SUNGAI SELANGOR

State of the River Report 2011

LEMBAGA URUS
AIR SELANGOR (LUAS)

The name Selangor has been used since the 14th century. It may have been derived from the Tamil name "Salangor", meaning "Village of the Salong. "Other sources refer to the name "Sarahangor", which may possibly be derived from the word 'Sarang Lang' which in the Malay language meant 'eagle's nest'. This name may have originated because at that time the entire coastal area of Selangor was abundant with eagle's nests.

The firefly habitat at Kg. Kuantan falls within the Protection Zone, which was created as a preventive and control measures to protect the river reserve, buffer zone and environment in Sungai Selangor. Under this protection, fireflies are free to breed and flourish for the enjoyment and delight of visitors in generations to come. Source: Majlis Daerah Kuala Selangor

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ACRONYMS

ABASS	Konsortium ABASS Sdn. Bhd.
BOD	Biochemical oxygen demand
COD	Chemical oxygen demand
DOA	Jabatan Pertanian/*Department of Agriculture*
DOF	Jabatan Perikanan/*Department of Fisheries*
EPU	Economic Planning Unit
FRIM	Forest Research Institute Malaysia
GPT	Gross pollutant trap
IWK	Indah Water Konsortium Sdn. Bhd.
JAS	Jabatan Alam Sekitar/*Department of Environment*
JKN	Jabatan Kesihatan Negara/*Department of Health*
JKT	Jabatan Kerajaan Tempatan/*Department of Local Government*
JKPTG	Jabatan Ketua Pengarah Tanah dan Galian/*Department of Lands and Mines*
JKR	Jabatan Kerja Raya/*Public Works Department*
JLM	Jabatan Laut Malaysia/*Marine Department Malaysia*
JMG	Jabatan Mineral dan Geosains/*Department of Mineral and Geoscience*
JPBD	Jabatan Perancangan Bandar dan Desa/*Department of Town and Country Planning*
JPNS	Jabatan Perhutanan Negeri Selangor/*Selangor Forestry Department*
JPP	Jabatan Perkhidmatan Pembentungan/Sewerage Services *Department*
JPS	Jabatan Pengairan dan Saliran/*Department of Irrigation and Drainage*
JPSPN	Jabatan Pengurusan Sisa Pepejal Negara/*Department of National Solid Waste Management*
JPV	Jabatan Perkhidmatan Veterinar/*Department of Veterinary Services*
KeTTHA	Kementerian Tenaga, Teknologi Hijau dan Air/*Ministry of Energy, Green Technology and Water*
LKIM	Lembaga Kemajuan Ikan Malaysia/*Malaysian Fisheries Development Authority*

LLM	Lembaga Lebuhraya Malaysia/*Malaysian Highway Authority*
LUAS	Lembaga Urus Air Selangor/*Selangor Water Management Authority*
MCM	Million cubic metre
MDHS	Majlis Daerah Hulu Selangor/*Hulu Selangor District Council*
MDKS	Majlis Daerah Kuala Selangor/*Kuala Selangor District Council*
MLD	Million litres per day
MNS	Malaysia Nature Society
MPS	Majlis Perbandaran Selayang/*Selangor Municipal Council*
NAHRIM	National Hydraulic Research Institute Malaysia
NH_3–N	Ammoniacal nitrogen
PDTG	Pejabat Daerah dan Tanah Gombak/*Gombak Land and District Office*
PDTHS	Pejabat Daerah dan Tanah Hulu Selangor/*Hulu Selangor Land and District Office*
PDTKS	Pejabat Daerah dan Tanah Kuala Selangor/*Kuala Selangor Land and District Office*
PERHILITAN	Jabatan Perlindungan Hidupan Liar dan Taman Negara/*Department of Wildlife and National Parks*
PNSB	Puncak Niaga (M) Sdn. Bhd.
PPj	Perbadanan Putrajaya/*Putrajaya Corporation*
SPAN	Suruhanjaya Perkhidmatan Air Negara/*National Water Services Commision*
SPLASH	Syarikat Pengeluar Air Sungai Selangor Sdn. Bhd.
SS	Suspended solids
STATS	Jabatan Perangkaan/*Department of Statistics*
STP	Sewage treatment plant
SYABAS	Syarikat Bekalan Air Selangor Sdn. Bhd.
TSS	Total suspended solids
UPEN	Unit Perancangan Ekonomi Negeri/*State Economic Planning Unit*
VFS	Vegetative filter strips
WTP	Water treatment plant

INTRODUCTION

Our water resources are under pressure: effects of climate change with extremes in low and high rainfall; increase in population leading to increases in water demand; our continued lackadaisical attitude in our treatment of the resources; and general lack of adherence to regulations.

To ensure the sustainability of our rivers in spite of these pressures, Lembaga Urus Air Selangor (LUAS), together with other government agencies and private entities, publish State of the River Reports on regular intervals to report on the condition of river basins in Selangor. The Report provides a snapshot of the health of our rivers and gives planners and implementers feedback on how are we doing in using and managing our resources.

The State of the River Report for Sg. Selangor provides an overall view of the river basin from the years 2009 to 2011. It is a handbook as well as a report. It explains the status and conditions of the various resources within the river network. It also covers the various issues on our uses and demands of the rivers, as well as our impact back to the same rivers that serve us.

CONTRIBUTORS

State government and private agencies have generously contributed their time, effort, and thoughts towards making this booklet as resourceful as possible. In this way, LUAS is the enabler of the

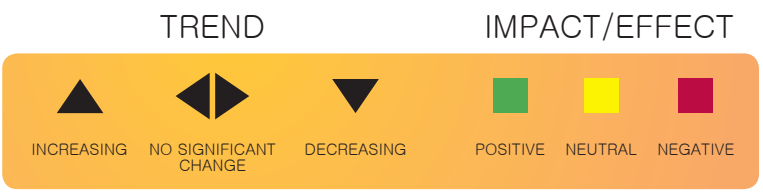
dissemination of information provided by the agencies for the use of all people interested in preserving and caring for our precious water resources. We extend our gratitude to these contributors, whose names are listed in Appendix E.

HOW TO USE THE INDICATORS

Indicators provide a measure of how healthy our rivers are. A river's health can be measured in terms of various criteria such as biological, chemical or physical.

In this report, there are seven key indicators that show the overall status of the river. The status of these indicators is shown by a color coded icon that indicate an upward or downward trend.

The key for the indicators is shown below. The direction of the triangles show whether the trend is increasing, decreasing, or no change. The colour of the triangle indicates whether the trend is positive, negative, or neutral (neither good nor bad).

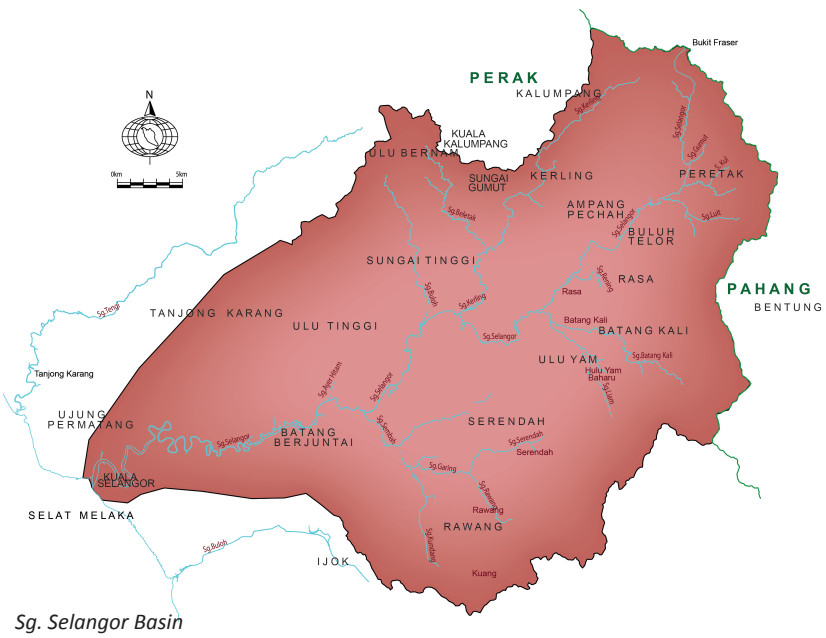


Key for the Indicators

ABOUT THE RIVER BASIN

LOCATION

The Sg. Selangor basin is situated in the upper part of the state. Sg. Selangor starts from Fraser's Hill and stretches for 110 km to the coast of Kuala Selangor. The basin covers an area of 2,200 km^2, which is about 28% of the state, and contains nine sub-basins, which are Ulu Selangor, Kerling, Kuala Kubu, Sg. Tinggi, Rantau Panjang, Batang Kali, Tanjung Karang, Rawang and Kuala Selangor. It is the third largest river basin in Selangor after Sg. Langat and Sg. Bernam basins.



Sg. Selangor Basin

Tributaries

The river has 13 main tributaries, which are Sg. Kanching, Sg. Kerling, Sg. Sembah, Sg. Batang Kali, Sg. Rening, Sg. Luit, Sg. Kul, Sg. Gumut, Sg. Darah, Sg. Kubu, Sg. Gerachi, Sg. Peretak and Sg. Tinggi.

There are another eight tributaries for the river, which are Sg. Beletak, Sg. Buloh, Sg. Liam, Sg. Serendah, Sg. Rawang, Sg. Garing, Sg. Kundang and Sg. Ayer Hitam.

Major Towns and Administrative Bodies

The river stretch passes through six major towns of Kuala Kubu Baru, Rawang, Serendah, Rasa, Bestari Jaya (formerly Batang Berjuntai) and Kuala Selangor.

The river basin includes the districts of Hulu Selangor, Gombak and Kuala Selangor, which are administered by Majlis Daerah Hulu Selangor, Majlis Perbandaran Selayang and Majlis Daerah Kuala Selangor. There are 19 mukim among the three districts.

District	Administrative Bodies
Hulu Selangor	Majlis Daerah Hulu Selangor
Gombak	Majlis Perbandaran Selayang
Kuala Selangor	Majlis Daerah Kuala Selangor

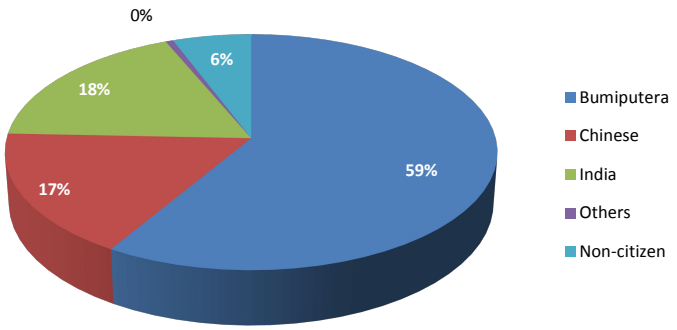
Source: LUAS 2012

Population

The population of the Sg. Selangor basin is approximately 415,671 according to Jabatan Perangkaan Selangor. This figure represents the total number of people living within the basin boundary. The basin is populated by Bumiputera at 59%, followed by Chinese at 17%. Indians occupy 18% and non-citizens 6%.

Jabatan Perangkaan
MALAYSIA

JPM is an agency that provides statistical services and conducts census of the population



Breakdown of the Sg. Selangor basin population
Source: Jabatan Perangkaan Selangor 2012

MAIN USES OF THE RIVER

The river is one of the most important natural resources in the basin, supporting many economic activities in the state. The Sg. Selangor Water Supply Scheme supplies about 2,950 MLD, which is about 60% of the total requirement of Kuala Lumpur and Selangor. As a major supplier of potable water to various parts of Selangor, including the Klang Valley, ensuring water supply is one of the priorities for the Sg. Selangor Basin.

In terms of economic value-added, sand mining is an economy activity that dates back 50 years in the country. There are about 19 sand mining locations, and the estimated sand yield is 1.4 million tonnes per year.

In the Sg. Selangor Basin Management Plan 2007-2012, the main uses of the river were listed as water supply, ecosystem, tourism & recreation, sand mining, aquaculture, and inland navigation. The river is also famous for tourist attractions such as the firefly sanctuary at Kg. Kuantan.

To ensure that these uses can be sustained, the Plan unveiled four main policies, which comprised (1) ensuring water supply, (2) ensuring clean water, (3) protection against floods, and (4) conservation of the fireflies.

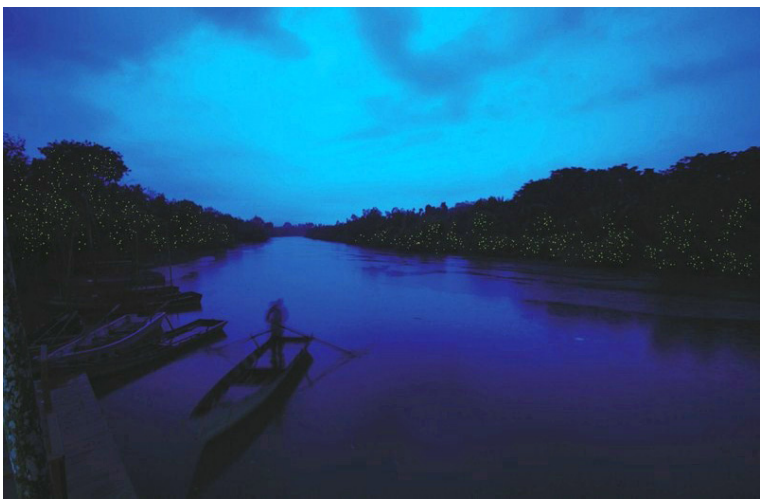
Sg. Selangor Dam
Source: LUAS 2012

DISTINCTIVE FEATURES OF THE BASIN

Historically, Sg. Selangor was one of the main transportation channels in the region before the development of inland passageways. This is evident from historical sites along the banks of the river, such as Malawati Hill in Kuala Selangor.

Malawati Hill

Today, the basin is noted for its wetlands and other riverine ecological sites such as the renowned firefly sanctuary. The **firefly sanctuary** along the river in Kuala Selangor that is now gazetted as a Protection Zone to conserve the fireflies has been captivating locals and tourists alike for decades.



Kg. Kuantan
Source: Majlis Daerah Kuala Selangor

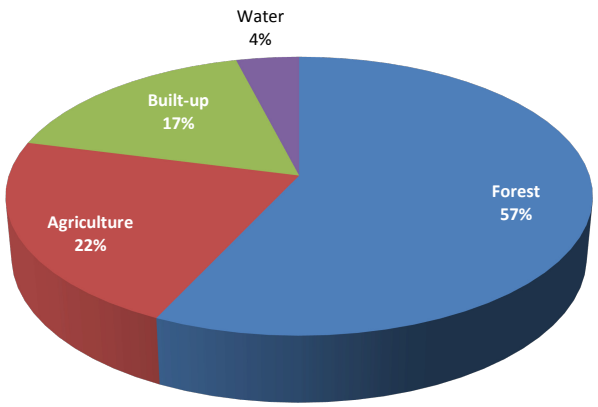
Another attraction are the black waters of the **Raja Musa and Tanjong Karang peat swamp forest reserves** which are remnants of a peat swamp forest that once covered a large part of the coastal plain.

Sg. Ayer Hitam
Source: The Star

LAND USE

Half of the basin area is still covered by natural forest and another 22% by agricultural activities. With the exception of Gombak, the basin holds

the highest percentage of rural population in the state. The economy of the river is based predominantly on agriculture and primary industries.



Land use in the basin
Source: LUAS 2011

Areas that are still undergoing major development are those around Bestari Jaya and those between the Hulu Selangor and Kuala Selangor districts (near the water intake plant at Bestari Jaya). This covers an area of approximately 14,000 acres.

A weir in Sg. Selangor in the forested and agricultural area of Ampang Pecah in upper Sg. Selangor basin

SUNGAI SELANGOR RIVER BASIN

Source: SYABAS EIS 2011 and LUAS


ULU BERNAM
SUNGAI GUMUT
KERLING
Sg.Kerling
Sg.Baletak
SUNGAI TINGGI
Sg.Buloh
Sg.Kerling
Sg.Selangor
PERETAK
Sg.Gumut
Sg.Kul
Sg.Luit
AMPANG PECHAH
SULUH TELOR
Sg.Rening
RASA
Rasa
Batang Kali
BATANG KALI
Sg.Batang Kali
ULU YAM
Hulu Yam Baharu
Sg.Liam
SERENDAH
Sg.Serendah
Serendah
Sg.Garing
Sg.Rawang
Rawang
RAWANG
Sg.Kundang
Kuang
1
2
3
4
9
WATER QUALITY
CLEAN
SLIGHTLY POLLUTED
POLLUTED

RIVER BASIN MANAGEMENT

Activities and assets within the river basin are managed by a number of government bodies.

