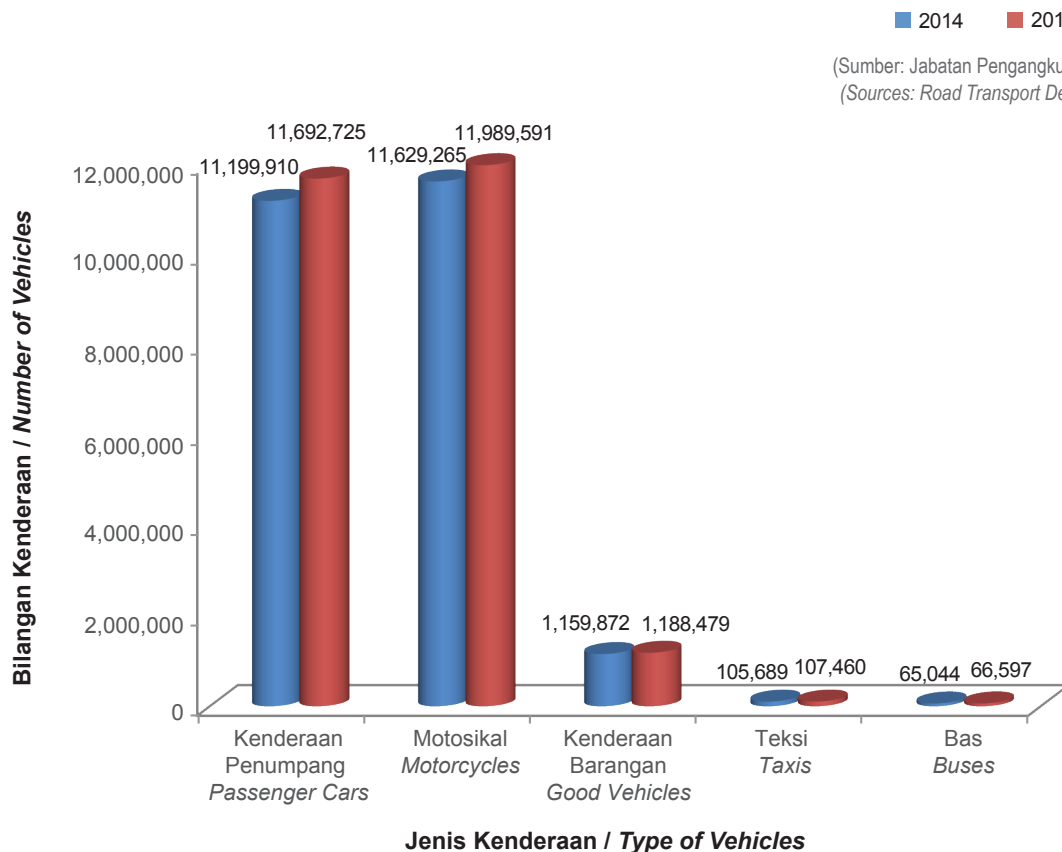


(Sumber: Sistem Inventori Pencemaran Alam Sekitar (SIMPAS), Jabatan Alam Sekitar)
(Sources: Environmental Pollution Inventory System (SIMPAS), Department of Environment)

Rajah 6.8 Malaysia: Punca Pencemaran Udara Mengikut Negeri, 2015
Figure 6.8 Malaysia: Industrial Air Pollution Sources by State, 2015

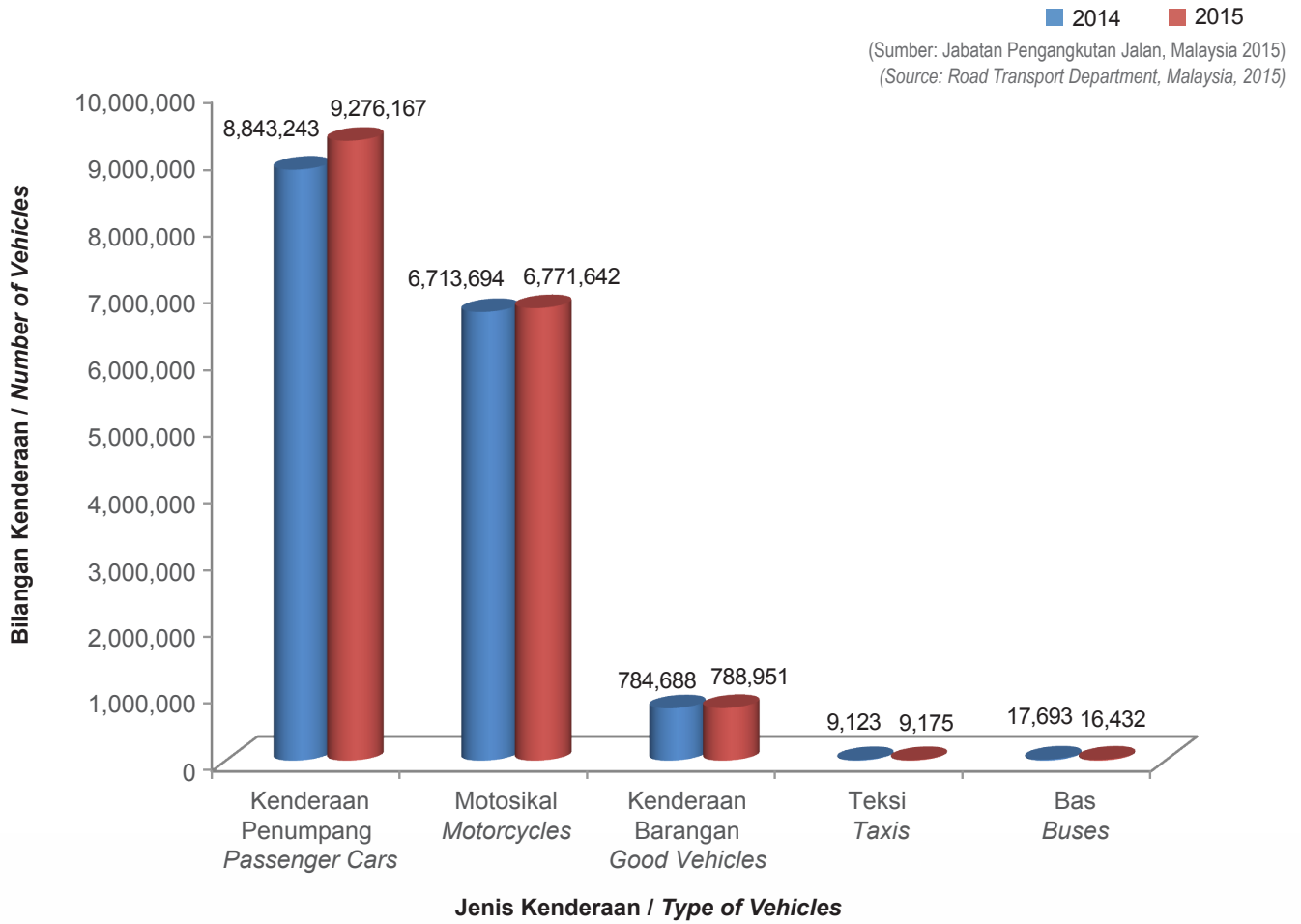
Seperti tahun-tahun yang lepas, pelepasan asap dari kenderaan bermotor merupakan punca utama yang menyumbang kepada pencemaran udara terutamanya di kawasan bandar. Pada tahun 2015, terdapat peningkatan bagi jumlah keseluruhan kenderaan bermotor yang didaftarkan. Bilangan pendaftaran yang direkodkan bagi kenderaan penumpang meningkat sebanyak 4.40%, motosikal 3.10%, kenderaan barangan 2.47%, teksi 1.68% dan bas 2.39% berbanding pada tahun 2014. Pendaftaran kenderaan bermotor yang direkodkan oleh Jabatan Pengangkutan Jalan pada tahun 2014 dan 2015 adalah seperti yang ditunjukkan dalam **Rajah 6.9**. Bilangan bagi kenderaan yang sedang digunakan dan yang masih aktif juga menunjukkan tren peningkatan, di mana bilangan bagi kenderaan penumpang meningkat sebanyak 4.90%, motosikal sebanyak 0.86%, kenderaan barangan sebanyak 0.54% dan teksi sebanyak 0.57% jika dibandingkan dengan tahun 2014 (**Rajah 6.10**). Manakala, bagi bas, ianya masih menunjukkan penurunan sebanyak 7.13% berbanding tahun 2014.

*Like the past years, emission from motor vehicles remained the major source of air pollution especially in urban areas. In 2015, there was an overall increase in the number of motor vehicles registered. The number of registered passenger cars increased by 4.40%, motorcycles 3.10%, goods vehicles 2.47%, taxi 1.68% and buses 2.39% compared to 2014. The number of registered vehicles in Malaysia as reported by the Road Transport Department for 2014 and 2015 is shown in **Figure 6.9**. The number of in use vehicles or active on the road also has shown an ascending trend in which the number of passenger vehicles has increased by 4.90%, motorcycles increased 0.86%, goods vehicles increased 0.54% and taxis increased 0.57% compared to 2014 (Figure 6.10). Meanwhile for the buses, it is still a descending trend of 7.13% compared to 2014.*

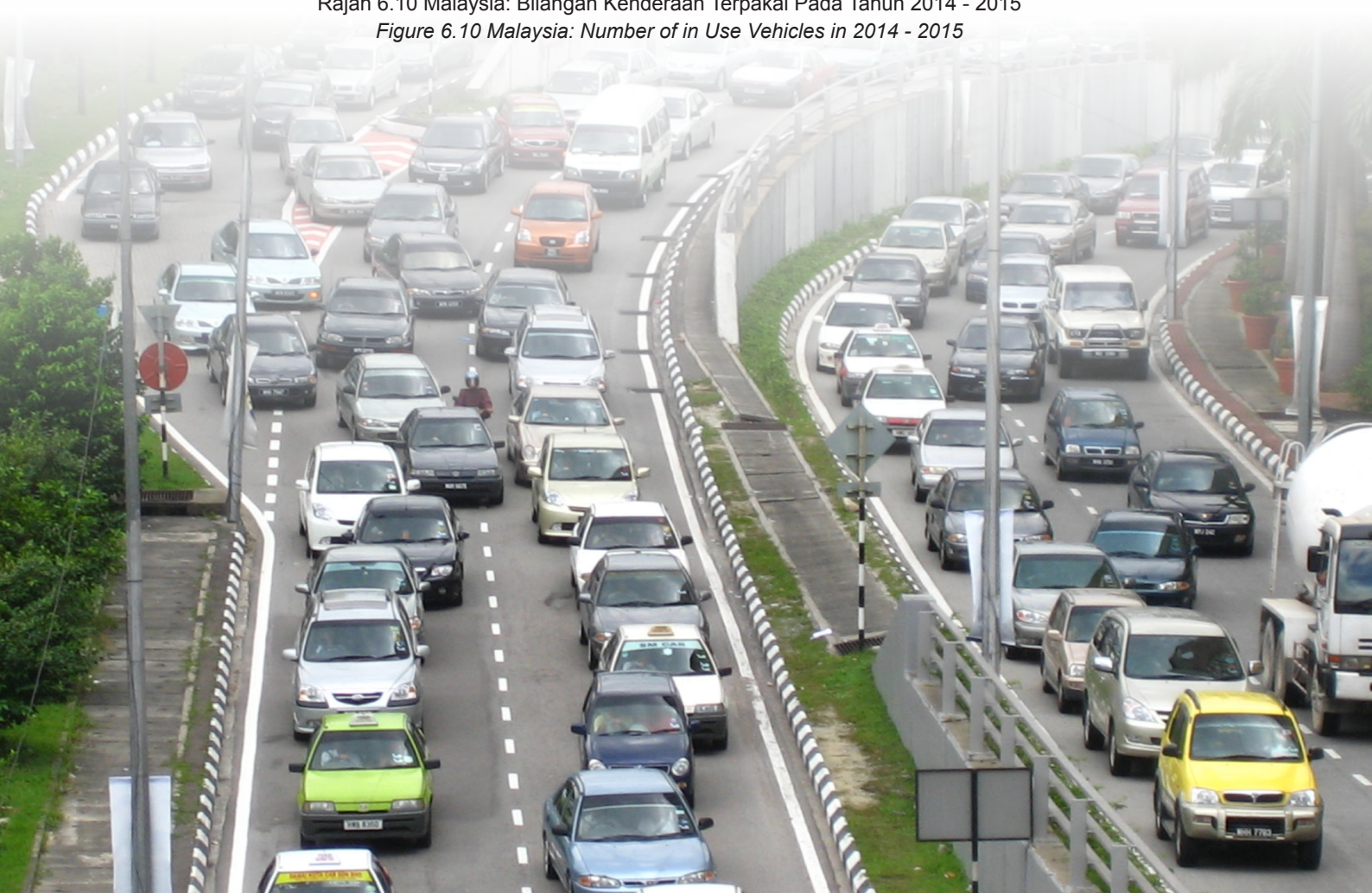


(Sumber: Jabatan Pengangkutan Jalan, Malaysia 2015)
(Sources: Road Transport Department, Malaysia 2015)

Rajah 6.9 Malaysia: Bilangan Kenderaan Berdaftar Tahun 2014 - 2015
Figure 6.9 Malaysia: Number of Registered Vehicles in 2014 - 2015



Rajah 6.10 Malaysia: Bilangan Kenderaan Terpakai Pada Tahun 2014 - 2015
 Figure 6.10 Malaysia: Number of in Use Vehicles in 2014 - 2015



BEBAN PENCEMARAN PENCEMAR UDARA AIR POLLUTANT EMISSION LOAD

Beban Pencemaran Secara Menyeluruh

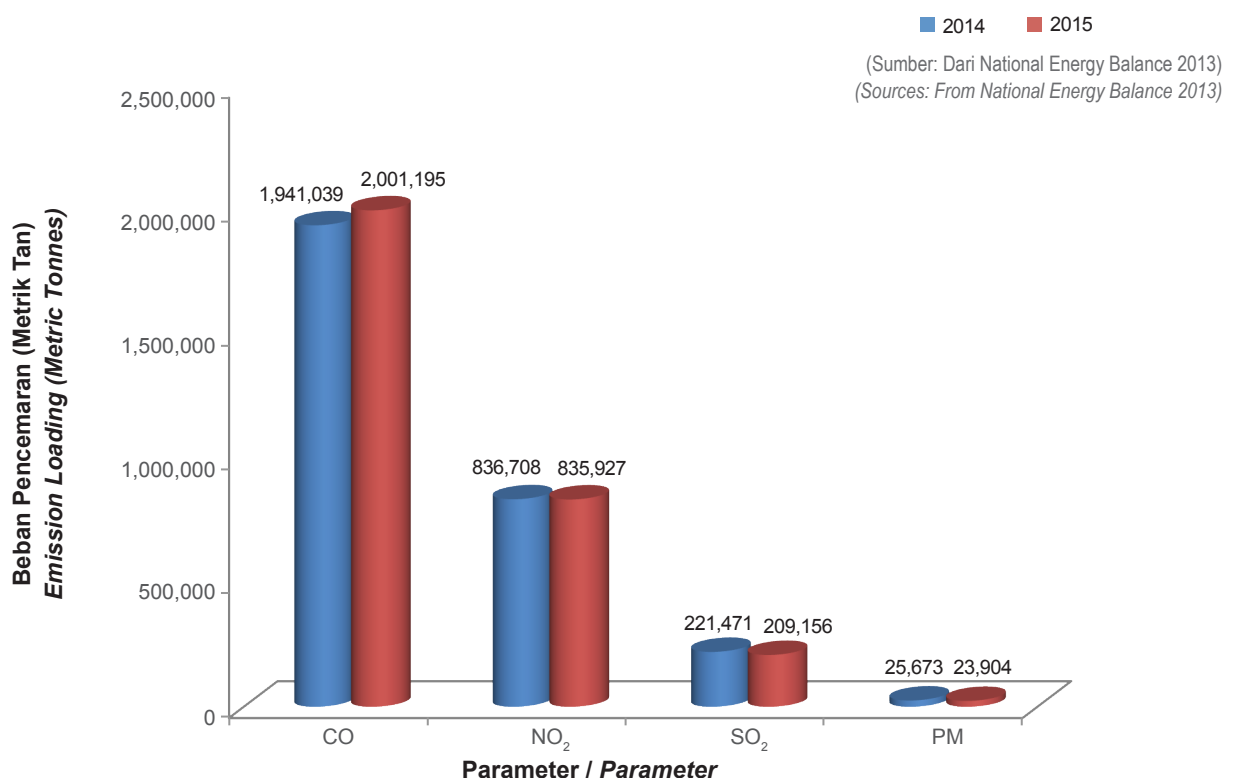
Dianggarkan pada tahun 2015, keseluruhan beban pencemaran yang terkumpul bagi pencemar karbon monoksida (CO) adalah 2,001,195 metrik tan; 835,927 metrik tan bagi nitrogen dioksida (NO₂); 209,156 metrik tan bagi sulfur dioksida (SO₂) dan 23,904 metrik tan bagi jirim zarah (PM). Perbezaan keseluruhan beban pencemaran bagi tahun 2014 dan 2015 adalah ditunjukkan dalam **Rajah 6.11**.

Beban pencemaran bagi CO adalah meningkat pada tahun 2015 berbanding dengan 2014 disebabkan peningkatan penggunaan bahan api minyak dan arang batu sebagai bahan api dalam industri dan loji janakuasa. Pengurangan sebanyak 0.10% beban pencemar CO, 5.56% bagi beban pencemar SO₂, dan 6.89% bagi beban pencemar PM berbanding dengan tahun 2014 adalah disebabkan pengurangan penggunaan bahan api dalam aktiviti pertanian. (Sumber: National Energy Balance, 2013)

Overall Emission Load

*It was estimated that in 2015 the combined air pollutant emission load accumulated to 2,001,195 metric tonnes of carbon monoxide (CO); ,927 metric tonnes of nitrogen oxides (NO₂); 209,156 metric tonnes of sulphur dioxide (SO₂) and 23,904 metric tonnes of particulate matter (PM). A comparison of the combined air pollutant emission load in 2014 and 2015 is shown in **Figure 6.11**.*

Emission load for CO had increased in 2015 compared to 2014 due to high consumptions of fuel oil and coke which were used as fuels in industries and, power and heat generation plants. The declination of 0.10% in CO emission load, 5.56% in SO₂ emission load and 6.89% in PM emission load compared to 2014 could be due to lower fuel consumption in agricultural activities. (Sources: National Energy Balance 2013).