REGULATION OF WATER SUPPLY AND SEWERAGE SERVICES

SPAN is a government commission that regulates water supply and sewerage services

Since 2007, all water-related services, including those in Selangor, have been regulated by a federal agency called the Suruhanjaya Perkhidmatan Air Negara (SPAN). The Commission authorises and issues licenses of all water supply and sewerage services in Selangor. One of the major changes under the new water law makes communal septic tanks (CSTs) and individual septic tanks (ISTs) the responsibility of individual owners and tenants. Another change in the law empowers SPAN to regulate sewage permit holders and Indah Water.

PLANNING OF WATER RESOURCES

While distribution falls under federal regulation, the state government, through the Unit Perancangan Ekonomi Negeri (UPEN), retains the power to declare water supply resources, water catchment areas, and river basins. UPEN also ensures that water agreements are adhered to by the various water concessionaires and other parties.

The Selangor state government also articulated the need for the introduction of a river protocol to control and manage the rivers in the state.

MONITORING OF WATER RESOURCES

LUAS is a state agency for regulating and managing all water resources in Selangor

A number of agencies monitor water resources and water quality throughout the river basin. One of them is Lembaga Urus Air Selangor (LUAS), a water resources management body that monitors and enforces control over human activities for the management of water resources, river basins, water bodies, ground water and coastal waters in the state of Selangor. Water quality of rivers is also monitored by other agencies and organisations such as water concessionaires, water distributors, Jabatan Alam Sekitar Selangor and Jabatan Kesihatan Negeri Selangor. Through LUAS, information is shared so that any issues or problems arising can be handled effectively and expeditiously.

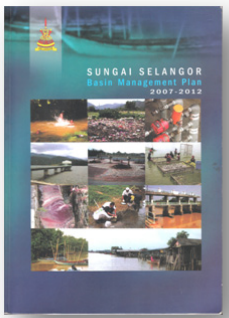
Currently, LUAS addresses violations mainly on the basis of incoming complaints or reports. To enlarge its scope of responsibilities to become more proactive, a "Emission or Discharge of Pollutants (State of Selangor) Regulations 2012" [Peraturan-Peraturan Kemasukan Atau Pelepasan Bahan Pencemar (Negeri Selangor) 2012] is currently being drafted for gazetting in 2012. The proposed list of activities to be expanded is shown below. With an expanded scope, LUAS can better regulate errant end-users of water resources.

Activity	LUAS' Expanded Scope
Freshwater aquaculture in ponds or cages	Operating breeding area of fifty (50) hectares or above
Marine shrimp aquaculture in ponds	Operating breeding area of ten (10) hectares or above
Development and earthworks	For areas less than fifty (50) hectares
Livestock other than pigs	Chicken, ducks, geese, turkeys, guinea fowl, guinea, pigeon, ostrich, emu, cows, goats and other livestock in number of twenty thousand (20,000) or more
Swine livestock	All farms regardless of the number
Pets	Activities involving twenty (20) cats or dogs or more
Mining-related activities	Any type of sand mining, soil and other irrespective of the quantity Mining or quarry in areas less than two hundred (200) hectares

Regulation of Discharge of Pollutants (Selangor State) 2012
Source: LUAS 2011

RIVER BASIN PLANNING

Sungai Selangor Basin Management Plan



The Sungai Selangor Basin Management Plan 2007–2012 is the result of a collaboration involving LUAS, EPU, Jabatan Pengairan dan Saliran, COWI and the governments of Malaysia and Denmark to address river-related issues from an integrated, basin-wide perspective and to formulate action plans. The Plan also includes indicators to mark progress of the action plans. River planners will find it is useful to benchmark the actions listed below against the progress made up to the year 2011.

Action Plans for the Sg. Selangor Basin	
Ensure sufficient water	Increased emphasis on demand management
	Increased use of ground water resources
	Better use of surface water
	Restoration of wetlands (especially peat swamps)
	Exploration of additional resources
Ensure clean water	Reduce pollution from industrial wastewater
	Upgrade sewerage system and sewage treatment
	Reduce pollution from other urban sources
	Reduce pollution from aquaculture
	Reduce pollution from animal husbandry
	Reduce sedimentation and suspended solids
	Reduce pollution from landfills
	Strengthen protection of reservoirs
Protect against floods	Improve storm water management
	Improve river corridor management
	Carry out river works at problem sites
Conserve the fireflies	Establish firefly park
	Improve conditions for firefly tourism
	Continue monitoring and research related to the fireflies

Subsidiary Legislation

The state of Selangor, through LUAS, has gazetted several rulings to protect several areas within the river basin.

In 2009, the Sungai Selangor Basin Management Plan and the actions plans mentioned therein were gazetted.

Also in 2009, the *Zone of Protection (Declared Area and Restriction) Notification* was passed to protect the river reserve, buffer zone and the environment along a specified stretch of Sg. Selangor at Mukim Pasangan, district of Kuala Selangor. Mukim Pasangan is the location of the Firefly Reserve at Kampung Kuantan. Restrictions of activities within the zone include the erection of structures, application or storage of any chemicals including pesticide or fertiliser, alteration of existing land contours including grading or construction of roads, clearing of vegetation and discharge of any effluent or waste.

In 2010, the *Notification of Charges For Diversion of Water From Any Water Source 2010*, was gazetted, allowing LUAS to prescribe a rate for the diversion of water for electricity generation.

In the same year, another ruling, *Zone of Protection (Declared Area and Restriction) No. 2) Notification 2010* was gazetted. This legislation is to protect and reserve water resources and their environment in the catchment area for dams within the state of Selangor. It protects Klang Gates Dam, Batu Dam, Langat Dam, Sungai Selangor Dam, Semenyih Dam, Sungai Tinggi Dam and Tasik Subang Dam.

White waters at Sg. Selangor near SSP3

WATER RESOURCES AND SUPPLY

SURFACE WATER

SPLASH is the water concessionaire for SSP1 and SSP3 of the Selangor Water Supply Scheme

Puncak Niaga is one of the water treatment suppliers in the state. It has 29 plants and 49% of treated water distributed to five million domestic agricultural and industrial end-users

Sg. Selangor is a major source of surface water supply for the state of Selangor, supplying approximately 60% of Klang Valley's water demand. The Selangor and Tinggi dams also supplies potable water for the north Selangor region. The Sg. Selangor Scheme, which provides the water supply, was developed in three phases.

Phase 1 (SSP1) comprises the Sg. Tinggi Dam to secure a yield of 1,900 MLD at the intake at Bestari Jaya for water treatment at Bukit Badong.

Phase 2 (SSP2) involves another river intake at Bestari Jaya and upgrading of the water treatment. Both Phase 1 and 2 treatment plants have a design capacity of 950 MLD each, with a total output of 1,900 MLD.

Phase 3 (SSP3) covers the Selangor Dam to secure an additional yield of 1,100 MLD. The combined storage capacity of both Sg. Tinggi and Sg. Selangor reservoirs increased the total yield to 3,000 MLD. The scheme also includes a treatment plant at Rasa of 250 MLD capacity to supply the northeastern area of Selangor towards Perak. The Bukit Badong water treatment plant, which supplies to Kuala Lumpur and other part of Selangor, was expanded by 800 MLD.

There are nine water treatment plants (WTPs) in the basin—three of which are operated by Syarikat Pengeluar Air Sungai Selangor Sdn. Bhd. (SPLASH) and the rest by Puncak Niaga (M) Sdn. Bhd. (PNSB).

	WTP	Operator	Raw water source
1	Batang Kali	PNSB	Sg. Batang Kali
2	Rantai Panjang	PNSB	Sg. Selangor
3	Sg. Rangkap	PNSB	Sg. Rangkap
4	Kuala Kubu Baru	PNSB	Sg. Gerachi
5	Sg. Buaya	PNSB	Sg. Darah
6	Sg. Selangor (SSP1)	SPLASH	Sg. Selangor
7	Sg. Selangor (SSP2)	PNSB	Sg. Selangor
8	Sg. Selangor (SSP3) - Badong	SPLASH	Sg. Selangor
9	Sg. Selangor (SSP3) – Sg. Rasa	SPLASH	Sg. Selangor

WTPs within the Sg. Selangor basin
Source: SYABAS EIS 2011

Water Reservoirs

Sg. Tinggi Dam
Catchment area: 3,962 ha
Dam area: 805 ha
Capacity: 51,694 ML
Yield: 1,100 MLD

There are two dams, the Sg. Tinggi Dam and the Sg. Selangor Dam. The **Sg. Tinggi Dam**, built in 1996, has a catchment area of 24 km^2, while the **Sg. Selangor Dam**, built in 2003 as a regulating dam, has a catchment area of 197 km^2 and a storage capacity of 235 million cubic metres. The combined capacity of both dams is 344,529 million litres. Excess water that used to flow into the sea is stored in the Sg. Selangor regulating dam during the wet season. During the dry season the dam releases water to ensure a constant and regular supply of raw water to the treatment plants at Rasa and Bukit Badong. In 2009, both dams were gazetted as water detention dams for water supply and are managed by SPLASH.

Sg. Selangor Dam
Catchment: 20,219 ha
Dam area: 509 ha
Capacity: 26,247 ML
Yield: 1,200 MLD
Type: Rockfill

Sg. Selangor Dam

Production Capacity

According to SPAN, the production at the water treatment plants fall below the design capacity.

WTP		2009	2010	2011
	Design Capacity	Production	Production	Production
	MLD	MLD	MLD	MLD
Sg. Selangor Phase 1	950	707	741	772
Sg. Selangor Phase 2	950	963	955	959
Sg. Selangor Phase 3 Rasa	800	633	674	650
Sg. Selangor Phase 3 Badong	250	32	27	29
Rantau Panjang	32	N/A	N/A	N/A
Batang Kali	20	N/A	N/A	N/A
Sg. Rangkap	9	N/A	N/A	N/A
Kuala Kubu Baru	7	N/A	N/A	N/A
Sg. Buaya	.9	N/A	N/A	N/A
TOTAL	**3,018**	**2,420**	**2,529**	**2,543**

Water Treatment Plant Production and Capacity
Source: SPAN and SYABAS 2011

Issues

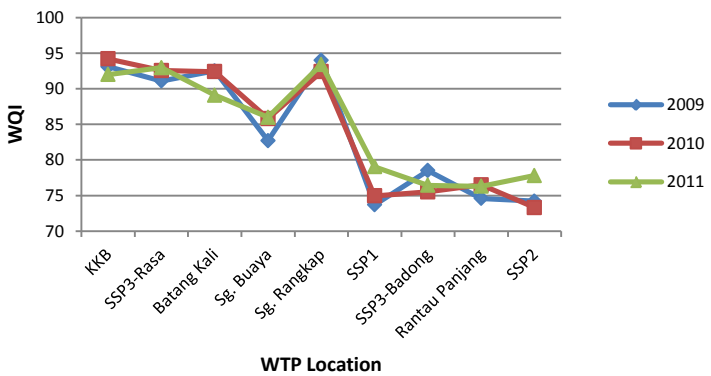
Major issues encountered during years 2009 to 2011 concerned the biological and chemical health of Sg Selangor.

COD and BOD. According to SPLASH, water quality has been decreasing over the past few years, caused by continued violations resulting in elevated levels of E.Coli, BOD and COD upstream of Sg. Selangor.

High pollutant readings at sites such as recreational areas corresponded with the increase in river recreational visitors, especially during the holiday seasons.

Heavy Metals. Downstream of Sg. Selangor, chemical compounds such as iron and manganese and heavy metal such as cadmium and mercury were detected at specific locations along the river. Detection of these compounds were occasional, but the presence of these carcinogenic compounds may pose a threat to the health of aquatic organisms as well as humans and animals.

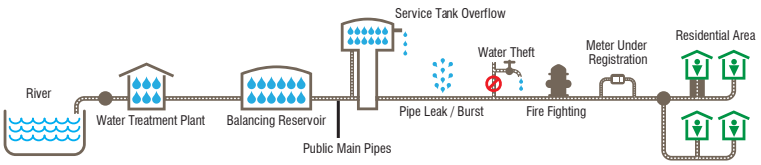
Such incidents indicate the need for firm mitigation actions at the source in order to control heavy metal pollution in Sg. Selangor. Also of concern are the high levels of BOD and COD downstream, with no significant improvement from 2009 to 2011.



WQI at intake points within the Sg. Selangor basin
Source: SPLASH 2012

Non-revenue water. Non-revenue water, or NRW, is a major source of losses for water distribution companies. Elements contributing to NRW are service tank overflow, leaking or burst pipes, water theft, and tampered meters.

Eliments Contributing to NRW



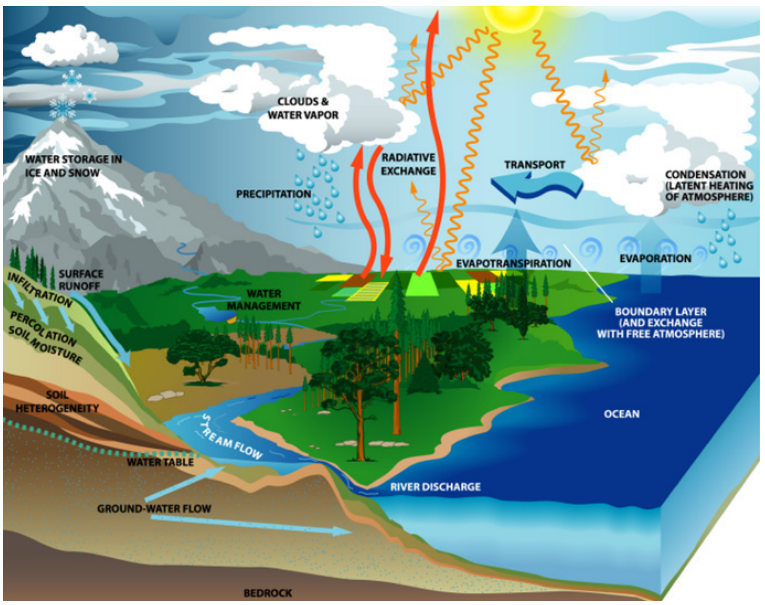
Sources of NRW
Source: Malaysia Water Guide 2011

NRW	
2008	34%
2009-2011	32%

The NRW for Selangor over the years 2009 to 2011 has been consistently hovering around the 32% mark, down from almost 34% in 2008. Efforts have been made to address this issue—SPAN has been monitoring NRW since January 2008—and NRW is a key performance indicator, or KPI item for all water distribution operators.

GROUND WATER

Ground water is water under the ground surface that fills spaces between sand grains, in rock crevices and in solution openings. LUAS refers ground water as subsurface water that occurs beneath the water table in soils and geologic formations. It includes wells, boreholes or any similar work sunk into underground strata, any excavation into underground strata, and any designated ground water.



Hydrological process including the ground water system
Source: California Department of Water Resources

Within Malaysia, ground water accounts for more than 90% of freshwater resources. Renewable water resources are 630 billion m^3, which is the summation of surface runoff and ground water recharge. This translates into an annual average water availability of approximately 28,400 m^3 per capita. Currently, surface water represents 97% of the total water use, while ground water is about 3%. Approximately 60–65% of ground water is used for domestic or municipal purposes, 5% for irrigation and 30–35% for industry.

Water Resources	Volume
Annual rainfall	990 billion m^3
Surface runoff	566 billion m^3
Evapotranspiration	360 billion m^3
Ground water recharge	360 billion m^3
Surface artificial recharge	25 billion m^3
Ground water recharge	5,000 billion m^3

Water resources in Malaysia
Source: Azuhan 1999

In Selangor, the ground water recharge is 150 mm yearly, which is equivalent to 1,220 million cubic metres (MCM) or 3,350 MLD. According to some sources, as ground water is part of the hydrological cycle, it could be considered as a second source of water rather than an alternative resource.

Ground water recharge	Equivalent to
150 mm	3,350 MLD

Source: LUAS

All ground water abstraction is regulated by LUAS. Users must get a license from LUAS, pending technical approval from Jabatan Mineral dan Geosains (JMG), which serves as a technical advisor. It is LUAS' role to ensure that abstraction is properly managed, while JMG advises on the volume and manner in which the abstraction is being done.

JMG is an agency that provides technical advisory services and expertise in minerals, geosciences, mining and quarries

As of 2011 there were 21 licensees of ground water abstraction in the Sg. Selangor Basin. This is a reduction from 32 licensees in 2010 and 33 in 2009.

	2009	2010	2011
Number of ground water licensees	33	32	21

Source: LUAS 2012

Issue & Action To Take

Ground water specialists talk about the need to think about regulation of the ground water industry. It is critical to regulate ground water activity at an early stage. Once there are a large number of unregulated ground water users, the industry will become difficult to control and initiate reforms.