Rajah 6.11 Malaysia: Beban Pencemaran Bahan Pencemar Udara Dari Semua Punca, 2014-2015
Figure 6.11 Malaysia: Air Pollutant Emission Load from All Sources, 2014-2015

Punca Beban Pencemaran

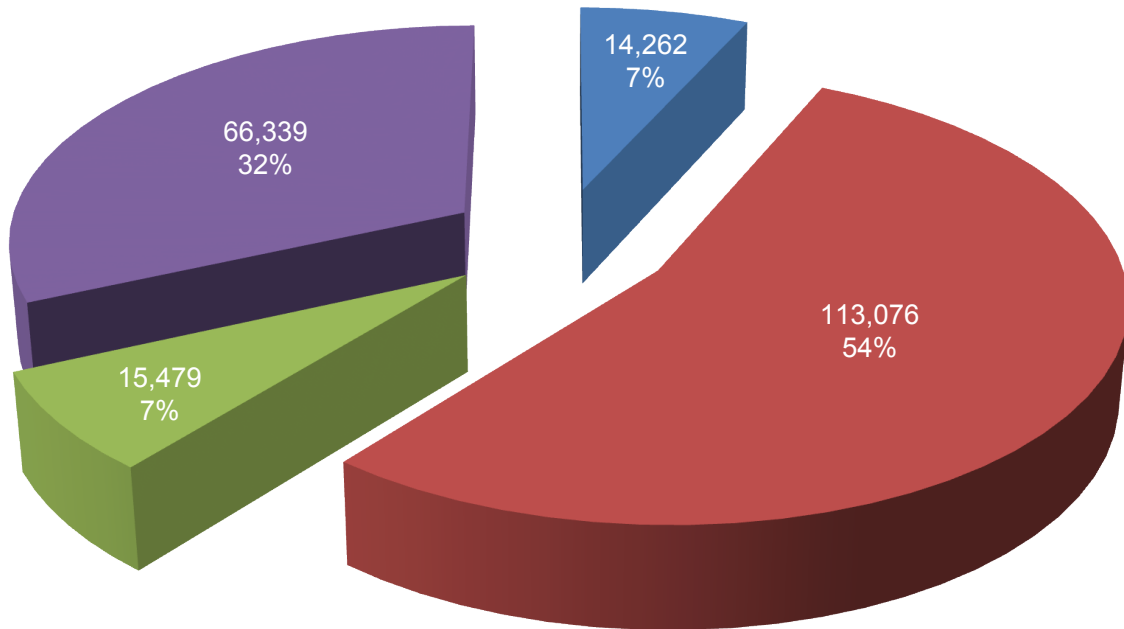
Loji janakuasa merupakan penyumbang utama kepada beban pencemar SO_2 (54%), diikuti dengan lain-lain kategori (32%), industri (7%) dan kenderaan bermotor (7%) (**Rajah 6.12**). Bagi beban pencemar PM pula, penyumbang terbesar adalah daripada industri (32%), diikuti oleh loji janakuasa (31%), lain-lain kategori (20%) dan kenderaan bermotor (17%) (**Rajah 6.13**). Seperti yang ditunjukkan dalam **Rajah 6.14**, penyumbang terbesar bagi NO_2 adalah daripada loji janakuasa (65%) diikuti kenderaan bermotor (27%), industri (6%) dan lain-lain kategori (2%). Walau bagaimanapun, kenderaan bermotor masih merupakan penyumbang terbesar kepada CO (95%) (**Rajah 6.15**). Punca-punca lain yang dinyatakan di dalam carta ini merupakan pelepasan bahan pencemar udara dari kawasan perumahan, komersial, penggunaan bukan tenaga serta pertanian.

Emission Load by Sources

*Power plants contributed to the highest SO_2 emission load (54%), followed by others (32%), industries (7%) and motor vehicles (7%) (**Figure 6.12**). As to PM the highest contributor was industries (32%) followed by power plants (31%), others (20%) and motor vehicles (17%). (**Figure 6.13**). As shown in **Figure 6.14** the highest contributor of NO_2 was power plants (65%) followed by motor vehicles (27%), others (6%) and industries (2%). However, motor vehicles remain the highest contributor of CO (95%) (**Figure 6.15**). Others in this chart represent air pollutant sources from residential, commercial, non-energy use and agriculture.*

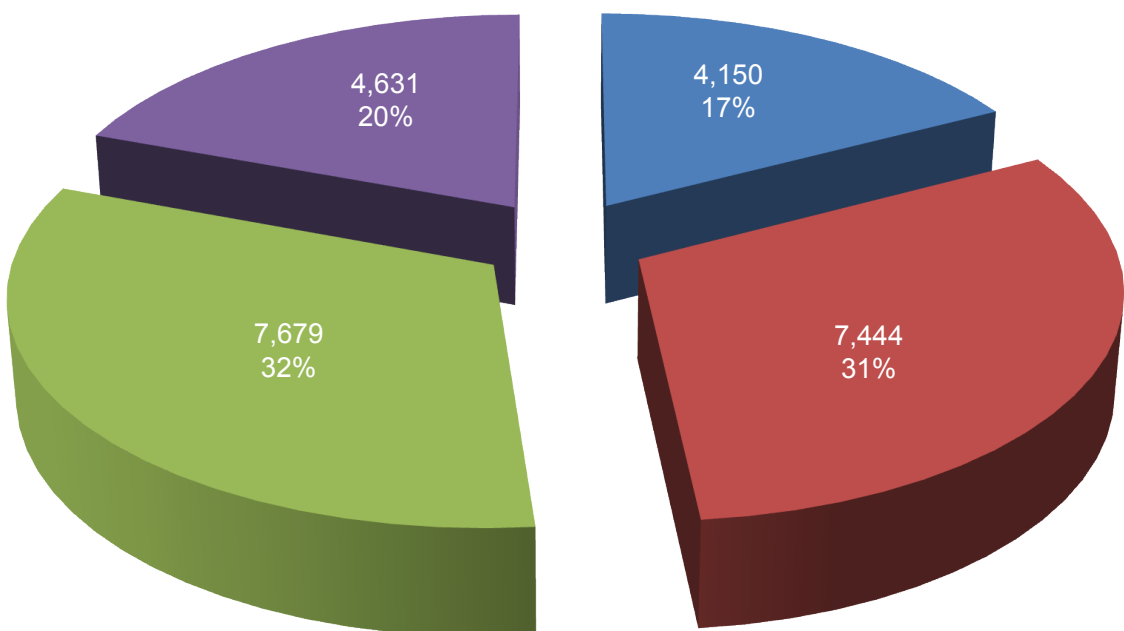


■ Kenderaan Bermotor
Motor Vehicles
■ Loji Janakuasa
Power Plants
■ Industri
Industries
■ Lain-lain
Others

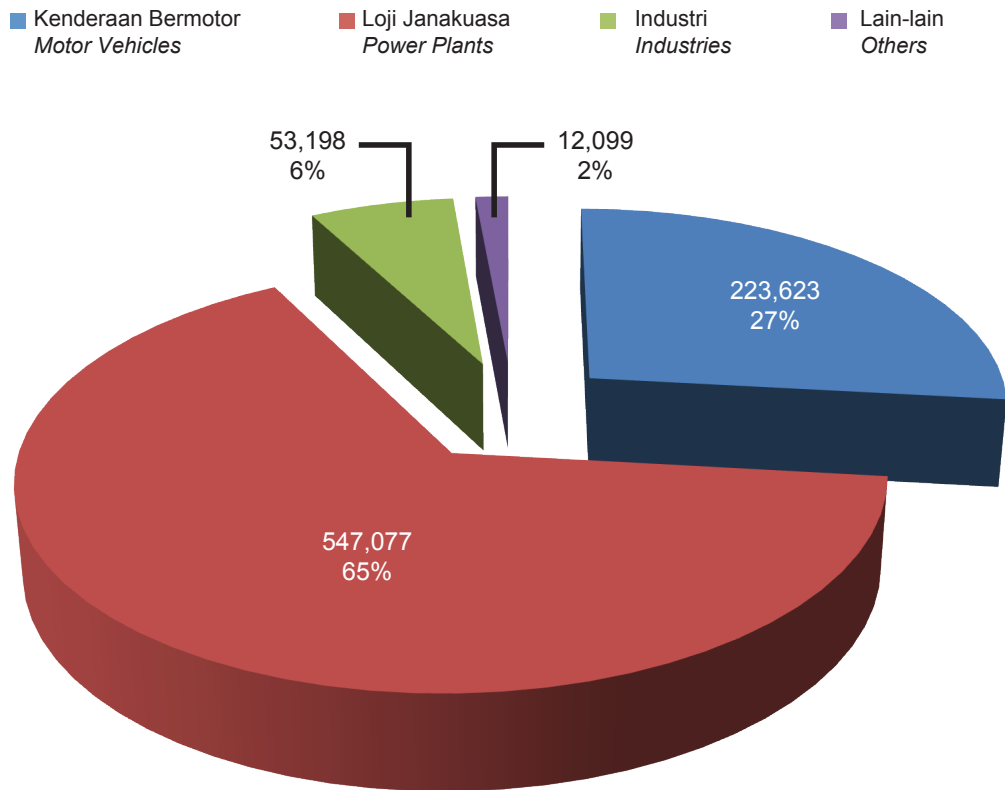


Rajah 6.12 Malaysia: Punca Pencemaran SO₂ (Metrik Tan), 2015
 Figure 6.12 Malaysia: SO₂ Emission by Sources (Metric Tonnes), 2015

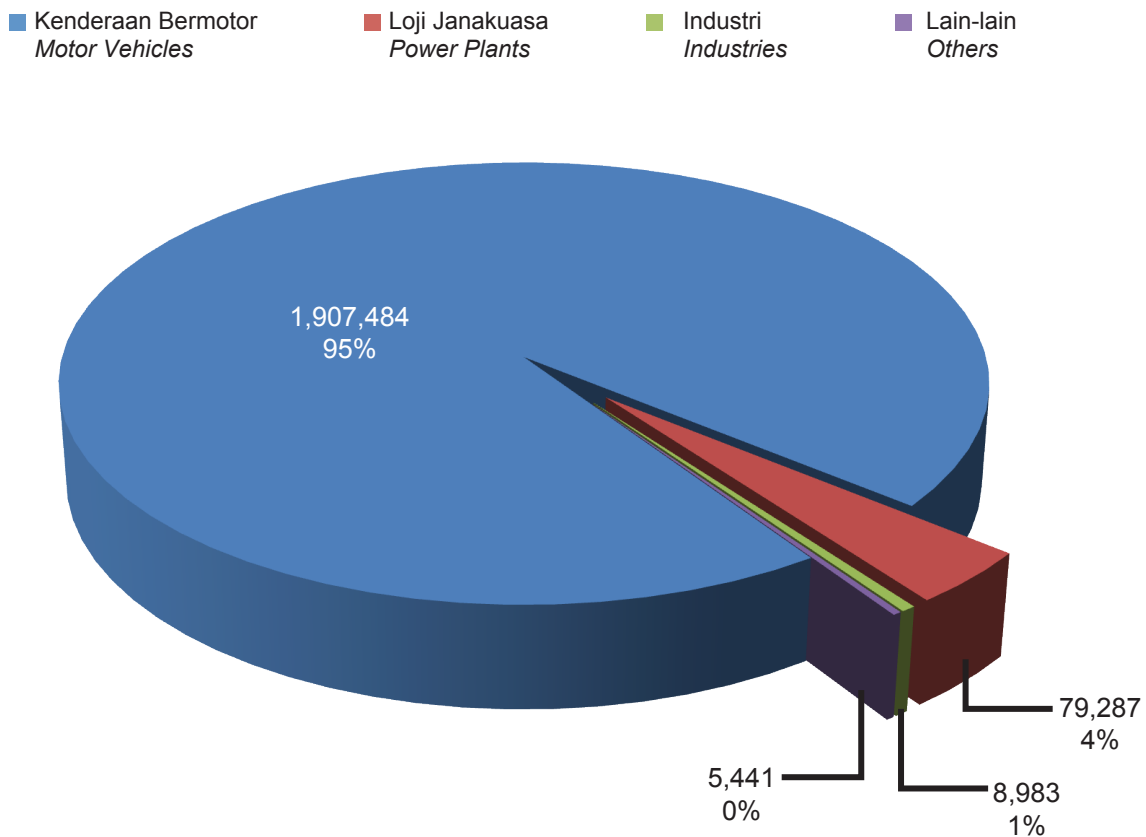
■ Kenderaan Bermotor
Motor Vehicles
■ Loji Janakuasa
Power Plants
■ Industri
Industries
■ Lain-lain
Others



Rajah 6.13 Malaysia: Punca Beban Pencemaran Jirim Zarah (PM) (Metrik Tan), 2015
 Figure 6.13 Malaysia: Particulate Matter (PM) Emission Load by Sources (Metric Tonnes), 2015



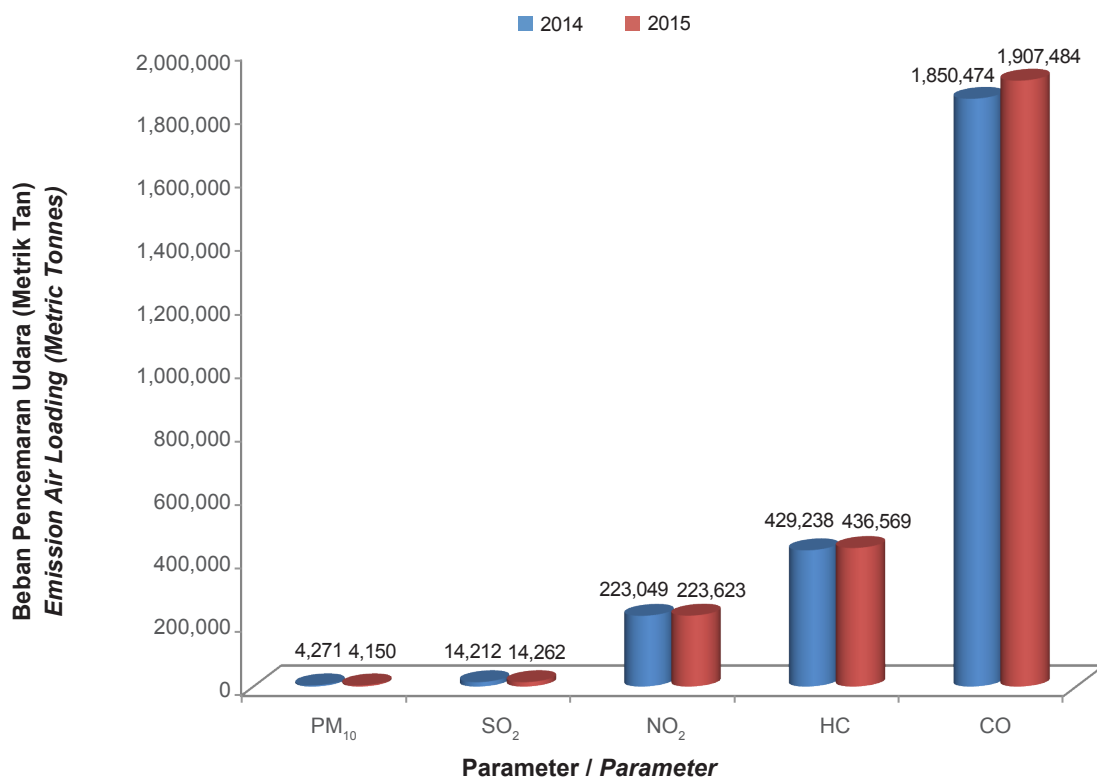
Rajah 6.14 Malaysia: Punca Pencemaran NO₂ (Metrik Tan), 2015
 Figure 6.14 Malaysia: NO₂ Emission by Sources (Metric Tonnes), 2015



Rajah 6.15 Malaysia: Punca Pencemaran CO (Metrik Tan), 2015
 Figure 6.15 Malaysia: CO Emission by Sources (Metric Tonnes), 2015

Anggaran pencemaran yang dihasilkan oleh beban pencemar udara iaitu HC, CO, PM, NO₂ dan CO₂ daripada kenderaan bermotor pada tahun 2014 dan 2015 ditunjukkan dalam **Rajah 6.16**. Pada tahun 2015, beban pencemaran bagi pencemar HC dan CO dianggarkan 436,569 metrik tan dan 1,907,484 metrik tan masing-masing. Terdapat peningkatan sebanyak 3.08% bagi beban pencemaran CO jika dibandingkan dengan tahun 2014. Tren peningkatan yang sama juga dilihat bagi beban pencemaran yang dihasilkan oleh SO₂, NO₂, dan HC daripada kenderaan bermotor pada tahun 2014. SO₂ sebanyak 14,262 metrik tan pada tahun 2015 berbanding pada 14,212 metrik tan pada tahun 2014 (penurunan sebanyak 0.35%) dan NO₂ sebanyak 223,623 metrik tan berbanding 223,049 metrik tan pada 2014 (meningkat sebanyak 0.26%) manakala HC adalah 436,569 metrik tan (meningkat sebanyak 1.7%). Peningkatan beban pencemar dari kenderaan bermotor ini adalah berkait rapat dengan peningkatan bilangan kenderaan bermotor pada tahun 2015. Walau bagaimanapun, beban pencemaran bagi PM berkurangan sebanyak 2.83% pada tahun 2015.

*The estimated annual air pollutant emission load of HC, CO, PM, NO₂ and SO₂ from motor vehicles for 2014 and 2015 is shown in **Figure 6.16**. In 2015, the emission load of HC and CO was estimated to be 436,569 metric tonnes and 1,907,484 metric tonnes respectively. There was an increase of 3.08% of CO emission load compared to 2014. A similar increasing trend was also observed for the emission load of SO₂, NO₂ and HC from motor vehicles in 2014. SO₂ was 14,262 metric tonnes in 2015 as compared to 14,212 metric tonnes in 2014 (0.35% increased); and NO₂ was 223,623 metric tonnes as compared to 223,049 metric tonnes in 2014 (0.26% increased). However, for the emission load of HC, 436,569 metric tonnes (increased by 1.70%). Emission load of PM was 4,150 metric tonnes in 2015 as compared to 4,271 metric tonnes in 2014 (2.83% decreased)*



Rajah 6.16 Malaysia: Beban Pencemaran Pencemar Udara Dari Kenderaan Bermotor, 2014 - 2015
 Figure 6.16 Malaysia: Air Pollutant Emission Load from Motor Vehicles, 2014 - 2015

INVENTORI BUANGAN TERJADUAL SCHEDULED WASTES INVENTORY

Pada tahun 2015, sebanyak 2,918,478.34 tan metrik buangan terjadual telah dihasilkan. Ini mewakili peningkatan keseluruhan sebanyak 14.82% berbanding 2,541,762.34 tan metrik yang dilaporkan pada 2014. Dross / sanga / klinker / abu, enapcemar logam berat, dan buangan gipsum, merupakan kategori utama dalam kategori buangan yang dihasilkan (**Jadual 6.1**). Merujuk kepada **Rajah 6.17**, Negeri Selangor menjana jumlah terbesar buangan terjadual (33.1%), diikuti oleh Negeri Johor (18.3%), Perak (14.1%), Terengganu (12.5%), Pulau Pinang (7.5%), manakala 10 negeri-negeri yang lain menghasilkan sebanyak 14.5%.