A stopgap measure to safeguard against unbridled abstraction of both surface and ground water is being drafted as the *Abstraction of Water Source (State of Selangor) Regulations 2012* under the *Selangor Waters Management Authority Enactment 1999*. The regulations empower LUAS to control the volume and manner of abstraction of ground water and surface water.

Alternative Water Resources. The Selangor state government has a policy of providing at least two month's reserve of alternative water resources as well as three to four month's reserve of existing reservoirs. Ensuring the alternative water reserves is an Alternative Water Resource Committee that manages water resources such as ground water and waters from ponds, lakes and ex-mining ponds.

Alternative Water Resource Committee	
Chairperson	Director of LUAS
Secretariat	LUAS
State government dept	JPS, JMG, JKNS, MMD, local authorities, and district and land offices
Water concessionaires	SYABAS, SPLASH, PNSB and ABASS
Others	Permodalan Negeri Selangor Berhd (PNSB), Kumpulan Darul Ehsan Berhad (KDEB) and Perbadanan Kemajuan Pertanian Selangor (PKPS)

LAKES AND EX-MINING PONDS

There are 30 natural ponds, lakes and ex-mining ponds that have been classified as alternative water resources. Twenty-four are in the Hulu Selangor district, and 6 are in Kuala Selangor. Some of the lakes are large and quite deep, some are over 20m, and have been identified as an alternative water supply resources, especially for periods during the dry seasons.

District	Location
Hulu Selangor	Batu 31, Jln. Rawang-Batang Berjuntai: KT Batu 31.-1, KT Batu 31-2, KT Batu 31-3
	KT Taman Desa Anggerik
	KT Sg. Rawang- Sg. Serendah (Berhampiran PLUS)
	KT Kg. Keliang, Kalumpang: KT Kg. Keliang 1, KT Kg. Keliang 2, KT Kg. Keliang 3
	KT Rasa, Taman Keruing
	KT Kg. Timah, Hulu Yam
	KT Kg. Serigala, Kg. Batu 6
Kuala Selangor	Lombong Berjuntai Tin (Batang Berjuntai)): KT Berjuntai Tin 1, KT Berjuntai Tin 2

	Kolam PNSB Batang Berjuntai (Kg. Sg. Darah): Kolam 3, Kolam 4
	Bekas Lombong KL-Larut

Source: LUAS 2012

Of particular interest is a complex of ponds north of Bestari Jaya, some of which can serve as large reservoirs of water.

LUAS team inventorizing ex-mining ponds at north of Bestari Jaya

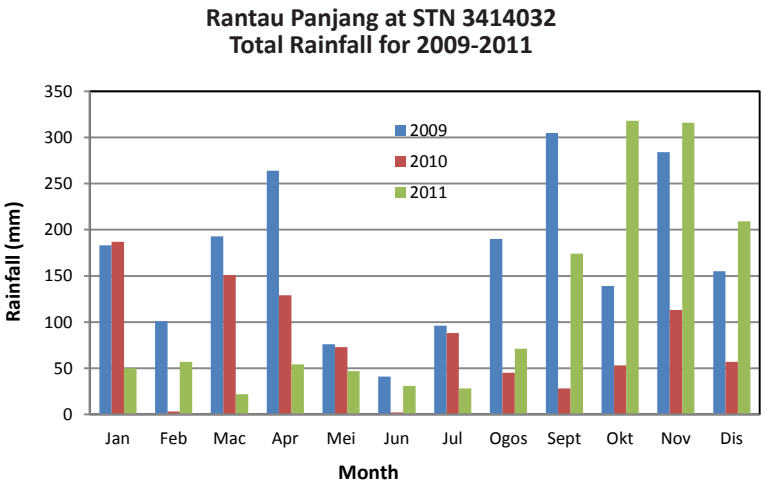
These ponds are monitored by Jabatan Kesihatan Negeri Selangor (JKNS) as alternative water supply in the event of water shortage from rivers and dams. Arsenic in the water is a concern as long-term exposure can cause cancer in the skin, lungs, and bladder as well as cause thickening and pigmentation of the skin.

Based on the results received from JKNS' Department of Chemistry and National Public Health Laboratory (MKAK), it was found that there were some ponds in the basin in 2011 that had shown presence of leptospira, aluminium and iron, and therefore did not meet quality standards. However, JKNS advises that water contaminated with the bacteria can be treated with conventional chlorination treatment. It is recommended

that water be abstracted one foot or more from the surface of the pond bottom to prevent extraction of heavy metals that have settled at the bottom of the pond.

RAINFALL PATTERNS

Rain has an impact on water resources in that stormwater carries heavy loads of pollution during the initial stages of rainfall, or first flush. In addition, intense and heavy rainfall contributes to erosion along the riverbanks, contributing to high turbidity. Shown below is the total monthly rainfall at the station at Rantau Panjang for years 2009 to 2011.

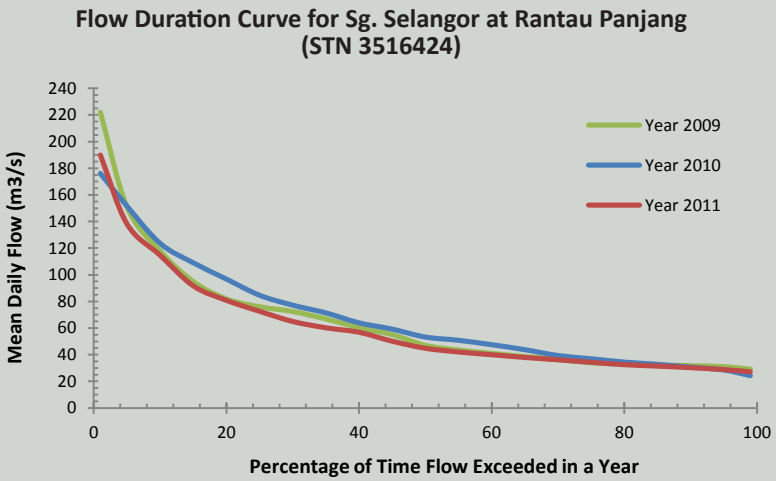


Source: JPS 2012

FOCUS
Flow Duration

Indicator 1: Availability of Water in Sg. Selangor

One of the ways to assess water availability is the observation of sufficient stream flows within the river regime. This can be done by observing the mean daily flow over a year. The mean daily flow indicates the mean volume of water flowing through the river throughout the year. It is a good indication of water availability for water budgeting purposes.



Source: Bahagian Hidrologi dan Sumber Air, JPS

From the flow duration curve plotted for 2009, 2010 and 2011, one can observe that more water in the river was available in 2010 than in 2009 and 2011. For example, 97 m^3/s flowed through Sg. Selangor for 20% of the time in 2010; only 81 m^3/s water flowed for the same time in 2009 and 2011. After allowing for water reserved for environmental flow and allocated abstraction uses, river planners and users can budget the remaining water for other uses, such as river-related projects and activities.

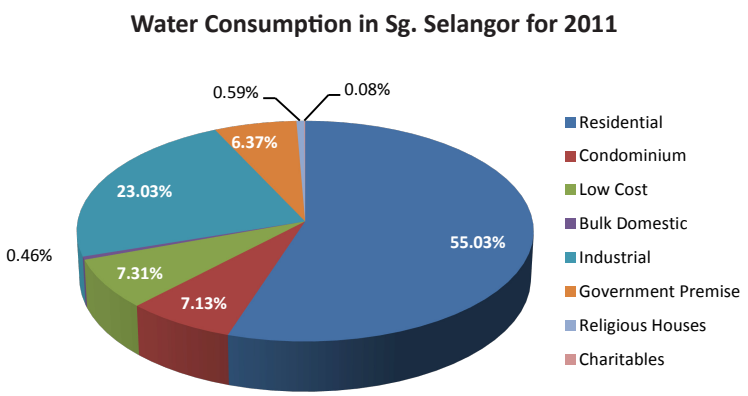
WATER CONSUMPTION AND ABSTRACTION

Water consumption is the amount of potable water billed to the consumers. The consumption for Gombak, Hulu Selangor and Kuala Selangor districts in the Sg. Selangor basin in 2009 was 196 million m^3. This includes domestic (residential, condominiums, low cost and bulk domestic), non-domestic (industrial), and others. The figure was 203 million m^3 in 2010, and 205 million m^3 in 2011.

Year	Water Consumption (M)
2009	196.25 m^3
2010	202.56 m^3
2011	204.52 m^3

Source: SYABAS 2012

According to water consumption recorded by SYABAS in 2011, the biggest consumer of water was the residential sector (residences, condominiums and low cost housing) at 55%, followed by the industrial sector at 23%. The water consumption allocation among the sectors varies slightly from year to year between 2009 and 2011.



Source: SYABAS 2011

Starting in 2008, the Selangor State Government has been providing 20 m^3 of free water monthly for domestic usage for residents of the state. Only consumers who received water bills directly from SYABAS via individual meter are entitled to this discount.

ABSTRACTION OF SURFACE AND GROUND WATER

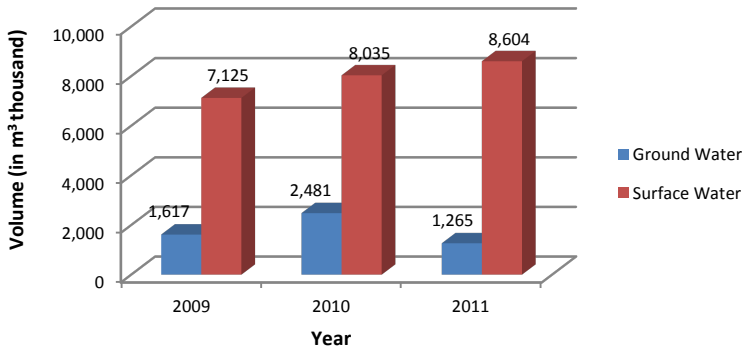
Abstraction is the amount of water abstracted by users such as water concessionaires, industries and private end users within the catchment. *Surface water* is water from rivers and water bodies such as lakes, ponds, wetlands, coastal waters and other natural or artificial bodies of water, while *ground water* is water abstracted from below the earth's surface.

Tighter control over abstraction of surface and ground water is being gazetted whereby licensing of abstractors, conditions and requirements for abstraction, and monitoring and declaration of amount abstracted can be closely managed by LUAS. Any infractions in requirements shall be met with corrective or punitive measures by LUAS.

Generally, within the Sg. Selangor basin, more surface water licensed by LUAS was abstracted than ground water. Within the past three years the volume of surface has been increasing, from 5 million m^3 in 2009 to over 8 million m^3 in 2010 and 2011.

In contrast, the volume of ground water abstracted within the basin fluctuates from 1.6 million m^3 in 2009 to 2.5 million m^3 in 2010 and back down to 1.3 million m^3 in 2011.

Comparison of Licensed Ground and Surface Water Abstracted within the Sg. Selangor Basin



Source: LUAS 2012

ABSTRACTION OF SURFACE WATER

In Selangor, approval from LUAS is required before water can be abstracted. LUAS carries out monitoring and enforcement action to ensure that premises and factories that abstract ground and surface water resources are registered with LUAS. This is to ensure that all the conditions stipulated in the license are complied. The ultimate goal is to control the use of water in a holistic and integrated manner.

LUAS imposes a charge for water abstracted from all water resources. Revenues from abstraction go towards the conservation of water resources and environment. Water abstracted for commercial use is RM0.05/m^3, while water for domestic supply purposes is RM0.01/ m^3.

Water Abstraction	Rates
Commercial	RM 0.05 /m^3
Water Supply	RM 0.01 /m^3

Source: LUAS 2011

SYABAS is the state's water distribution company

In 2011 there were nine water treatment plants and 30 industrial and private facilities that abstracted surface water from within the basin. Syarikat Air Bekalan Selangor (SYABAS) is the distributor of potable water to the consumer. Water extraction and treatment is divided between two water concessionaires.

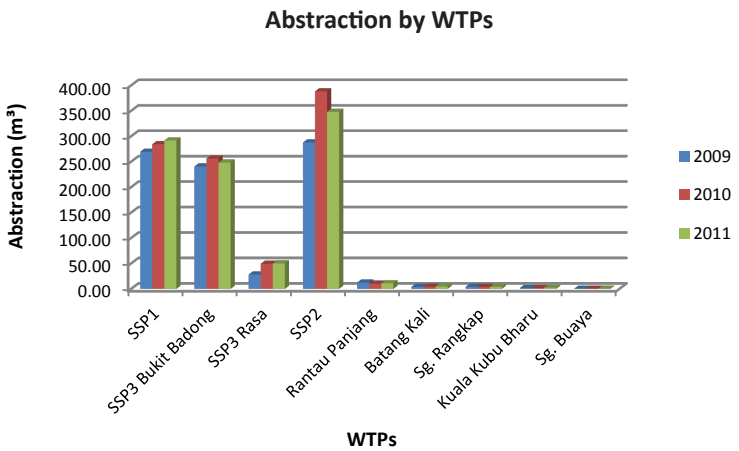
SPLASH is the concessionaire in charge of the Sg. Selangor Water Scheme for Phases 1 and 3, while PNSB services Phase 2.
In 2009, the amount of raw water abstracted from rivers was 948 million m^3. The number jumped to 998 million m^3 in 2010 and down to 959 million m^3 in 2011.

No	Water Intakes	Operator	2009	2010	2011
			Abstraction (m^3 in millions)		
1	SSP 1	SPLASH	269.35	284.27	291.55
2	SSP 2	PNSB	387.61	388.14	347.83
3	SSP 3 - Badong	SPLASH	240.54	256.18	248.28
4	SSP 3 - Rasa	SPLASH	28.20	49.29	49.87
5	Rantau Panjang	PNSB	12.46	10.21	10.94
6	Batang Kali	PNSB	4.00	4.11	4.52
7	Sg. Rangkap	PNSB	4.14	3.9	3.78
8	Kuala Kubu Baru	PNSB	1.80	1.80	2.04
9	Sg. Buaya	PNSB	0.24	0.17	0.20
		Total	948.26	998.10	959.03

Water abstracted from the Sg. Selangor basin
Source: LUAS 2012

In terms of abstraction volume, the most was taken at the Selangor Water Scheme Phases 1, 2 and 3.

A total of 154 licenses for ground water and 137 licenses for surface water abstraction were issued in 2011 throughout Selangor. Factories (automotive, electrical, electronics, rubber and glass) were the biggest abstractors of surface and ground water, followed by other industries and construction sites.



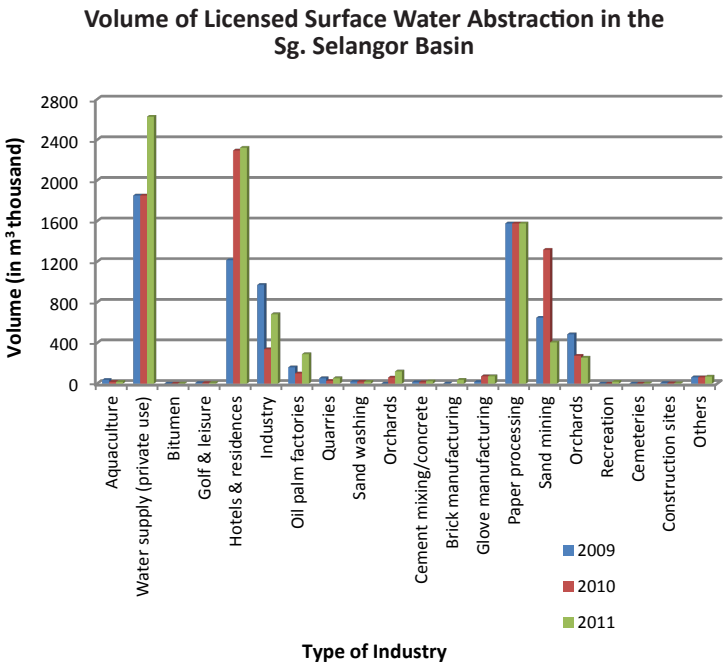
Distribution of abstraction among WTPs
Source: LUAS 2012

SPLASH water intake at Rasa

Water Abstraction by Industry

The Sg. Selangor basin has several significant abstractors of surface water that are licensed by LUAS, with the biggest being water supply for private use (2.7 million m^3 in 2011), followed by hotels and residences (2.3 million m^3) and paper processing (1.6 million m^3).

Other signifcant surface water abstractors in 2011 were general industry (882,901 m^3), sand mining (405,690 m^3), oil palm factories (290,000 m^3) and quarries (55,802 m^3).