Sebanyak 452,956.76 tan metrik (15.52%) daripada jumlah buangan yang dihasilkan diperoleh kembali di dalam dan luar negara. Ini menunjukkan penurunan sebanyak 30.26% berbanding 649,496.69 tan metrik pada tahun 2014. Daripada jumlah itu, 446,077.76 tan metrik (15.28%) daripada buangan terjadual yang diperoleh kembali di kemudahan pemerolehan kembali luar tapak tempatan dan 6,879.00 tan metrik (0.24%) telah dieksport untuk pemerolehan kembali di kemudahan di luar negara.

Sebanyak 165,028.05 tan metrik (5.65%) daripada jumlah buangan terjadual yang dihasilkan, dirawat dan dilupuskan untuk pelupusan akhir, iaitu di Kualiti Alam Sdn. Bhd (120,221.72 MT), Trienekens (Sarawak) Sdn. Bhd (19,283 MT) dan 25,523.32 tan metrik (0.87%) daripada buangan klinikal telah dibakar dan dilupuskan di kemudahan luar tapak yang dilesenkan (**Jadual 6.2**). Jumlah ini menunjukkan kenaikan sebanyak 5.28% daripada sejumlah 156,750.89 tan metrik sisa berjadual dilupuskan pada tahun 2014.

Sebanyak 445,867.97 tan metrik (15.28%) daripada buangan terjadual terhasil telah diolah di tapak, manakala 299,622.49 tan metrik (10.27%) telah distor di premis pengeluar buangan (**Jadual 6.2**). Dua (2)

*In 2015, a total of 2,918,478.34 metric tonnes of scheduled wastes were generated. This represents an overall increase of 14.82% as compared to 2,541,762.34 metric tonnes reported in 2014. Of the total waste generated, dross/slag/clinker/ash, heavy metal sludge, and gypsum were the main categories (**Table 6.1**). Referring to **Figure 6.17**, the state of Selangor generated the largest amount of scheduled wastes (33.1%), followed by Johor (18.3%), Perak (14.1%), Terengganu (12.5%), Pulau Pinang (7.5%), whilst the other 10 states generated a total of 14.5%.*

A total of 452,956.76 metric tonnes (15.52%) of waste were being recovered locally and abroad. This showed a decrease of 30.26% as compared to 649,496.69 metric tonnes in 2014. From the total, 446,077.76 metric tonnes (15.28%) of scheduled wastes were recovered at local off-site facilities and 6,879.00 metric tonnes (0.24%) were exported for recovery at foreign facilities abroad.

*A total of 165,028.05 metric tonnes (5.65%) of waste were treated and disposed for final disposal, at Kualiti Alam Sdn. Bhd. (120,221.72 MT), Trienekens (Sarawak) Sdn. Bhd. (19,283.00 MT) and 25,523.32 metric tonnes (0.87%) of clinical wastes were incinerated at licensed off-site facilities (**Table 6.2**). The amount showed an increase of 5.28% from a total of 156,750.89 metric tonnes of scheduled waste disposed in 2014.*

*A sum of 445,867.97 metric tonnes (15.28%) of scheduled waste were treated on-site; while 299,622.49 metric tonnes (10.27%) were stored on-site at waste generators' premises (**Table 6.2**). Two (2) land farms*

kemudahan pengolahan di atas tanah dan lima belas (15) insinerator dalam tapak telah dilesenkan oleh Jabatan Alam Sekitar bagi membolehkan rawatan dan pembakaran dalam tapak.

Daripada jumlah buangan terjadual yang dihasilkan pada tahun 2015, 1,555,003.07 tan metrik (53.28%) telah diberi kelulusan bersyarat di bawah pengurusan khas seperti yang ditetapkan di bawah Peraturan 7, Peraturan Kualiti Alam Sekeliling (Buangan Terjadual), 2005 (**Jadual 6.4**). Jumlah ini merupakan peningkatan sebanyak 77.43% berbanding 876,415.44 tan metrik pada tahun 2014. Kebanyakan buangan dihasilkan dari loji jana kuasa arang batu (44.71%), enap cemar daripada kemudahan rawatan air minuman (41.51%) dan lain-lain (13.78%) .

and fifteen (15) on-site waste incinerators has been licensed by DOE to allow for on-site treatment and incineration respectively.

Of the total wastes produced in 2015, 1,555,003.07 metric tonnes (53.24%) were granted conditional approval to be managed under special management as stipulated under Regulation 7, Environmental Quality (Scheduled Wastes) Regulations, 2005 (**Table 6.4**). The amount represented an increase of 77.43% as compared to 876,415.44 metric tonnes in 2014. These waste streams are mostly generated from coal-fired power plant (44.71%), sludges from drinking water treatment facilities (41.51%) and others (13.78%).

Jadual 6.1 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2015
Table 6.1 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2015

Bil No	Nama Buangan Name of Waste	Kod Buangan Waste Code	Kuantiti Buangan Quantity of Waste	
			(MT/Tahun) (MT/Year)	Peratusan (%) Percentage (%)
1	Dros / sanga / klinker / abu Dross / slag / clinker / ash	SW 104	1,062,259.39	36.40
2	Enap cemar logam berat Heavy metal sludges	SW 204	846,680.03	29.01
3	Gypsum Gypsum	SW 205	548,768.49	18.80
4	Campuran buangan terjadual dan buangan tidak terjadual Mixture of scheduled waste & non-scheduled waste	SW 422	49,482.15	1.70
5	Minyak pelincir terpakai Spent lubricating oil	SW 305	49,280.71	1.69
6	Buangan elektronik E-waste	SW 110	47,962.73	1.64
7	Asid terpakai Spent acids	SW 206	43,735.85	1.50
8	Bekas tercemar Used container	SW 409	28,207.57	0.97
9	Buangan dakwat dan cat Waste of inks & paints	SW 417	26,602.07	0.91
10	Buangan patogenik / klinikal Pathogenic clinical waste	SW 404	25,523.33	0.87
11	Buangan pelarut organic bukan terhalogen Waste of non-halogenated solvent	SW 322	24,985.60	0.86

Jadual 6.1 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2015
 Table 6.1 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2015

Bil No	Nama Buangan Name of Waste	Kod Buangan Waste Code	Kuantiti Buangan Quantity of Waste	
			(MT/Tahun) (MT/Year)	Peratusan (%) Percentage (%)
12	Kain buruk, plastik, kertas atau turas tercemar <i>Rags / plastics / papers contaminated with scheduled waste</i>	SW 410	20,827.07	0.71
13	Enap cemar mineral <i>Mineral sludges</i>	SW 427	17,222.86	0.59
14	Emulsi minyak mineral-air terpakai <i>Spent mineral oil-water emulsion</i>	SW 307	13,676.30	0.47
15	Buangan getah atau lateks yang mengandungi logam berat <i>Rubber/latex waste containing heavy metal</i>	SW 321	12,956.18	0.44
16	Sisa dari pengolahan atau pemerolehan kembali buangan terjadual <i>Residue from recovery</i>	SW 501	11,888.79	0.41
17	Tanah / puing tercemar <i>Contaminated land / oil</i>	SW 408	9,516.71	0.33
18	Buangan kimia <i>Lab waste</i>	SW 429	8,131.83	0.28
19	Buangan mengandungi formaldehid <i>Waste containing formaldehyde</i>	SW 320	6,594.66	0.23
20	Buangan bateri asid plumbum <i>Waste of acid plumbum batteries</i>	SW 102	6,062.59	0.21
21	Campuran minyak-air <i>Oil -water mixture</i>	SW 309	5,519.24	0.19
22	Enap cemar dakwat dan cat <i>Ink&paints sludges</i>	SW 416	4,609.37	0.16
23	Buangan minyak atau enap cemar berminyak <i>Waste oil / oily sludges</i>	SW 311	4,293.34	0.15
24	Buangan mangkin <i>Waste catalyst</i>	SW 202	4,056.33	0.14
25	Alkali terpakai <i>Spent alkalis</i>	SW 401	4,039.84	0.14
26	Minyak hidraulik terpakai <i>Spent hydraulic oil</i>	SW 306	3,758.42	0.13
27	Klinker, sanga dan abu dari penunu buangan terjadual <i>Clinker, slag and ashes from incinerator</i>	SW 406	3,618.54	0.12
28	Enap cemar yang mengandungi fluorida <i>Sludge containing flouride</i>	SW 207	3,151.16	0.11
29	Buangan bateri yang mengandungi cadmium dan nikel <i>Waste of bateries containing cadmium / hg / litium</i>	SW 103	3,048.66	0.10
30	Karbon teraktif terpakai <i>Contaminated actice carbon</i>	SW 411	2,735.11	0.09
31	Produk dakwat, cat, pigmen atau lakuer yang tidak mengikut spesifikasi yang mengandungi pelarut organik <i>Discarded of ink / paint / pigment / lacquer containing organic solvent</i>	SW 418	2,596.13	0.09
32	Buangan resin yang mengandungi pelarut organik <i>Waste of resin containing organic</i>	SW 325	1,930.79	0.07
33	Alkali terpakai dengan $ph \geq 11.5$ <i>Spent alkalis with $ph > 11.5$</i>	SW 402	1,927.32	0.07