Source: LUAS 2012

Water Abstraction for Irrigation

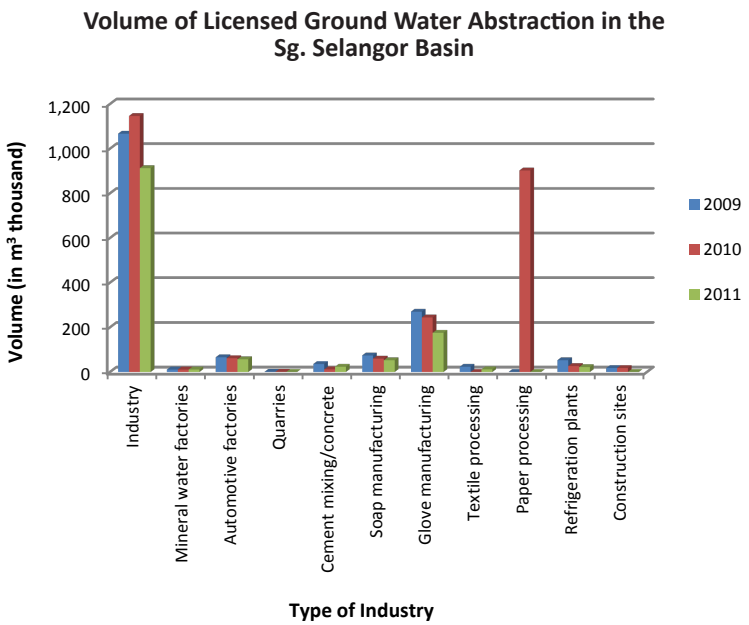
The irrigation water demand in Selangor is largely confined to the Northwest Selangor Integrated Agricultural Project in the northern part of the state, specifically the Sabak Bernam basin. Most of the 17 minor irrigation schemes in Selangor totaling 2,238 hectares are located in the districts of Hulu Langat and Hulu Selangor. Many of these small schemes have been abandoned as a result of lack of labour in rural areas and out-migration of workers, leading to an overall low cropping intensity. Others have been used for housing the close proximity for urban areas means that in the long term, the remaining schemes are also likely to be converted to housing or cultivation of higher value crops.

Shortages in supply for agriculture are being experienced due to various constraints in the irrigation infrastructure and its conveyance and distribution system. Water supply from Sg. Selangor was considered

to augment the shortage, but studies showed that water resources of the river, particularly drought flows, have been fully committed for domestic and industrial uses, and alternative sources must be explored.

ABSTRACTION OF GROUND WATER

The biggest consumer of ground water within the basin is general industry at 1 million m^3, 1.1 million m^3 and 912,613 m^3 in 2009, 2010 and 2011. There was a spike in paper processing at 902,370 m^3 in 2010 and a significant amount of abstraction for glove manufacturing (172,200 m^3 in 2011), but other activities such as automotive factories, cement mixing/concrete and soap manufacturing are evenly spread out in terms of ground water usage.



Source: LUAS 2012

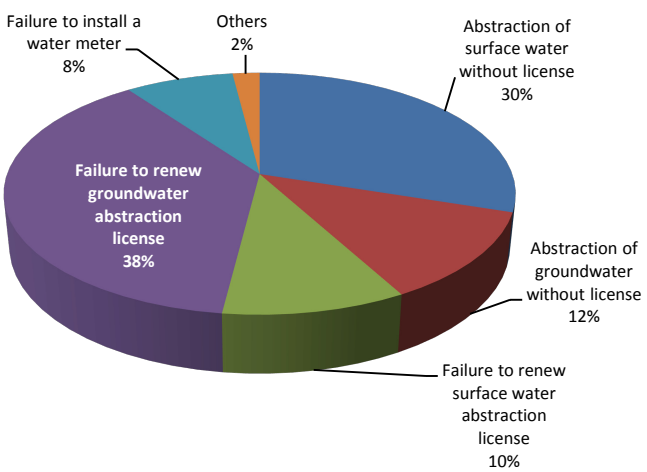
ABSTRACTION FROM LAKES AND EX-MINING PONDS

There is a vast network of ex-mining ponds north of Bestari Jaya in the district of Kuala Selangor. Formerly tin mine ponds, they have now been identified as viable water supply resources to the state. These ponds have the potential to be converted into detention ponds for flood mitigation during rainy seasons and storage ponds for potable water during periods of drought and will be studied further.

Issues

In 2011, LUAS issued 144 violation notices for commercial water abstraction. Out of this, 29.9% were for abstraction of surface water without a license, 11.8% were for abstraction of ground water without a license, 10.4% for failure to renew surface water license, 37.5% for failure to renew ground water license, 8.3% for failure to install a meter, and 2.1% for others.

Water Abstraction Violations in Selangor



Source: LUAS 2012

SUSTAINABLE WATER PRACTICES

Rainwater harvesting. The state government promotes sustainable water usage by encouraging the use of rainwater harvesting system throughout all the districts in Selangor. Likewise, Jabatan Pengairan dan Saliran is also promoting its use.

Rainwater harvesting is one of the best management practice that is being promoted in Malaysia. The system slows the flow of surface runoff, and as such serves as 'on site detention storage' as well as a source of water. However, as rainwater may contain traces of chemicals that may be harmful as drinking water, harvested rainwater is best used to flush toilets, water plants, wash cars and other external uses.

WATER QUALITY

JAS is an environmental protection agency that monitors and regulates air quality, river, ground water and marine water quality, noise pollution and climate change

Jabatan Alam Sekitar (JAS) Selangor continuously monitors the quality of river water, marine water, and ground water to detect and quickly address any changes in the environment that may have a negative impact on humans as well as the environment.

Overall, within the state of Selangor, there are 44 water quality stations monitoring the rivers. There was an increase in the number of clean rivers in Selangor in 2010, i.e., 16 rivers (36.4%) as compared with 12 rivers (27.3%) in 2009. Meanwhile, nine rivers in Selangor were classified as polluted in year 2010 compared to ten in year 2009.

Within the Sg. Selangor river basin, there are nine JAS monitoring stations along the major rivers and tributaries for water quality. These stations monitor six parameters, which are biochemical oxygen demand (BOD), chemical oxygen demand (COD), ammoniacal nitrogen (NH_3–N), pH, dissolved oxygen (DO), and suspended solids (SS).

Water Quality Index, or WQI, shows how polluted is a river's water. It is a weighted average of various pollutants, called parameters, to classify a river according to established quality levels. (Refer to Appendix A for details on the WQI and classifications).

In 2010, one river out of the nine, Sg. Rawang, showed improvement from Class III to II. Two rivers were downgraded in water quality, Sg. Kanching and Sg. Kerling, while the rest maintained their water quality

level. The downgrading of Sg. Kanching and Sg. Kerling require the attention of river monitoring agencies, as both rivers are in the upstream areas of the basin.

Water Quality at Water Intakes

The WQI trend at the water intakes shows that compared with the year 2010, only Sg. Rangkap WTP climbed to Class I in 2011. Kuala Kubu Bharu WTP fell to Class II from Class I. SSP2 and SSP3 rose from Class III to Class II. Other WTPs such as Batang Kali, Sg. Buaya, SSP1 and SSP3 Rasa remained as Class II, while Rantau Panjang WTP fell to Class III in 2011. Overall, the WTPs within Sg. Selangor river basin were categorized as Class II.

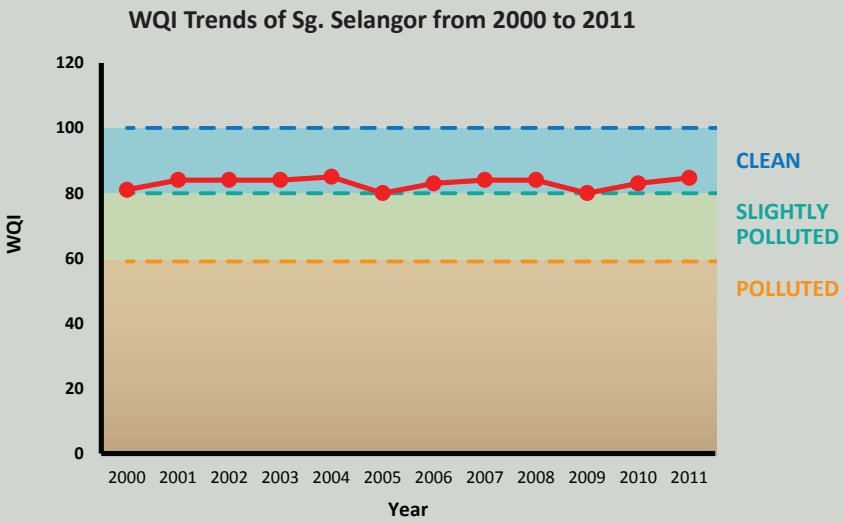
WTP Station	2009		2010		2011	
	WQI	Class	WQI	Class	WQI	Class
Kuala Kubu Bharu	93.1	I	94.2	I	92	II
SSP3-Rasa	91.09	II	92.56	II	92.96	I
Batang Kali	92.5	II	92.4	II	89.1	II
Sg. Buaya	82.7	II	85.8	II	86	II
Sg. Rangkap	94	I	92.4	II	93.4	I
SSP1	73.69	II	74.96	III	79.04	II
SSP3 – Bkt Badong	78.51	II	75.51	III	76.44	III
Rantau Panjang	74.6	III	76.5	II	76.3	III
SSP2	74.2	III	73.3	III	77.8	II

Source: Puncak Niaga and SPLASH 2012

FOCUS
Water Quality

Indicator 2.: Water Quality in Sg. Selangor

The WQI for Sg. Selangor has been consistently steady for the last 10 years. Since 2000 the water quality has been hovering above the 'slightly polluted' level in the WQI scale. In 2011, the WQI was 85, up from a WQI of 80 in 2009 and 83 in 2010.

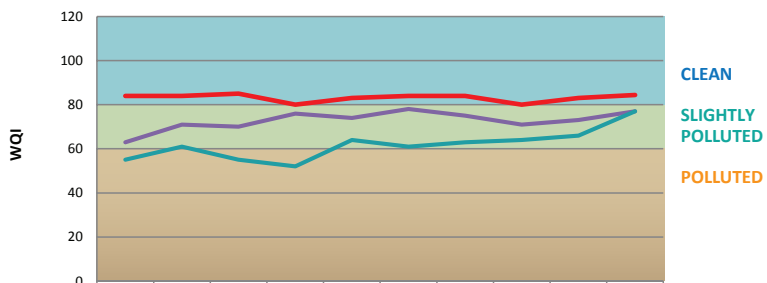


Source: JAS Selangor 2011

In comparison with Sg. Klang and Sg. Selangor river basins, Sg. Selangor ranks the highest in water quality, although all three rivers show evidence of steadily improving WQI over the past three years.

The major pollutants in rivers within the state were suspended solids and ammoniacal nitrogen. High concentrations of suspended solids are usually due to earthworks and ammoniacal nitrogen originates from effluents from waters that have not been treated or agricultural activities.

Comparison of WQIs Among River Basin



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Sg. Langat	63	71	70	76	74	78	75	71	73	77
Sg. Selangor	84	84	85	80	83	84	84	80	83	85
Sg. Klang	55	61	55	52	64	61	63	64	66	77

Source: JAS Selangor 2012

Other indicators

WQI gives an average measurement of the water quality of the river. To identify specific problems existing in the river, it is necessary to look at the individual parameters.

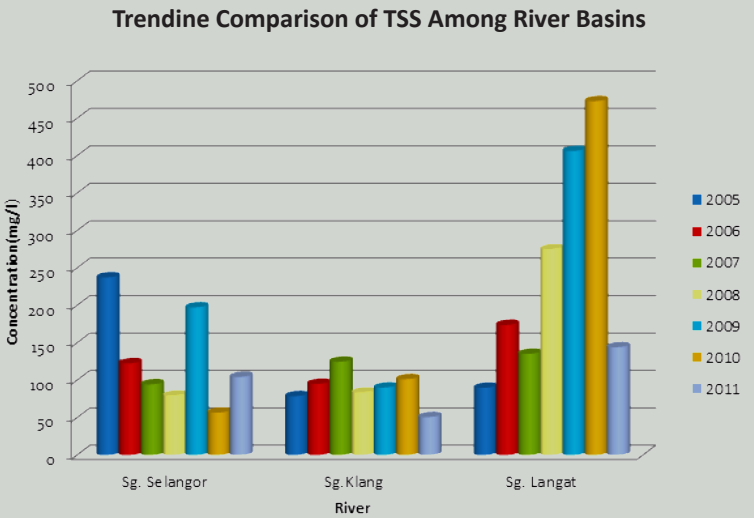
Total Suspended Solids

Total suspended solids (TSS) are small solid particles which remain in suspension in water. It is used as one indicator of water quality. TSS is important to measure as pollutants and pathogens are carried on the surface of particles. The smaller the particle size, the greater the total surface area per unit mass of particle, and so the higher the pollutant load that is likely to be carried.

Indicator 3: Total Suspended Solids in Sg. Selangor

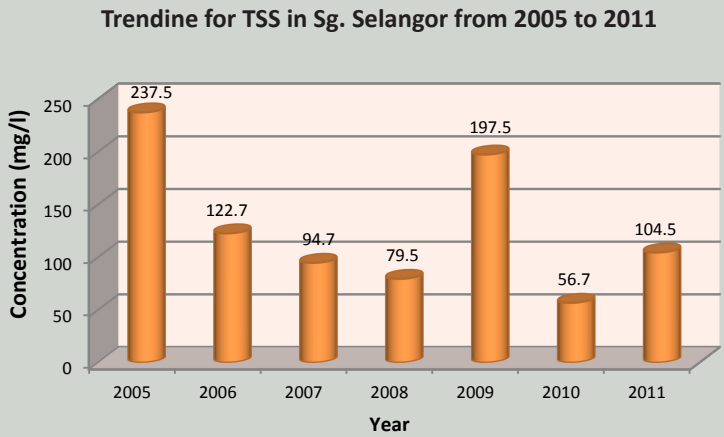
In the year 2010, the level of pollutant concentration for the parameter TSS in Sungai Selangor rose drastically from the previous year. TSS is a measure of how much sediment is in the river water. Activities that contributed to the rise in concentration levels were soil erosion, earthworks, and sand mining.

A comparison among the river basins shows that Sg. Selangor has moderately high levels of TSS, higher than Sg. Klang but lower than Sg. Langat.



Source: JAS Selangor, Laporan Tahunan 2011

The TSS level of Sg. Selangor for over the last three years shows fluctuations, from 197.5 mg/l in 2009, dropping to 56.7 mg/l in 2010 and rising to 104.5 mg/l in 2011.



Source: JAS Selangor, 2011

Ammoniacal Nitrogen

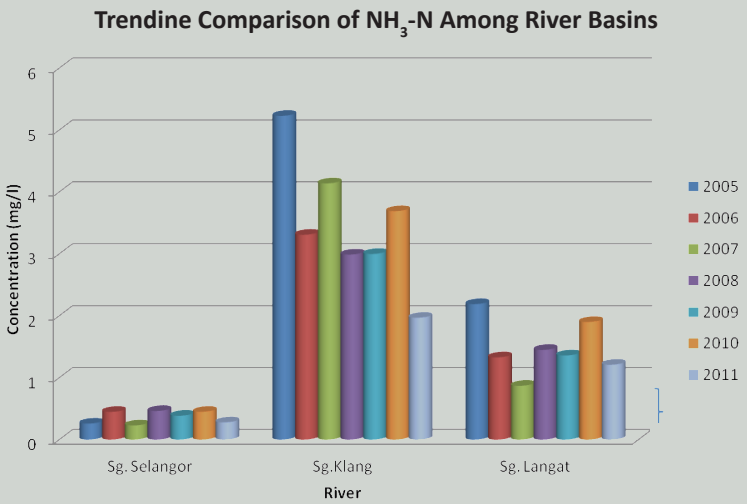
Depending on temperature and pH, high levels of ammoniacal nitrogen (NH_3–N) can be toxic to aquatic life. High concentrations can stimulate excessive aquatic production and indicate pollution. Sources of NH_3–N include fertilisers, human and animal wastes and byproducts from industrial manufacturing processes.

A comparison among the river basins shows that NH_3–N is not a serious problem in Sg. Selangor.

FOCUS
Water Quality

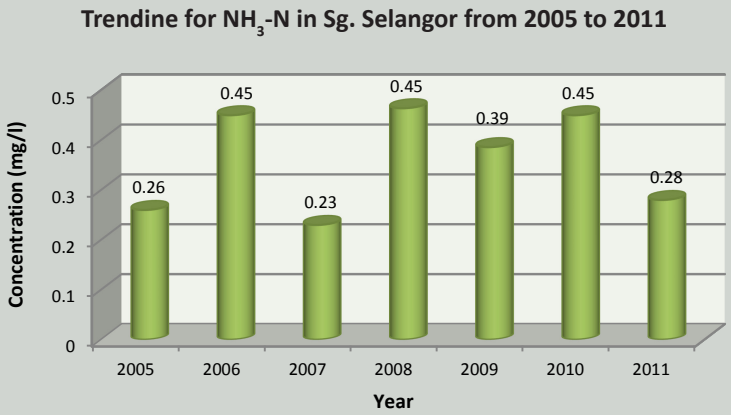
Indicator 4: Ammoniacal Nitrogen in Sg. Selangor

Concentration levels for NH_3–N in Sg. Selangor were consistently low. NH_3–N is a measure of the amount of ammonia, a toxic pollutant often found in landfill leachate and in waste products, such as sewage, liquid manure and other liquid organic waste products. Generally, the main causes of the increase are from the release of untreated sewage or partially treated effluents and agricultural activities.



Source: JAS Selangor, Laporan Tahunan 2011

In 2011, there was a drop in ammoniacal nitrogen to 0.28 mg/l. The previous years showed more elevated levels of 0.39 mg/l and 0.45 mg/l.



Source: JAS Selangor, 2011

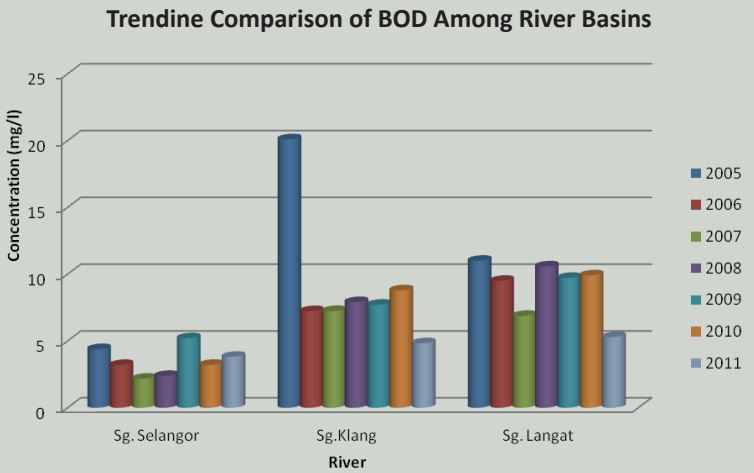
Biochemical Oxygen Demand

Biochemical oxygen demand (BOD) is the amount of oxygen required by microorganisms to decompose organic matter in water that is polluted by, for example, sewage.

FOCUS
Water Quality

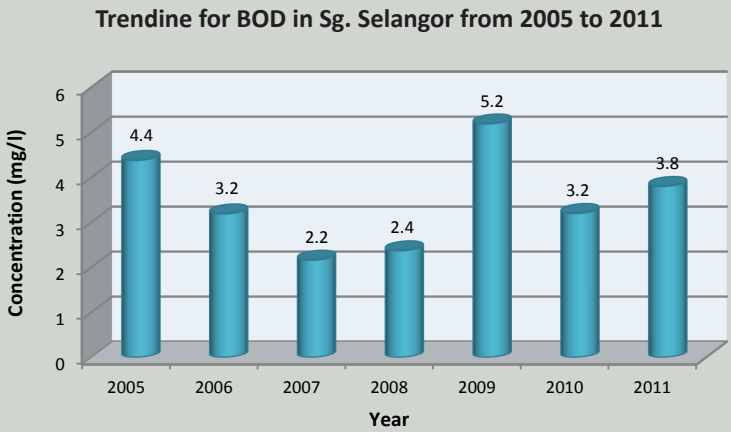
Indicator 5: Biochemical Oxygen Demand in Sg. Selangor

BOD level during the year 2010 showed an increase from that in 2009, although not as high as in 2009. High BOD levels indicate a high amount of oxygen needed by bacteria and other microbial organisms, which deprive fish and other aquatic life of the same source of oxygen. The main focus of wastewater treatment plants is to reduce the BOD in the effluent discharged to natural waters.



Source: JAS Selangor, Laporan Tahunan 2011

The BOD level in 2011 showed an increase from the previous year, indicating the presence of the microbial organisms. The highest level was recorded in 2009 at 5.2 mg/l, while in 2010 it dipped to 3.2 mg/l.



Source: JAS Selangor, 2011

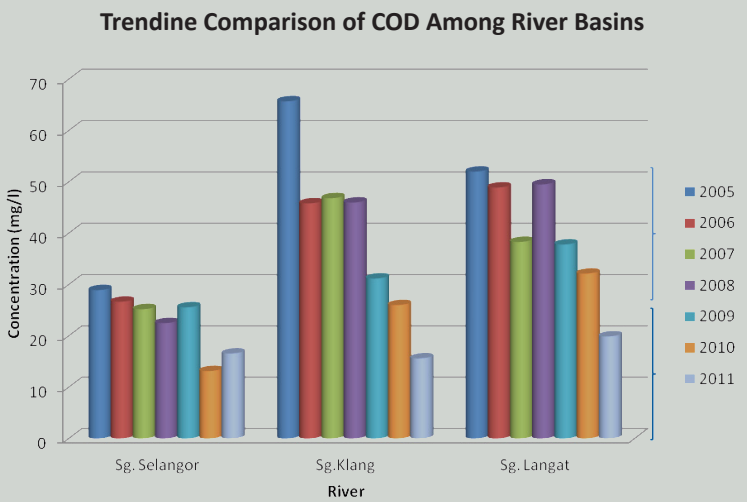
Chemical Oxygen Demand

Chemical oxygen demand (COD) is a measure of the oxygen required to oxidize all compounds in water. This includes both organic and inorganic compounds.

FOCUS
Water Quality

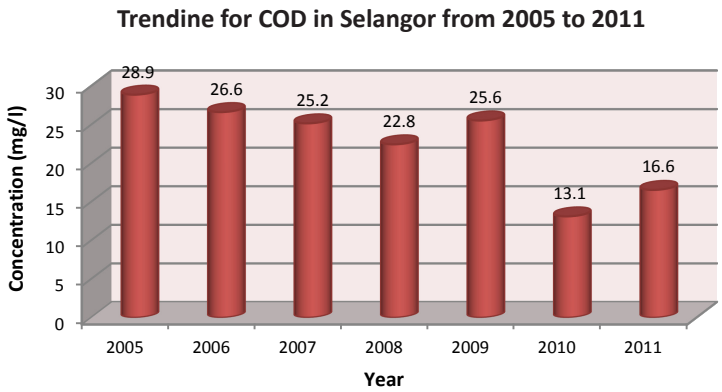
Indicator 6: Chemical Oxygen Demand in Sg. Selangor

Chemical oxygen demand (COD) is an indicator of the quality of effluents and wastewaters prior to discharge. It is a measure of the total quantity of oxygen required to process both biological and inert organic matter. It is often used in monitoring and control of discharges, and for assessing treatment plant performance. In 2011 there was a slight increase in the COD level in the Sg. Selangor from the previous year.



Source: JAS Selangor, Laporan Tahunan 2011

The COD level in the past two years has shown an improvement. The level in 2011 was 16.6 mg/l while it was 13.1 mg/l in 2010. This is an improvement over the previous years which registered levels over 22 mg/l.



Source: JAS Selangor, 2011

Issues

Violations and Enforcement. Overall, the Sg. Selangor basin recorded fewer violations in raw water quality than the Sg. Klang or Sg. Langat basins. The raw water quality is compared against the Recommended Raw Water Quality Limit (National Standard for Drinking Water Quality, Ministry of Health, Malaysia).

Sungai Selangor Raw Water Quality Violations from 1995 to 2011
Source: SYABAS EIS 2011

From 1995 to 2011, a total of 3,611 violations were detected within the catchment. In 2011 alone, 286 violations were recorded. Parameters that recorded violations in 2011 were total coliform (142 violations), colour (92), pH (9), COD (11) and iron (32).

WTPs that were located within the upper catchment area, such as at Batang Kali, Sg. Rangkap, Kuala Kubu Baru and Sg. Buaya did not face serious river water pollution as these WTPs were located further upstream, where the catchment areas were still intact. However, WTPs at Rantau Panjang and Sg. Selangor Phase II (SSP 2) recorded a higher number of violations, as these WTPs were located within the lower part of the catchment area.

Actions Taken

In response to the violations, stringent monitoring activities have been undertaken. In addition to the JAS, other agencies and private entities such as SYABAS, LUAS, PNSB, SPLASH and JKNS have been conducting water quality testing and sanitary surveys. Data gathered and relevant information is centralised at LUAS so that an integrated, concerted effort towards enforcement, issues resolution and problem solving can be made.

Monitoring by SPLASH. SPLASH conducts river survey on a quarterly basis to regularly assess the status of the river and identify critical issues. After the survey is carried out, SPLASH analyses the collated data and summarises the findings for the relevant authorities' attention and further action. To further assist authorities such as LUAS and JAS, pollution incidents and violation of standards are immediately investigated and reported. Major concerns and recurring issues are regularly raised at relevant meetings. These proactive actions would then be followed up by relevant authorities to ensure clean raw water supply.

Source: LUAS 2012

Monitoring by PNSB. Puncak Niaga actively conducts annual environmental impact studies of six water catchments in Selangor and the Klang Valley. It carries out land use assessment as well as monitor raw water quality at water intake points. It monitors for microbiological, physical, heavy metals, pesticides, and radioactivity according to the National Raw Water Quality Standard.

Monitoring by JKNS. JKNS also has a program for continuous monitoring through sanitary surveys. Its team tests river water at water intake sites and alerts LUAS when any significant potential health threat is detected. LUAS then calls the party responsible for the source of the pollution, water concessionaire, and other related parties for pollution mitigation. JKNS has also proposed a *Water Safety Plan* in 2011 and is expected to be tabled in Parliament in 2012.

Source: Puncak Niaga

According to PNSB, in view of the rapid population growth, industrialisation, and uncertainties caused by climate change, additional strategies for managing raw water resources sustainably needs to be developed. This is to ensure that sufficient quantity and quality of raw water is available for use by present and future residents of Selangor.

PNSB suggests that there should more awareness of the violations being made so that the general public becomes aware of the pollution being dumped into the rivers.

JKNS recommends that local authorities also conduct a sanitary survey of their section of rivers by district. This would enable comparison of the quality of raw water and treated water.

Water Quality of Coastal Waters

JAS has set up a monitoring station at the estuary of Sg. Selangor to observe marine water quality for purposes of recreation, fishing and marine parks. The station is located at Kuala Sg. Selangor.

Throughout the coastline, JAS has marine water quality monitoring conducted at 14 stations along the sea. Overall, the parameters E. coli, total suspended solids (TSS) and oil and grease are the main pollutants in the coastal marine waters of Selangor. The recorded E. coli level exceeds the standard level. This is believed to be due to the discharge of wastewater from food shops, restaurants and domestic sewage that are not treated properly.

In addition, shipping and fishing boats have also been identified as a major contributor to the pollution of oil and grease, while earthworks activities along the coast and estuaries contribute to increased levels of high suspended solids. Naturally occurring coastal erosion can also contribute to increased levels of suspended solids.

Jeti Tanjong Keramat at Kuala Selangor

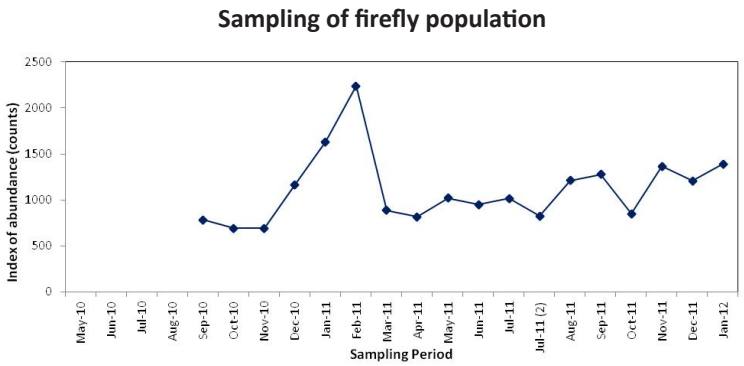
RIVER ECOLOGY

Sg. Selangor supports a diversity of flora and fauna, from mangrove trees to aquatic animals and the most spectacular of all, the fireflies. The famous fireflies of Kampong Kuantan, Kuala Selangor draw scores of tourists and nature lovers hoping to catch a glimpse of these light-emitting insects.

FIREFLY CONSERVATION

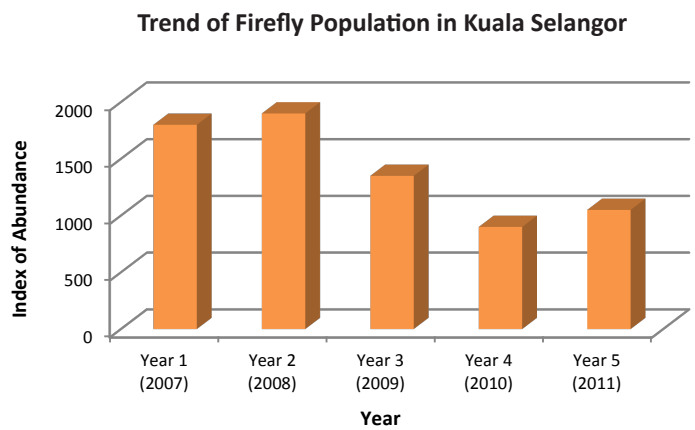
To preserve this unique entymological as well as tourist feature, a firefly conservation program was started in 2006 by Jabatan Pengairan dan Saliran. The program was subsequently funded by the Forestry Research Institute Malaysia (FRIM) and more recently, by LUAS.

FRIM developed a special technique for monitoring the firefly population comprising high-resolution digital night photography to obtain a form of population measurement called an *index of abundance* of the adult firefly population on a monthly basis. Malaysia is the only country in the world to have developed a systematic monitoring programme and technique to monitor firefly population.



Source: FRIM and LUAS 2012

The monitoring program yielded valuable information for the purposes of population tracking: a trend line showed evidence of habitat degradation and a whopping 48% drop in population from 2007 to 2011. The regression line revealed an annual decrease of approximately 12%, and the biggest drop in population was seen in 2009.



Source: FRIM and LUAS 2012

Other factors such as temperature, RH, rainfall, salinity and air quality were considered, and patterns of population increase were identified. For example, it was found that population increased around November and December 2010 and peaked in January and February 2011. There is also a shifting of peak abundance to shift from mid-year in 2008 to the end/beginning of the year in 2010. And while rainfall was thought to

have some impact on the abundance index, it was not deemed as significant enough to cause the dramatic drop in population.

Thus, the conclusion drawn from monitoring and observation of the population patterns and other factors was that the decrease in firefly population was most likely caused by land clearing along the riverbanks.

Riverbanks along firefly habitat in Kampong Kuantan

Fireflies are not the only casualty of land degradation. Riparian areas along the river are natural breeding grounds for the fireflies as vegetation provides shelter and food for the firefly during the larval stage. The berembang trees lining the riverbank act as a shelter during the day and as display trees during the night for the adult fireflies. These trees are not able to survive in a high-salinity environment. Therefore, they can only thrive in the upper part of the estuary where the water salinity is relatively low. The survival of the berembang trees depend on maintaining the right salinity level of Sg. Selangor. The flow of freshwater from upstream influences the salinity levels of the river in estuarine areas located downstream.

Berembang trees and leaves along the river at Kampung Kuantan

Actions Taken

LUAS undertook a series of steps towards mitigating the population drop. It created awareness among the general public through media coverage highlighting the plight of the diminishing firefly community. It was also highlighted in the international academic and professional circles through journals and presentations at symposiums.

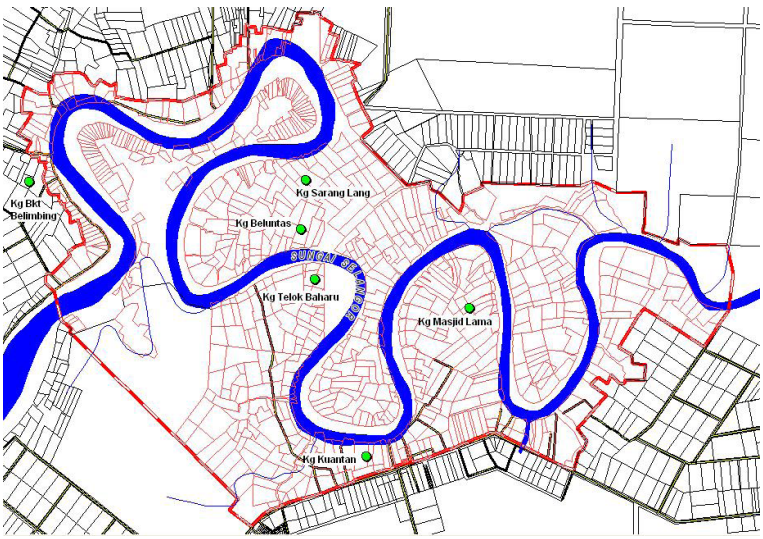
Other steps included land reaquisition at Tanjung Beluntas, rehabilitation of degraded areas, and protecting the firefly area through enactment.