Jadual 6.1 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2015
 Table 6.1 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2015

Bil No	Nama Buangan Name of Waste	Kod Buangan Waste Code	Kuantiti Buangan Quantity of Waste	
			(MT/Tahun) (MT/Year)	Peratusan (%) Percentage (%)
34	Buangan pelarut organik terhalogen <i>Waste of halogenated solvents</i>	SW 323	1,722.79	0.06
35	Campuran buangan terjadual <i>Mixture of scheduled waste</i>	SW 421	1,654.47	0.06
36	Buangan mengandungi merkuri <i>Waste containing mercury/compound</i>	SW 109	1,322.09	0.05
37	Buangan cecair terma <i>Waste of thermal fluids</i>	SW 327	1,115.57	0.04
38	Buangan sisa penyulingan tidak berair terhalogen atau bukan terhalogen <i>Waste of halogenated or unhalogenated non-aqueous distillation residues arising from organic solvents recovery process</i>	SW 324	811.76	0.03
39	Asid organik terpakai <i>Spent organic acids</i>	SW 301	741.63	0.03
40	Garam terpakai yang mengandungi sianida <i>Spent salt containing cyanide</i>	SW 413	717.14	0.02
41	Buangan pelekat / glu yang mengandungi pelarut organik <i>Adhesive/glue containing organic solvent</i>	SW 303	655.13	0.02
42	Enap cemar dari tangki penyimpanan minyak mineral <i>Sludges from mineral oil storage tank</i>	SW 310	549.52	0.02
43	Sisa berminyak dari bengkel automotif <i>Oily residue from workshop</i>	SW 312	525.36	0.02
44	Buangan makmal <i>Chemical waste</i>	SW 430	513.90	0.02
45	Buangan fotografi <i>Photographic waste</i>	SW 423	377.21	0.01
46	Larutan alkali berair terpakai yang mengandungi sianida <i>Spent aqueous alkaline containing cyanide</i>	SW 414	359.81	0.01
47	Tar atau sisa bertar dari loji penapisan minyak <i>Tar residue from oil refinery/petrochemical plant</i>	SW 315	343.34	0.01
48	Dadah terbuang <i>Expired drug</i>	SW 403	282.31	0.01
49	Minyak/enapcemar daripada loji penapisan minyak <i>Oil/sludges from oil refinery</i>	SW 314	241.56	0.01
50	Tanah yang dicemari dengan minyak daripada penapisan semula minyak pelincir terpakai <i>Contaminated oil from re-refining/used lubricating oil</i>	SW 313	139.62	0.00
51	Enap cemar dari tangki minyak <i>Oil tankers sludges</i>	SW 308	137.34	0.00
52	Buangan farmaseutikal <i>Discarded drug</i>	SW 405	112.01	0.00
53	Enap cemar yang distabilkan <i>Stabilized sludges</i>	SW 203	78.46	0.00
54	Buangan asbestos <i>Asbestos</i>	SW 201	72.97	0.00
55	Enap cemar yang mengandungi sianida <i>Sludges containing cyanide</i>	SW 412	67.30	0.00

Jadual 6.1 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2015
 Table 6.1 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2015

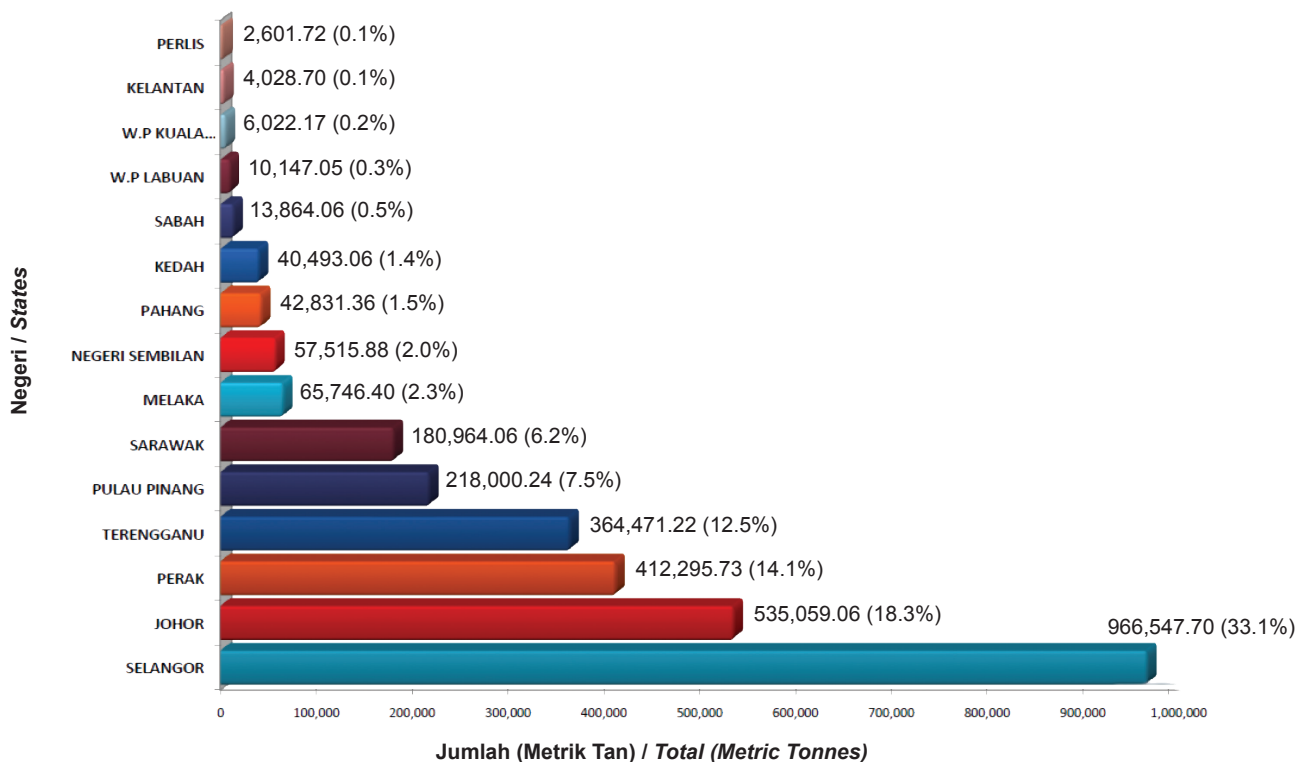
Bil No	Nama Buangan Name of Waste	Kod Buangan Waste Code	Kuantiti Buangan Quantity of Waste	
			(MT/Tahun) (MT/Year)	Peratusan (%) Percentage (%)
56	Produk racun perosak yang tidak mengikut spesifikasi <i>Used pesticide/herbicides/biocides</i>	SW 426	67.13	0.00
57	Buangan fluks <i>Flux waste</i>	SW 302	58.51	0.00
58	Buangan yang mengandungi arsenik <i>Waste containing arsenic</i>	SW 101	54.23	0.00
59	Buangan fenol <i>Waste of phenols/its compound</i>	SW 319	52.70	0.00
60	Buangan racun perosak <i>Pesticide</i>	SW 425	29.21	0.00
61	Buangan sebatian fosforus organik <i>Waste of organic phosphorus compound</i>	SW 326	6.97	0.00
62	Diisosianat terpakai <i>Spent di-isocyanates</i>	SW 419	5.86	0.00
63	Buangan yang mengandungi peroksida <i>Waste containing peroxides</i>	SW 432	4.74	0.00
64	Buangan yang mengandungi dioksin atau furan <i>Waste containing dioxins or furans</i>	SW 407	2.79	0.00
65	Agen pengoksidaan terpakai <i>Spent oxidizing agent</i>	SW 424	2.35	0.00
66	Enap cemar asid <i>Acid sludges</i>	SW 316	1.13	0.00
67	Sanga kuprum <i>Slag of copper</i>	SW 107	0.70	0.00
68	Enap cemar galvanik <i>Galvanic sludges</i>	SW 105	0.70	0.00
69	Sebatian organologam terpakai <i>Spent of organometallic compound</i>	SW 317	0.50	0.00
70	Sisa dari pemprosesan zink <i>Zink residue</i>	SW 108	0.14	0.00
71	Buangan yang mengandungi bft dan tft <i>Waste containing pcb or pct</i>	SW 318	0.13	0.00
72	Buangan dari pengilangan bahan letupan <i>Waste from manufacturing/processing or use of explosive</i>	SW 431	0.09	0.00
73	Sisa dari pemerolehan kembali likuor penjerukan asid <i>Residue from recovery of acid pickling liquor</i>	SW 106	0.02	0.00
74	Kek tekan daripada prapengolahan lai sabun gliserol <i>Cake from glycerol soap iye</i>	SW 304	-	0.00
75	Minyak pelindapan terpakai yang mengandungi sianida <i>Spent quenching oil containing cyanide</i>	SW 415	-	0.00
76	Larutan resap dari tapak pelupusan buangan terjadual <i>Leachate from scheduled waste landfill</i>	SW 420	-	0.00
77	Buangan daripada operasi pengawetan kayu <i>Waste from wood containing heavy metals</i>	SW 428	-	0.00
Jumlah Total			2,918,478.34	100.00