In July 2009 LUAS gazetted a large swath of lands as 'Zon Perlindungan' (Protection Zone) at Kuala Selangor. The purpose of the Protection Zone is to protect river reserve area, its buffer zone and the natural surrounding from being destroyed and contaminated. The fireflies' habitat is also covered in this area.

Areas that have been gazetted as Firefly Habitat Protection Zones			
Kg. Nyior	Kg. Sarang Lang	Kg. Tanjung Beluntas	Kg. Lubok Jaya
Kg. Telok Baharu	Kg. Telok Siam	Kg. Kuantan	Kg. Inche Bahan
Kg. Masjid Lama	Kg. Kedah		

LUAS protects the firefly habitat zone by enforcing restrictions of activities within the zone. Restricted activities are erection of structures, application or storage of any chemicals including pesticide or fertiliser, alteration of existing land contours including grading or construction of roads, clearing of vegetation and discharge of any effluent or waste. Any activity within the zone of protection must obtain written approval from LUAS.

The map below shows the location for Fireflies Habitat Protection Zone



Source: LUAS 2011

Longer term measures and recommendations proposed by FRIM and LUAS to prevent further loss in firefly population are acquisition of land comprising existing habitat, rehabilitation of degraded riverside land, engage the villagers towards sustainable and 'firefly–friendly' agricultural practices, increased enforcement, continue funding for monitoring of fireflies, set up permanent environmental monitoring stations, and establish permanent firefly monitoring stations.

Sg. Selangor at the Kerling Hot Springs in Hulu Selangor

RIVER-RELATED ACTIVITIES AND SOURCES OF POLLUTION

According to the Environmental Impact Study (EIS) 2011 carried out by SYABAS, the main sources of pollution in Sg. Selangor river basin are industrial wastes and effluents, slaughter houses or abattoirs, agricultural activities and landfills.

Institutional Setups. For incidents arising from any pollution sources, there are two institutional set-ups comprising various state agencies. One is called the *Sungai Selangor Pollution Control Task Force* for regular monitor and control, while the other is the *State Water Resources Pollution Emergency Committee* for emergency and incident response.

The Sungai Selangor Pollution Control Task Force was formed in March 2008 to investigate reports of point and non-point pollution within the catchment.

Sungai Selangor Basin Pollution Control Task Force	
Chairperson	Director of LUAS
Secretariat	LUAS
Committee Members	SPAN, JPP, JPBD, JMG, JPV, UPEN, JAS, JPS, JKNS, JPNS, DOA, district and land offices, local authorities, SYABAS, PNSB, ABASS, IWK

Source: LUAS 2012

Severe cases of river pollution are immediately responded to by the State Water Resources Pollution Emergency Committee. This setup enabled quick response and cleanup of several cases of river pollution during 2009 and 2011.

Selangor State Water Source Pollution Emergency Committee	
Chairperson	Chairman of the Selangor Infrastructure and Public Amenities Standing Committee
Secretariat	LUAS
Government Departments	JAS, JPS, JKNS, JKR, local authorities, district and land office, other related agencies
Water Concessionaires	SPLASH, PNSB, ABASS and SYABAS
Highway Board and Concessionaires	Lembaga Lebuhraya Malaysia, MTD Prime and PLUS

Source: LUAS 2012

Issues

SYABAS figures show that there were 612 raw water quality violations in Sg. Selangor from the years 2009 to 2011. In 2011 alone, there were 286 violations. A typical case is heavy levels of turbidity caused by landslides and river bank landslip at the Gading Reserve Forest. The slope failures caused the operations at WTP Rantau Panjang to stop for four hours and WTP SSP3 Bukit Badong for two hours.

Actions Taken

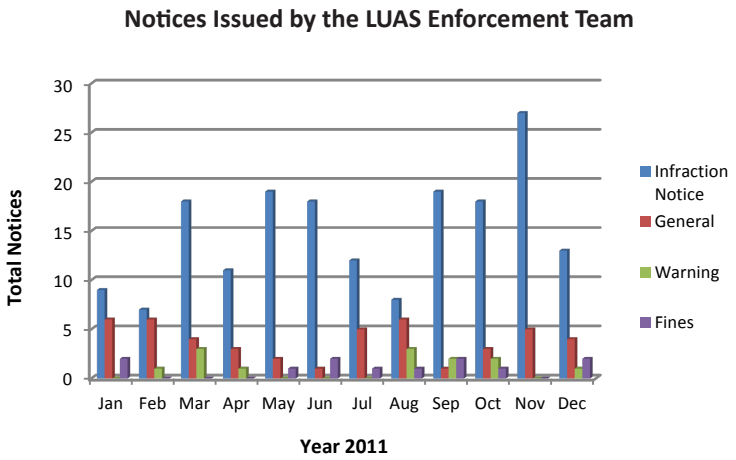
Enforcement. To stem the tide of infractions, enforcement has been imposed through a multi-agency effort involving the Enforcement Unit of LUAS, Suruhanjaya Pencegahan Rasuah Malaysia (SPRM), land and district offices, JAS, SYABAS, water concessionaires, the police, among others. Actions taken have included seizures, penalties and arrests.

In particular, Unit Selangor and Task Force monitors the following specific types of pollution.

Types of pollution		
Illegal dumping	Landfill	Animal husbandry
Sewage treatment plants	Sand mining	Effluent discharge
Forest reserve infringement	Turbidity	Trespassing on river reserve

Source: LUAS 2012

Altogether, 417 notices have been issued in 2010 and 2011. In 2011 alone, there are 250 actions taken by the LUAS enforcement team.



Some of the pollution cases resolved by LUAS in 2011 involved alteration of resources.

Location	Issues	Agencies	Note
Sg. Sireh Tg. Karang	Pollution due to intrusion of peat swamp waters	LUAS, JPS	Caused Sg. Selangor plant to be closed.
Sg. Kerling and Sg. Selangor	Turbidity due to landslide at the upstream of Sg. Kerling	SYABAS, SPLASH, Puncak Niaga, LUAS	Caused pollution to Sg. Kerling and Sg. Selangor Sg. Selangor plant needs to be closed.
Sg. Sembah Sg.Selangor	Sand mining activities	SPRM, Polis, LUAS	Alteration of resources without permission Breach of rules Arrest
Sg. Selangor Dam	Trespassing	Polis, SPLASH, LUAS	Arrest by police Seizure Notice given to OYDS
Sg. Selangor Dam	Trespassing	Polis, SPLASH, LUAS	Arrest Seizure Notice given to OYDS
Sg. Sembah Sg.Selangor	Monitoring of legal sand mining activities	SPRM, Polis, LUAS	Alteration of resources without permission Breach of rules Arrest
Selangor's coast	Sea sand mining	APMM, LUAS	Monitoring

Source: LUAS 2012

River Inventory. In the year 2011, LUAS carried out a river basin inventory program called *Program Kenali Sungai Kita* for the Sg. Selangor river basin. The program gathered information on the physical aspect of the river as well as traced any possible threat to the river health.

SEWAGE

Domestic sewage refers to wastewater that is discharged from households. Sewage falls into two categories: "black water" from toilets and "grey water" from kitchens, washing machines, and baths. If not properly treated before being discharged into the river, it can severely affect the water quality with organic and pathogenic pollution.

As of 2011, there were 144 public sewage treatment plants and 22 network pumping stations in the Sg. Selangor river basin.These plants fall under the operation and maintenance of Indah Water Konsortium (IWK). IWK manages public plants only; those under private ownership are responsible for their own operation and maintenance.

IWK is a national sewerage company providing sewerage services, operating and maintaining public sewage treatment plants and sewerage pipelines

	2009	2010	2011
Total Network Pump Station (NPS)	19	22	22
Total Communal Septic Tank (CST)	105	105	105
Total Sewage Treatment Plants (STPs)	134	137	144

Source: IWK 2012

Although there is a push towards centralised treatment plants, there are still many individual septic tanks.

Among the plants, there are different categories depending on effluent discharge requirements. The Environmental Quality Act (EQA) 1974 specifies two standards for effluent discharge: Standard A for discharge upstream of any raw water intake (Catchment A), and Standard B for discharge downstream of any raw water intake (Catchment B). The effluent standard of STPs is then divided into three main categories: Category 1, Category 2 and Category 3. Any STPs constructed before 1 January 1999 is a Category 3 plant, while STPs constructed between

1 January 1999 and 10 December 2009 is a Category 2 plant. STPs constructed after 10 December 2009 is a Category 1 plant.

Type	Qty	PE
Category 1		
Mechanised Cat 1 (STD A)	-	-
Mechanised Cat 1 (STD B)	-	-
Total	**-**	**-**
Category 2		
Mechanised Cat 2 (STD A)	39	181,088
Mechanised Cat 2 (STD B)	24	28,216
Total	**63**	**209,304**
Category 3		
Mechanised Cat 3 (STD A)	48	323,802
Mechanised Cat 3 (STD B)	6	4,412
AL (STD A & B)	6	27,987
OP (STD A& B)	14	26,765
IT (STD A & B)	7	3,640
Total	**81**	**386,606**

Classification of STPs within the Sg. Selangor Basin (2011)
Source: IWK 2012

Category 1 is a type of plant that is equipped with tertiary treatment. Tertiary treatment means that the plant can further reduce or remove pollutants beyond the level of common secondary treatment process, such as nitrogen and phosphorus.

Category 2 plants use a common secondary treatment process without the nutrient removal process, while Category 3 plants employ a combination of secondary and primary treatment processes.

In 2009, revisions were made to the 1979 Environmental Quality Regulations. This meant that as of 2010 more stringent requirements and monitoring of effluents were imposed, such as the addition of leachate removal and stricter effluent control for lakes and ponds. The new regulations also added parameters such as ammoniacal nitrogen, nitrate nitrogen, and phosphorus, which suppress aquatic life, produce

foul-smelling and cloudy water, and have negative effects on human health. (Refer to Appendix B to see the new regulations).

Issues

In spite of the measures that IWK has taken, it has come under fire as one of the main contributors to pollution within the basin. Some of the many challenges that IWK has been facing are difficulties in treating oil and grease, ageing infrastructure and illicit connections.

Challenges Facing IWK	Comment
Oil and grease	Many of the STPs are not designed to treat
Ageing infrastructure	Some of the older facilities need to be upgraded to regulatory standards
Illicit connections	Cause contaminated wastewater or chemical or toxic substances enter into sewers or directly into existing standard domestic sewers before receiving treatment from a wastewater treatment plant

Source: IWK 2012

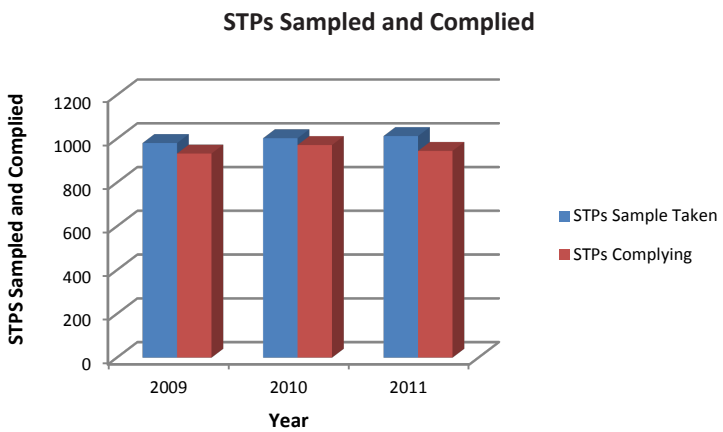
Some of the cases that LUAS has handled involved effluents discharging from sewage treatment plants, resulting in odorous black water in the river. This was the result of faulty equipment that caused untreated water to be released.

Dumping of effluents from the Tasik Puteri township in Rawang
Source: LUAS 2012

Actions Taken

LUAS addresses cases such as these by informing all parties involved so as to ensure that effluent standards adhere to the charters of JAS, SPAN and IWK. Every three months, LUAS holds discussion with river stakeholders on river pollution. IWK contributes data on public STPs. At the same time, IWK maintains it is not the only source of pollution as there are private STPs and septic tanks that also contribute to pollution.

In response to these issues, IWK monitors its plants to ensure compliance to the new environmental quality regulations. Of the 981 STPs monitored in 2009, 933 or 95.1% were in compliance with the EQSR 2009; in 2010, 972 or 96.9% out of 1,003 STPs were in compliance; and in 2011, 945 or 93.3% out of 1,013 STPs were in compliance.



Source: IWK 2012

The reason for the high compliance rate is due to the removal of communal septic tanks (CSTs) and independent septic tanks (ISTs)

from IWK's maintenance schedule. Although CSTs are no longer under the IWK's responsibility, the agency continues to monitor CSTs as part of its effluent monitoring effort.

KeTTHA is a federal ministry for energy, green technology and water

Kementerian Tenaga, Teknologi Hijau dan Air (KeTTHA) is restructuring the sewerage services industry through the formation of a Sewerage Facilities Licensee, the National Sewerage Company (NASCO) in accordance to the Water Services Industry Act 2006. It is also reviewing the sewerage services tariff, which will be implemented in phases, to make the sewerage services sustainable in the long term.

INDUSTRY

Industrial activities generate wastewater that must be treated and disposed of in an environmentally friendly manner. In a 2011 survey conducted by SYABAS, water quality degradation was observed for some of the water bodies and tributaries that meandered nearby the industrial areas.

As of 2007, there were 30 factories and facilities within 11 industrial areas. Industrial area within the Sg. Selangor basin are Bukit Beruntung Industrial Park, Rawang Industrial Park, Kundang and Serendah. Within the Hulu Selangor district there are two major industrial areas as Sg. Choh and Bukit Beruntung.

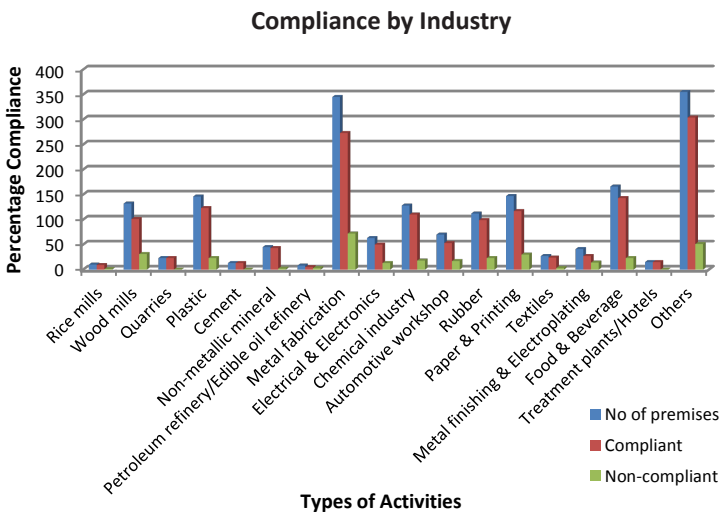
Types of industries within the basin are typically palm oleo mills, glove manufacturing, steel manufacturing, furniture, paper recycling and food processing factories.

Issues

Industrial effluents from various industrial areas were suspected to have contributed to the recurring objectionable odour, high levels of fluoride and discolouration of water in the rivers. According to JKNS, industrial effluents from textile, furniture and latex factories were frequently detected in the river.

Actions Taken

Industries that had the highest compliance rate were the quarry industry, water treatment plants and hotels at 100%, followed by non-metallic mineral industry (98.6%) and automotive workshops (98.5%). Industries that had the lowest level of compliance were the cement industry at 92.3%, followed by metal finishing and electroplating (92.5%) and the rubber industry (95.1%). Other industries such as electrical and electronic, wood mills, rice mills and plastic factories ranged between 96% and 98%.



Source: JAS Selangor 2011

Factors that contributed to non-compliance ranged from poor practices to lack of adequate plants to lack of understanding of regulations.

Factors for Non-Compliance	
1	Lack of effluent treatment plants, thus allowing direct discharge of raw untreated water into the waterways
2	Performance of effluent treatment plants not at optimal levels
3	Effluent treatment plants operating at levels above actual design capacity
4	Lack of qualified personnel in proper effluent treatment
5	No regular surveillance on the quality of effluent discharge
6	Overall lack of understanding of the new regulatory requirements, the Regulations of the Environmental Quality (Industrial Effluents) 2009

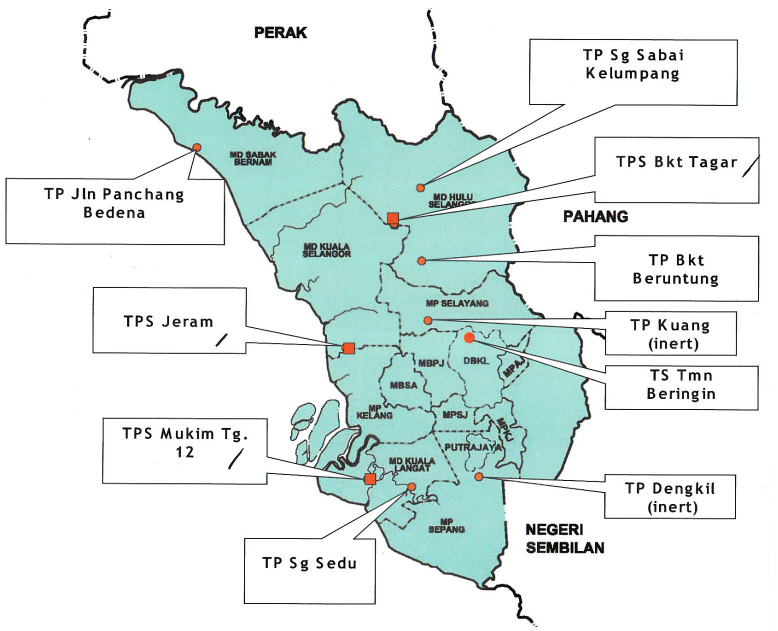
Source: JAS Selangor 2011

SOLID WASTE

Landfills are the oldest form of waste treatment. Leachate is produced when rain *percolates* or passes through waste deposited in a landfill, producing a liquid that has passed through landfilled materials.

Generally, leachate is rich in dissolved organic matter (alcohols, acids, and aldehydes), inorganic macro components (sulphate, chloride, iron, aluminium, zinc, and ammonia), heavy metals (Pb, Ni, Cu, and Hg), and organic compounds such as halogenated organics (PCBs and dioxins).

The pollution risks from leachate, especially to the water treatment process are due to its high concentration of organic contaminant and ammonia as well as associated pervasive odour.



Landfills throughout Selangor
Source: JPSPN 2012

There are 165 operating in Malaysia, with plans for nine sanitary landfills to be built.

There are four landfills located within the Sg. Selangor river basin: TP Kalumpang, TP Bukit Beruntung, TP Jeram and TP Bukit Tagar. Bukit Tagar, a Class 4 facility on a 405 hectare site, processes all the waste from Kuala Lumpur, which is approximately 2,500 tonnes per day. Two of the facilities—Bukit Tagar and Bukit Beruntung—are sanitary landfills, while the other two are not.

JPSPN is a government agency dedicated to the management of solid waste

The National Solid Waste Management Department (JPSPN) is an agency that manages solid waste matters throughout the country. It works closely with the local authorities in that it approves the building of landfills proposed by the state. It also provides technical advice on how landfills should be built and managed.

Non-sanitary landfills allow leachates to seep into the ground, and thus must be must be monitored to ensure that leachate does not infiltrate into nearby waterways. This is especially so as the location of these landfills upstream of water intakes raise the concern of potential river pollution.

District	Name	Landfill Type	Start	Ends	Area (ha)	Volume
						(ton/day)
Hulu Selangor	TP Kalumpang	Non-sanitary	2001	2021	8.1	60
Hulu Selangor	TP Bkt Beruntung	Non-sanitary	1998	2021	8	150
Kuala Selangor	TP Jeram	Sanitary	2007	2027	80.9	2,066
Hulu Selangor	Bukit Tagar	Sanitary	2005	2041	405	2,500

Source: JPSPN 2012

In the rivers, log booms were installed at three locations: Sg. Buloh at Kg. Ijok, Sg. Selangor at Kg. Rantau Panjang and Sg. Sembah at Rawang.

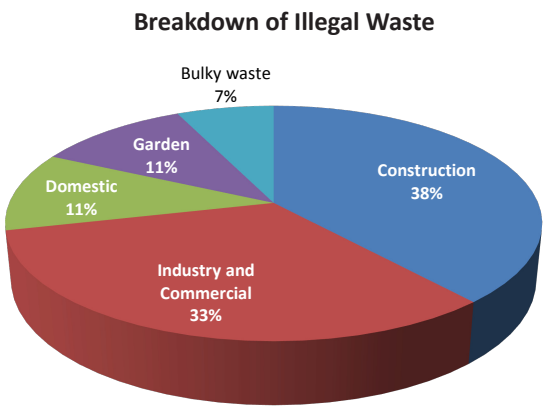
Issues

Solid wastes or litter are often transported by stormwater runoff. However, these items are sometimes illegally dumped directly into the streams or deposited along riverbanks. A SYABAS survey conducted in

2011 showed that household wastes, including plastic bottles, plastic bags, and polystyrene food containers were thrown into the river. It was evident that people were still using waterways as a repository for unwanted things.

This practice poses pollution risks as these wastes disrupt the river flow and contain pollutants that degrade river water quality.

A survey on illegal dumping conducted by JPSPN and DANIDA in the Bukit Beruntung area showed that 39% of the waste was from construction activity, 33% from industry and commercial, 11% from both domestic and garden activities and 7% were bulky waste. The nature of the waste indicates that the offenders could be contractors of housing renovation, developers, households, industries and commercial enterprises.



Source: Report on Illegal Dumpsite Identification in Selected Areas of MDHS, 2009

In 2009 and 2010, LUAS handled a number of cases involving illegal dumping of waste in various locations within the basin, including sites within Bukit Beruntung.

Year	Issues	Action	Status
2009	Illegal waste disposal site at Sg. Sembah, Rawang caused pollution to Sg. Sembah	Notice has been issued to the land owner by PTD Gombak and JAS.	Site cleared
	Illegal dumping at Pusat Serenti Rawang	Monitor	Being monitored

2010	Leachate from Bukit Beruntung landfill and caused pollution to Sg. Kelubi	The operator has prepared a retention pond and use EM	Being monitored
	Illegal dumping at ex-mining pond near to PKNS Industrial Area, Batu 20 Rawang, caused the leachate flow into Sg. Choh		Resolved
	Open illegal dumping at Country Homes Rawang		Resolved

Source: LUAS 2012

Actions Taken

In 2010, there was a case of illegal dumping at Pusat Serenti Rawang in the Gombak district. This posed the threat of leachate into a nearby pond as well as into Sg. Rawang, Sg. Kundang and Sg. Garing. LUAS directed the posting up of warning signs to the public against any dumping activities while Majlis Perbandaran Selayang and Pejabat Daerah Gombak moved to revoke the Temporary Occupation License until the owner took action to settle the matter.

Illegal dumping at Pusat Serenti Rawang in Gombak
Source: LUAS 2012

SAND MINING

Sand mining and stone quarry mining activities in the Sg. Selangor basin caused high turbidity pollution in Sg. Selangor and its tributaries. In 2009, there were 23 sand dredging activities that were approved by LUAS.

Sand mining written approvals are issued by LUAS, which also monitors the sites to ensure compliance to sand mining guidelines and procedures.

Issues

Most of the issues pertaining to sand mines involve unlicensed activities or those not registered with LUAS, as shown in the list of actions taken below.

Actions Taken

In the Gombak district, a total of four cases involving sand mines were handled, while in Hulu Selangor five. Some of the cases that have been addressed and resolved are shown below.

Year	Issues	Action
2009	Sand mining and sand washing activity next to inert waste at Sg. Dungun, Kuang, Rawang, which caused pollution to Sg. Dungun	Notice has been issued by PTD Gombak, resulting in seizure of machine
	Sand mining and sand washing activity behind a kilang in Serendah, Hulu Selangor, which polluted Sg. Selangor	KSSB took over the operation
	Sand mining and sand washing activity near to Sg. Tinggi pump house (SPLASH), which caused riverbank erosion and polluted Sg. Selangor	KSSB took over the operation
2010	Illegal sand mining and sand washing activity at Sg. Garing, Rawang, which polluted Sg. Garing, Sg. Sembah and Sg. Selangor	Resolved
	Illegal sand mining and sand washing activity at Sg. Chul, Serendah, which polluted Sg. Chul, Sg. Serendah, and Sg. Selangor	Resolved

Source: LUAS 2012

Illegal sand dredging and mining at Sg. Garing, Rawang, Gombak
Source: LUAS 2012

SOIL/RIVERBANK EROSION

Turbidity due to soil and riverbank erosion has been a long-standing problem within the basin. A report from SPLASH for SSP3, the water treatment plant at Rasa, shows that there have been many plant shutdowns due to elevated levels of turbidity.

Year	Number of shutdowns	Average NTU level	Average time down
2009	16	829	2 hours
2010	20	835	2 hours
2011	2	1,000	2 hours

Source: SPLASH 2012

A similar shutdown that was recorded at the Bukit Badong WTP due to turbidity attributed the high level to a river bank collapse at Sg. Kerling. Another report of erosion by LUAS places the incident at Sg. Kundang due to natural causes.

However, as the December 6, 2000 water intake shutdown has demonstrated, turbidity caused by earthworks can have major impact on water supply and the environment. All earthworks cause erosion to some extent, and it is important to reduce this by measures such as construction of properly designed and maintained silt traps and protection of slopes with bare soil.

ALTERATION OF RESOURCES

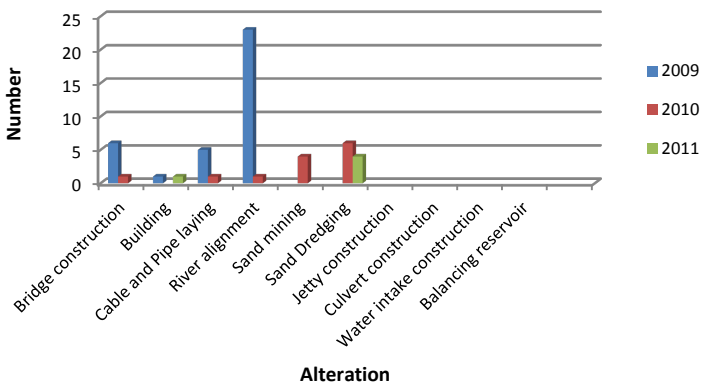
Alteration of resources covers 29 categories of activities that impact rivers such as river diversions and river sand mining.

List of Alteration of Resources			
River diversion	River alignment	Earth works	Sand extraction
Beach reclamation	Land reclamation		
Construction, reconstruction, modification or removal of:			
Dams	Weirs	Inlets or outlets	Log booms

Installation of:			
Pipes	Cables	Sewer pipes	Culverts
Construction of:			
Bridges	Jetties	Hydroelectric plants	Breakwaters
River reserve structures	Intakes	Highways	Fish breeding ponds
Groynes	Walkways	Boat ramps	Boat moorings
Fish racks	Navigation markers	Buildings	

All such activities are regulated by LUAS. Approval for any of the activities must be given by LUAS prior to commencement. In the years 2009 to 2011, the activity for which LUAS has issued the most approvals was river alignment. In 2010, there were 23 approvals for this activity.

Number of Approved Alterations in the Sg. Selangor Basin



Source: LUAS 2012

There are three mini-hydro projects that have been approved under the Small Renewable Energy Program with a total capacity of 15 mega watts. The project at Sg. Kerling is operational, producing 2 megawatts. It connects to the power grid line at Taman Kerling and is run by Renewable Power Sdn. Bhd. Two others—a 10 megawatt proposed by SPLASH at Sg. Selangor Dam and a 3 megawatt at Sg. Batang Kali by Gunung Medan Hydro Sdn. Bhd.—are still in the proposal stages.


2-megawatt dam at Sg. Kerling
Source: LUAS 2011

Jetty licensing and management for inland navigation fall under the purview of LUAS. At the coast, any jetties within the port limit will be licensed and managed by the Port Klang Authority.

Under Jabatan Perikanan, there are several jetties for cockle landings. All the jetties are constructed in JPS reserve areas and cater for Type A vessels, which are 40 feet or longer.

Location	Licensed fishermen	Area (m^3)
Sg. Sembilang, Jeram, Kuala Selangor	29	180
Sg.Buloh, Jeram, Kuala Selangor	11	72
Bgn Sg. Tengkorak, Tjg Karang	10	60
Pantai Jeram, Kuala Selangor	38	N/A
Total licensed fishing operators	88	N/A

Source: Jabatan Perikanan

One of the most significant alteration activities falls under the category of river diversion. This includes sand mining as well as river sand mining.

In 2009, there were 23 sand mining, river sand mining and sand stockpiling activities in Sg. Selangor and Sg. Rawang. A smaller number of activities were carried out in Sg. Serendah, Sg. Kerling and Sg. Inki. In 2010, there were six sand mining and river sand mining in Sg. Selangor and Sg. Rawang. There were also four tin mining activities along Sg. Selangor in Mukim Ulu Tinggi and Bestari Jaya.

In 2011, there were four sand mine activities in Bestari Jaya, Kuala Selangor; Sungai Tinggi, Hulu Selangor; and Rawang, Gombak.

Actions Taken

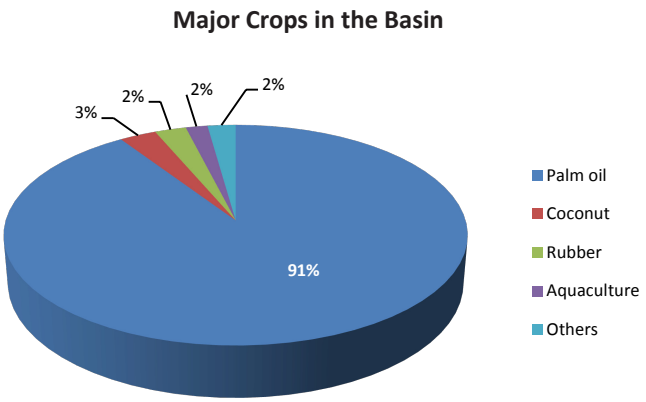
Enforcement carried out by LUAS in 2011 were mostly related to river diversion and sand extraction issues. One case in Sg. Gong in Rawang involved illegal diversion of the river to a pond for individual use. JPS Gombak, PDT Gombak and LUAS worked together in stopping the diversion and reverting the river to its original alignment. Similarly, a case in Sg. Batang Kali for sand mining along the river bank led to the arrest and imposition of penalties on the offenders.

Diversion of Sg. Gong in Rawang

AGRICULTURAL ACTIVITIES

There are 43,000 registered farmers in Selangor. On average, there is a ratio of one farmer per two hectares of land. In the Sg. Selangor basin, agriculture occupies 22% of the basin's land. Commercial plantations as well as small plantations for palm oil can be found along Sg. Batang Kali and downstream Sg. Kerling.

The major crop cultivated in the basin is overwhelmingly palm oil, followed distantly by rubber and coconut. There are also many other crop types that were cultivated such as watermelon, jackfruit and vegetable. However, they tended to belong to individual owners on small plots of land. In the pie chart, they constitute the thin slivers of the pie.



Common crops grown in the Sg. Selangor basin
Source: Jabatan Pertanian 2011

A breakdown of the major crops by district shows that Kuala Selangor has the largest tracts of land for palm oil.

Type of Crops	Area (ha)			Total Area (ha)
	Hulu Selangor	Gombak	Kuala Selangor	
Palm Oil	2,932	214	20,445	23,591
Rubber	478	-	170	647
Others	152	348	1,289	1,789
			Total	26,027

Source: DOA 2011

Issues

Fertiliser Run-off. Nitrogen, phosphorus, and potassium that are applied regularly, especially in palm oil plantations, can overstimulate the growth of aquatic plants and algae. This can become an issue as indiscriminate application of fertilisers and pesticides or herbicides for plant growth or weed control pollute the surface water when runoff, especially after heavy rain, carry these chemicals into nearby streams. This would result in depletion of dissolved oxygen and lead to deterioration of aquatic life.

Irrigation. Another concern, particularly for farmers, is access to water suitable for irrigation during dry seasons. It is dependent on the availability of river flow within the basin. Illegal abstraction of water

occurs when small-scale farmers use water piped from inappropriate sources for irrigation. This also results in polluted water being used to grow vegetables for humans. Other sources of water used for irrigation are peat swamps. By itself, the acidic nature of peat water has no adverse effect on crops and produce, but it affects pesticides in that it makes it non-biodegradable. Ground water abstraction is an option, but it is deemed expensive for some farmers. There is also concern over the effects of reduction in agricultural areas that in favour of urban development.