Jadual 6.2 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Jenis Industri, 2015
 Table 6.2 Malaysia: Quantity of Scheduled Wastes Generated by Industry, 2015

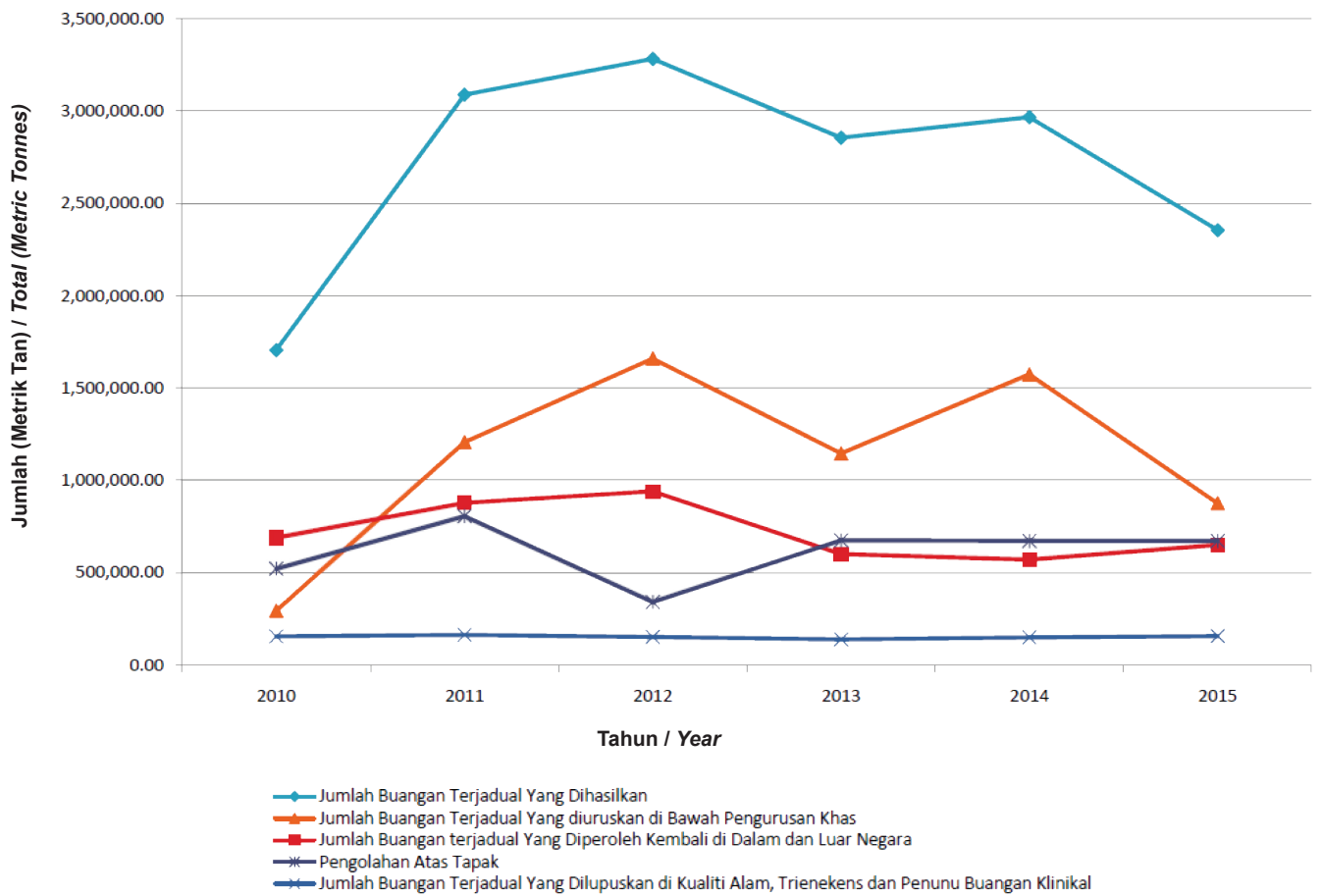
Bil No	Jenis Industri Type Of Industry	Jumlah Buangan Quantity of Waste	
		(MT/Tahun) (MT/Year)	Peratusan (%) Percentage (%)
1	Loji Janakuasa Power Plant	829,827.06	28.43
2	Loji Rawatan Air Water Treatment Plant	648,271.37	22.21
3	Premis Buangan Terjadual (PYDT) Recovery Facilities	511,643.12	17.53
4	Industri Kimia Chemical Industry	191,199.00	6.55
5	Pengilangan Logam Metal Refinery	169,057.30	5.79
6	Elektrik Dan Elektronik Electric And Electronic	138,085.75	4.73
7	Kertas Paper	118,878.67	4.07
8	Kenderaan Vehicle	44,242.67	1.52
9	Lain-lain Others	35,366.94	1.23
10	Galian Bukan Logam Excavation Non Metal	33,907.16	1.16
11	Perubatan Health Care Services	25,523.33	0.87
12	Percetakan Printing	23,677.92	0.81
13	Bengkel Workshop	23,364.27	0.80
14	Berasaskan Getah Rubber Base	22,527.82	0.77
15	Penapisan Petroleum Petroleum Refinery	20,908.57	0.72
16	Penyudahan Logam Dan Sadur Elektrik Metal Finishing and Coating	15,879.90	0.54
17	Makanan & Minuman Food & Drink	8,953.58	0.31
18	Fabrikasi Logam Metal Fabrication	8,760.25	0.30
19	Penapisan Minyak Makan Edible Oil Refinery	7,020.69	0.24
20	Perlombongan Mining	5,868.01	0.20
21	Perkhidmatan Services	5,728.52	0.20
22	Plastik Plastic	5,098.91	0.17
23	Kuari Quarry	4,087.28	0.14
24	Gudang Warehouse	3,751.56	0.13

Jadual 6.2 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Jenis Industri, 2015
 Table 6.2 Malaysia: Quantity of Scheduled Wastes Generated by Industry, 2015

Bil No	Jenis Industri Type Of Industry	Jumlah Buangan Quantity of Waste	
		(MT/Tahun) (MT/Year)	Peratusan (%) Percentage (%)
25	Pertanian Agriculture	3,330.23	0.11
26	Jentera Machinery	3,302.68	0.11
27	Kilang Kelapa Sawit (PYDT) Palm Oil Mill	2,923.73	0.10
28	Pembuatan Payung dan Lain-lain Industri Pembuatan Others Manufacturing	2,680.55	0.09
29	Berasaskan Kayu Wood Base	1,128.11	0.04
30	Simen Cement	1,042.93	0.04
31	Tekstil Textiles	1,040.38	0.04
32	Tapak Pelupusan Sampah Sanitary Landfill	516.91	0.02
33	Kilang Getah (PYDT) Rubber Factory	473.89	0.02
34	Peralatan Sukan Dan Permainan Sports Equipment and Games	244.97	0.01
35	Peralatan Pejabat dan Alat Tulis Office Supplies and Stationery	164.29	0.01
JUMLAH TOTAL		2,918,478.34	100.00



Rajah 6.17 Malaysia: Penghasilan Buangan Terjadual mengikut Negeri, 2015
 Figure 6.17 Malaysia: Distribution of Scheduled Waste Generated by State, 2015



Rajah 6.18 Malaysia: Trend Pengurusan Buangan Terjadual, 2010-2015
 Figure 6.18 Malaysia: The Trend of Scheduled Waste Management from 2010-2015

Jadual 6.3 Malaysia: Kemudahan Yang Mengendalikan Buangan Terjadual, 2015
 Table 6.3 Malaysia: Facilities Handling Scheduled Wastes, 2015

Bil No	Kemudahan Facility	Metric Tan Metric Tonnes	Peratusan (%) Percentage(%)
1	Pengurusan Khas <i>Special Waste Management</i>	1,555,003.07	53.28
2	Kemudahan Pemerolehan Kembali Luar Tapak Tempatan <i>Local Off-site Recovery Facilities</i>	446,077.76	15.28
3	Pengolahan Dalam Tapak <i>On-Site Treatment</i>	445,867.97	15.28
4	Penstoran Dalam Tapak <i>On-Site Storage</i>	299,622.49	10.27
5	Kualiti Alam Sdn Bhd <i>Kualiti Alam Sdn Bhd</i>	120,221.72	4.12
6	Penunu Buangan Klinikal <i>Off-site Clinical Waste Incinerators</i>	25,523.33	0.87
7	Trienekens (Sarawak) Sdn Bhd <i>Trienekens (Sarawak) Sdn Bhd</i>	19,283.00	0.66
8	Kemudahan Luar Negara (Export) <i>Foreign Facilities (Export)</i>	6,879.00	0.24
JUMLAH TOTAL		2,918,478.34	100.00

Jadual 6.4 Malaysia: Buangan Terjadual Yang Diuruskan Di Bawah Pengurusan Khas, 2015
 Table 6.4 Malaysia: Generated Scheduled Waste Managed Under Special Management, 2015

Bil No	Kategori Buangan Waste Category	Kod Buangan Waste Code	Sumber Sources	Metrik Tan Metric Tonnes	Peratus (%) Percentage(%)	Kaedah Pelupusan Method of Disposal
1	Erap cemar Logam Berat Heavy Metal Sludge	SW 204	Loji Rawatan Air Minuman Drinking Water Treatment Plant	645,498.62	41.51	Tapak Pelupusan Sanitari Sanitary Landfill
				83,028.01	5.34	
			Industri Industry	14,980.55	0.96	Guna semula sebagai bahan mentah pembuatan produk Reuse as raw material for product
2	'Fly Ash' & 'Bottom Ash'	SW 104	Loji Janakuasa elektrik Coal-Fired Power Plant	695,299.87	44.71	Guna semula sebagai bahan mentah pembuatan produk Reuse as raw material for product
			Industri Industry	24,738.34	1.59	
3	Gypsum Gypsum	SW 205	Industri Industry	73,189.91	4.71	Tapak Pelupusan Sanitari Sanitary landfill
				344.80	0.02	Guna semula sebagai bahan mentah pembuatan produk Reuse as raw material for product
4	Buangan yang mengandungi formaldehid, resin, serbuk epoksi terbuang Waste Containing Formaldehyde, resin, discarded epoxy powder	SW 320, 325, 418	Industri Industry	7,053.66	0.45	Tapak Pelupusan Sanitari Sanitary landfill

Jadual 6.4 Malaysia: Buangan Terjadual Yang Diuruskan Di Bawah Pengurusan Khas, 2015
 Table 6.4 Malaysia: Generated Scheduled Waste Managed Under Special Management, 2015

Bil No	Kategori Buangan Waste Category	Kod Buangan Waste Code	Sumber Sources	Metrik Tan Metric Tonnes	Peratus (%) Percentage(%)	Kaedah Pelupusan Method of Disposal
5	Produk farmasi terbuang, Produk terbuang <i>Discarded Pharmaceutical Product, Discarded Product</i>	SW 405, 429	Industri <i>Industry</i>	30.59	0.00	Tapak Pelupusan Sanitari <i>Sanitary landfill</i>
6	Abu dari enapcemar kertas <i>Ash of Paper Sludge</i>	SW 406	Industri <i>Industry</i>	2,436.35	0.16	Tapak Pelupusan Sanitari <i>Sanitary landfill</i>
7	Campuran minyak terpakai <i>Spent Mixed Oil</i>	SW 421	Industri <i>Industry</i>	6,628.95	0.43	Guna semula sebagai bahan mentah pembuatan produk <i>Reuse as raw material for product</i>
8	Enap Cemar Mineral <i>Mineral Sludge</i>	SW 427	Industri <i>Industry</i>	1,773.43	0.11	Gunasemula sebagai agen peneutralan <i>Reuse as neutralizing agent</i>
JUMLAH / TOTAL				1,555,003.07	100.00	

Kemudahan yang paling banyak dilesenkan oleh Jabatan ini mengikut kategori buangan terjadual adalah buangan elektrik dan elektronik (140 kemudahan) diikuti dengan dross / abu / klinker (64 kemudahan), enapcemar minyak / mineral / agen penyejuk terpakai (51 kemudahan), enapcemar logam berat (49 kemudahan), bekas terpakai (48 kemudahan), kertas & plastik (41 kemudahan), pelarut terpakai (39 kemudahan) dan asid / alkali (34 kemudahan), seperti di **Jadual 6.5**.

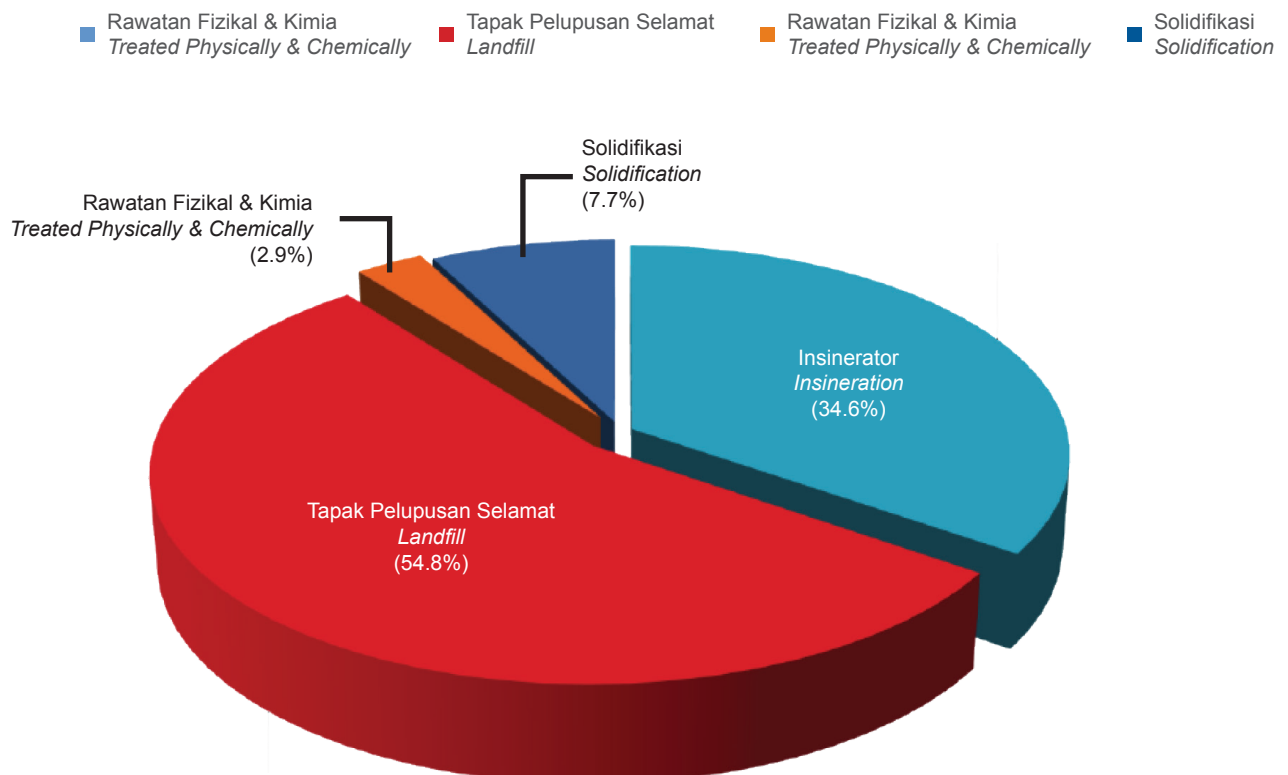
*The most facilities licensed by the department according to categories of waste are electronic and electrical wastes (140 facilities) followed by dross/ ash/ slag (64 facilities), oil/mineral sludge/spent coolant (51 facilities), heavy metal sludge (49 facilities), used container (48 facilities), paper and plastic (41 facilities), spent solvent (49 facilities), acid and alkali (34 facilities), phenol/ adhesive/ resin (32 facilities), mixed wastes (27 facilities), ink/ paint (23 facilities), catalyst (19 facilities), whilst 4 other wastes categories totaling of 39 facilities as shown in **Table 6.5**.*

Jadual 6.5 Malaysia: Bilangan Kemudahan Pemerolehan Kembali Luar Tapak, 2015
Table 6.5 Malaysia: Numbers of Off-site Recovery Facilities, 2015

Kategori Buangan <i>Waste Category</i>	Kemudahan Pemerolehan Kembali <i>Recovery Facility</i>
Buangan elektrik dan elektronik <i>e- Wastes</i>	140
Dros / Sanga / Klinker <i>Dross / Slag / Clinker</i>	64
Minyak / Enap cemar Mineral / Agen Penyejuk Terpakai <i>Oil / mineral sludge / spent coolant</i>	51
Enap cemar logam berat <i>Heavy Metal Sludge</i>	49
Bekas terpakai <i>Used Container</i>	48
Kertas & Plastik <i>Paper & Plastic</i>	41
Pelarut Terpakai <i>Spent Solvent</i>	39
Asid / Alkali <i>Acid / Alkali</i>	34
Fenol / Pelekat / Resin <i>Phenol / Adhesive / Resin</i>	32
Campuran buangan <i>Mixed Wastes</i>	27
Dakwat / Cat / Lakuer <i>Ink / Paint</i>	23
Pemangkin <i>Catalyst</i>	19
Fotografi <i>Photographic</i>	12
Bateri <i>Batteries</i>	11
Enapcemar Getah <i>Rubber Sludge</i>	10
Gypsum <i>Gypsum</i>	6

Kategori buangan terjadual yang dihantar ke premis berlesen (Kualiti Alam Sdn Bhd dan Trienekens (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 6.19**, kebanyakan sisa dihantar ke Kualiti Alam Sdn Bhd dan Trienekens Sdn Bhd adalah ke tapak pelupusan (54.8%), diikuti dibakar (34.6%), solidifikasi (7.7%) dan rawatan secara fizikal dan kimia (2.9%).

*The categories of wastes sent to the licensed premises (Kualiti Alam Sdn Bhd and Trienekens (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 6.19**, most wastes sent to Kualiti Alam Sdn Bhd and Trienekens Sdn Bhd were landfilled (48%), followed by incinerated (39%), solidified (11%) and treated physically and chemically (2%).*



Rajah 6.19 Kualiti Alam dan Trienekens: Jenis Rawatan dan Pelupusan Buangan Terjadual, 2015
 Figure 6.19 Kualiti Alam and Trienekens: Types of Treatment and Disposal of Waste, 2015