Plant shutdown. In April 2011, there was a case of acidic and turbid water near the Hutan Raja Muda Musa peat swamp at Kuala Selangor. Investigation revealed that villagers continuously break the bund separating the river and the peat swamp to release black water from their cultivated land. Meanwhile, the WTP at Sungai Selisik, which is downstream, have to shut down several times.

Sedimentation. Other issues included sedimentation from groundbreaking and earthwork activities for agriculture that enter the waterways.

Actions Taken

Control of Pesticide Use. The usage of pesticides is regulated and enforced by the Jabatan Pertanian (DOA) in terms of quantity and type that can be used. The department collects sample of vegetation, soil and water to check the pesticides level usage by farmer. For some pesticides, a maximum residual level (MRL) test is conducted and if the reading is high, DOA advises farmers on the proper usage.

To regulate factories and larger agricultural enterprises there is an authority called *Lembaga Racun Mahluk Perosak*. It determines the content of the pesticides and serves as a safety board for factories and small-scale users.

DOA is an agency for encouraging and monitoring agricultural activities

Good Practices. DOA recommends using a *vegetative buffer* to prevent pesticides to flow into the river. This practice is also one of the key points highlighted in the IRBM Plan. Legumes *(kekacang)* are well suited for this use.

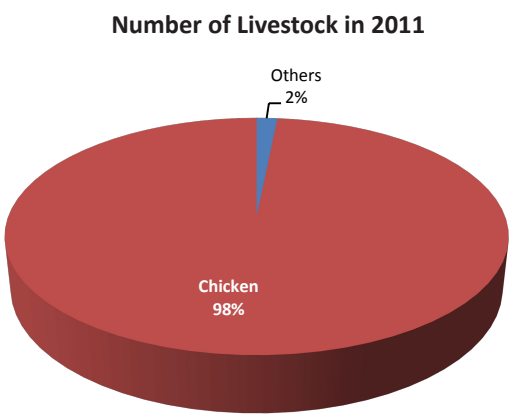
Uncontrolled water runoff from development areas into agricultural land poses a problem for farmers. It is suggested that developments consider drainage systems that do not impinge on agriculture activities. There is also a need for upgrading the drainage system and canals on agriculture land to prevent flooding.

Small scale farms along Sg. Selangor

LIVESTOCK FARMING

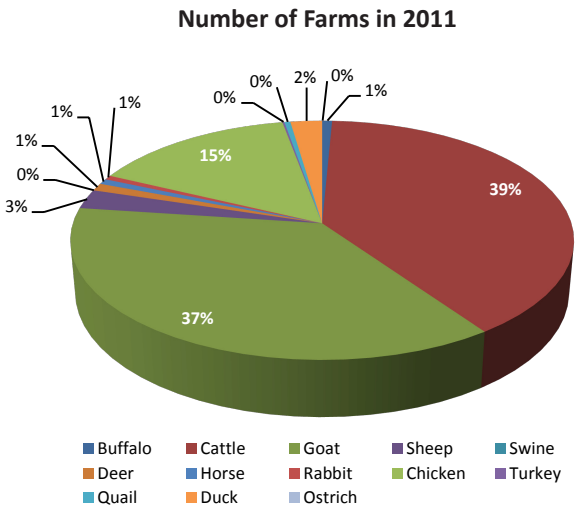
JPV is an agency for animal disease control, inspects livestock farms and processing plants, controls production of livestock, livestock products and animal feed

In the Sg. Selangor basin, the population of livestock is predominantly poultry. Poultry consists of broilers, hens, Baka breed and free-range chicken. In terms of population, there were 7.48 million chickens in the basin in 2011. Quails came next at 83,400, followed by goats at 14,077 and cattle at 11,124. Other livestock comprised sheep, swine, deer, horses, rabbits, turkey, duck and ostrich.



Source: DVS 2012

For number of farms, there were more farms for buffaloes and cattle. In 2011, there were 271 buffalo farms in the river basin (39%), 253 cattle farms (37%) and 103 poultry farms (15%). Farms for other livestock such as sheep, duck and deer were small in number.



Source: DVS 2012

Farm rearing turkeys and rabbits in Bestari Jaya

Poultry farming generates little wastewater, but some is produced in the cleaning of cages and sheds. Waste from the farms does not discharge directly in into the river, but are distributed through seepage into the ground or leaching as rain mix with manure under the pens.

Waste from cattle tend to be discharged directly into streams or seep into the ground. Many cattle farming tend to be on public land or in oil

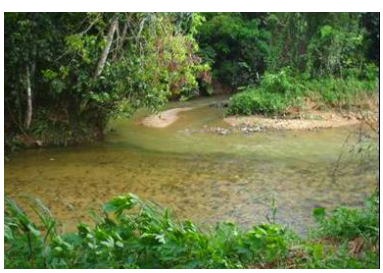
palm estates. As such, many cattle breeding outfits do not have waste management facilities. A few within the basin have waste management in the form of unlined, 3-stage earth ponds, but there are no exact figures on how many.

Issues

A common complaint that has been reported is the smell and flies that comes from the farm. In 2010, there was a case of waste water from a cattle farm flowing into Sg. Rawang, which has been closely monitored to prevent future reoccurrences. According to LUAS, animal husbandry appears to have a major impact on the basin's waters. Waste water from cattle rearing appears to pose the biggest potential threat, although regulators are encouraging most of the waste to be recycled into fertiliser.

Cattle farms near Sg. Rawang
Source: LUAS 2010

Another common occurrence is waste from chicken farming that seep into river waters. In a particular case near Kalumpang, the concentration of waste was so intense that it altered the colour of a section of the river and resulted in fish kill.



Light green water from chicken effluents resulting in fish kill
Source: LUAS

Actions Taken

LUAS has taken action on such cases by recommending the relocation of cattle to central breeding areas that are equipped with wastewater treatment systems. For poultry farms, regular monitoring was conducted to ensure compliance with pollution control measures and best management practices.

Before and after LUAS' directive to poultry farmers to create a holding pond for wastewater
Source: LUAS 2012

Effective Microorganism (EM) technology has been implemented all over Selangor in 2011. EM refers to anaerobic organisms that break down pollutants and its use is an environmentally friendly approach to cleaning up rivers. The aim of the programme was to address concerns raised by the public.

Jabatan Perkhidmatan Veterinar (JPV) has been communicating to farmers on how agricultural activities and animal farming can contaminate water bodies and also how to manage confined animal facilities. To this end, the department has published guidelines on *Good Animal Husbandry Practices* that is being disseminated to farmers. LUAS also has stipulations that require farms to be constructed 50 m from the river bank.

JPV recommended more stringent enforcement to make sure that good practices and guidelines were being complied. It also promotes the use of Vegetative Filter Strips (VFS). VFS is also known as buffer zones that increase infiltration, slow runoff, and allow more time for sediment, nutrients, and pesticides to settle. They are installed downslope from managed crop or forage areas that have been contain fertilizer, manure, and/or pesticides. The purpose of VFS is to filter and purify runoff as it flows across the filter before discharge into receiving waters.

AQUACULTURE

According to Jabatan Perikanan Negeri Selangor (DOF), there are several types of aquaculture ponds: freshwater ponds, brackish water ponds, freshwater cages, sangkar air payau, ex-mining ponds, cement tanks, and cockle breeding ponds.

DOF manages the national fishing industry and delivery system. It issues licensing, approvals and permits to fishing operators.

In the Kuala Selangor district, as of 2010 there are 302 freshwater ponds, 796 brackish water ponds, 15 freshwater cages, 1 ex-mining pond and 125 cement tanks, which totals 1,283 facilities.

Types of Aquaculture Cultivation	No. of facilities
Freshwater pond	302
Brackish water pond	796
Freshwater cage	15
Brackish water cage	0
Ex-mining pond	1
Cement tank	125
Cockle breeding	41
Ornamental fish	3
Mussel breeding	0
Total	**1,283**

Source: Jabatan Perikanan 2012

LKIM is an agency that provides assistance to local fishermen through financial incentives, skills development and technology improvement

Activities are clustered downstream of Sg. Kerling. Lembaga Kemajuan Ikan Malaysia (LKIM) identifies two aquaculture ponds in Kuala Selangor that may be problematic: one is in Assam Jaya, which rears prawns and is privately owned. It is built according to European Union (EU) standard. The other pond is Tanjung Karang, also EU standard.

DOF advocates a treatment pond for each aquaculture site where wastewater from the pond will be directed into the treatment pond before being released back into the river. This is necessary to prevent high levels of BOD from polluting the river.

Currently there are no agencies to actively monitor wastewater from aquaculture. It depends on the operator to install and operate

wastewater treatment on its premises. This will be expected to change with the gazetting of the new regulations on effluent discharge in 2012.

Fish culture in excavated ponds

Fish culture in floating cages

WET MARKETS/RESTAURANTS/FOOD OUTLETS

Generally, commercial wastes consist of wastes generated from business' premises such as workshops, restaurants, and wet markets. Lack of awareness among premises' owners results in solid wastes such as food wastes, plastics, and papers as well as effluents (sullage, used engine oil, and cooking oil) from these premises to end up in the drainage system that channelled directly into the nearest waterways.

This practice could lead to high organic content and presence of oil layer in the river, causing depletion of dissolved oxygen (DO) and objectionable odour in surface water bodies.

RECREATION

Tourism Selangor is an agency that promotes the state's cultural, historical, artistic and natural attractions and sites

Due to its wealthy natural ecosystem, the Sg. Selangor basin has become well-known for ecotourism. Within the basin lies a collection of waterfalls and that includes the Sg, Kedondong Recreational Park, Sg. Sendat Waterfall and Serendah Waterfall.

Recreational Sites	Location
Semangkuk Waterfalls	Hulu Selangor
Ikan Kelah Sanctuary, Sg. Chilling	Hulu Selangor
Chilling Waterfall	Hulu Selangor
Sg. Kedondong Recreation Park, Batang Kali	Hulu Selangor
Sg. Sendat Waterfall, Ulu Yam	Hulu Selangor
Serendah Waterfall	Hulu Selangor
Sungai Pertak Recreational Forest	Hulu Selangor
Sungai Selangor White Water Rafting	Hulu Selangor
Kg. Kuantan Firefly	Kuala Selangor
Remis Beach, Sg. Sembilang	Kuala Selangor
Firefly Park Resort Kampung, Bukit Belimbing	Hulu Selangor
Kolam Air Panas	Sg. Kerling, Hulu Selangor

Source: Tourism Selangor 2012 and website of local authorities

These forest reserves are sites for many local visitors for various activities such as picnicking, trekking, photography and swimming. More adventurous activities such as inner tubing, white water rafting and paragliding are starting to become popular.

Of particular interest is the well-known Firefly Reserve in Kampung Kuantan in Kuala Selangor that continues to draw crowds among local and international visitors.

Picnickers at Sg. Kedondong in Hulu Selangor enjoying a dip

IMPACT OF POLLUTION

WATER BORNE DISEASES

River pollution can have negative impact on human health, in the form of water-borne diseases such as cholera and acute gastroenteritis. It also known to cause skin diseases, and constant exposure to heavy metals in the water will give rise to respiratory problems and nervous system failures.

Types of common water-borne diseases are typhoid, leptospirosis, salmonella, and E. coli.

Disease	Effects	Cause
Typhoid	Abdominal pain, diarrhea, cramps, high fever	Salmonella in contaminated water
Leptospirosis	Flu-like symptoms with stiffness of neck. Can lead to meningitis and liver and kidney disease	Direct contact through animals such as rodents or contact with contaminated water
E-coli infection	Nausea, vomiting, cramps, diarrhea. Can lead to kidney failure, anemia and dehydration	E. coli bacteria in wastewater

Source: JKNS 2011

The most common sources of pollutants are:

Sources of Pollution
Leachate from landfills that contain heavy metals and agriculture wastes such as pesticides.
Sewage: wastewater that flow directly into the river
Industrial effluents from textile, furniture, and latex factories
Illegal sand mining and land use contributes to higher turbidity of the river water
Agricultural activities: fertilisers and soil
Aquaculture and Animal husbandry: waste from animals directly flowing into the river

Source: JKNS 2012

JKNS is a government agency that safeguards public health and monitors the environment for factors that impact human health

Although water treatment plants handle most pollutants, there are some bacteria that cannot be eradicated by standard water treatment. It has been found that protozoas such as *Cryptosproridium* and Giardia are resistant to chlorine, the chemical used to treat pollutants. These protozoas are parasites that live in the intestine and cause persistent diarrhea in children and nausea and fatigue. However, this depends on the treatment process, such as the dose of chlorine, coagulant, media filter and water pH.

Currently, the Engineering Services Unit under the Ministry of Health is in the process of drafting a bill called the *Safe Drinking Water Act* which is now being tabled in Parliament. This act and the *Water Safety Plan (WSP)* are initiatives to improve the quality of drinking water and subsequently, the quality of human health.

Untreated sewage poses a threat to public health since it contains pathogenic bacteria and viruses that cause deadly diseases such as cholera, typhoid, and hepatitis A.

Actions Taken

Since 2000, Jabatan Kesihatan Negeri Selangor (JKNS)' Engineering Services Unit has been conducting sanitary surveys, which is routine monitoring of water quality from the water intake to the water treatment plants and up to the reticulation system. The surveys are conducted systematically district by district. If there is a water quality violation, JKNS will conduct investigation together with the treatment plant

operator and water supplier. JKNS also conducts an immediate investigation upon receiving a report on the quality of drinking water.

One of the measures that JKNS has taken is to inform the public through hazard warning notice boards describing the risk of infection and preventive actions to be taken.

The Hulu Selangor district has set up a requirement urging riverside resort and park operators to post up warning notice boards before they can obtain or renew a business license.

A JKNS sign at the Kerling Hot Springs warning of possible water contamination

JKNS has some suggestions for future action, including more enforcement towards polluters of river and other water sources, conducting awareness programs and educate the public on health, and making it compulsory for resorts to be registered and licensed to operate. Many cases of outbreaks involve resorts with public toilet facilities not built to specification and causes spillage.

Other measures call for riverside resort owners to improve or upgrade water treatment and sanitation at recreational areas so that river water

is not contaminated for tourists and river users and ensuring proper supply of water to residents in low-pressure water areas to avoid tapping into untested wells.

WATER SUPPLY DISRUPTION

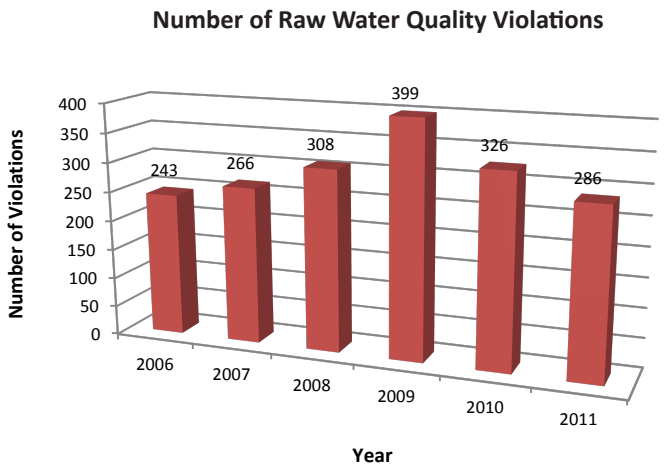
Between 2009 and 2011, there were 67 water treatment plant shutdowns. The causes of the water disruptions were high turbidity levels, high levels of fluoride and ammonia, excessive amount of water weeds, minor oil spills and high river water levels due to floods.

In 2009, SSP1 experienced four shutdowns due to oil pollution, while SSP2 closed down twice due to turbidity. SSP3 at Rasa suffered the most, with 13 shutdowns due to turbidity. There were 15 shutdowns for the year.

In 2010, the number of shutdowns rose to 27. SSP1 had seven shutdowns due to turbidity, fluoride, debris and ammonia, while Kuala Kubu Bharu and Sg. Buaya each experienced one shutdown because of turbidity. SSP3 at Rasa had the highest number of closures at 18.

In 2011, SSP1 saw 18 shutdowns due to the same reasons as the year before. SSP3 at Bukit Badong had five shutdowns due to turbidity, weeds and oil spills, while SSP3 Rasa and Rantau Panjang each had one incident due to turbidity. This brought the number of shutdowns to 25 for the year.

It was noted that during the times of plant shutdowns, the number of raw water quality violations also rose in those years.



Source: SYABAS EIS Report 2011, SPLASH and PNSB

ECOLOGICAL DESTRUCTION

JPNS manages, plans, protects and develops the Permanent Forest Reserve in accordance with national policies

Jabatan Perhutanan Negeri Selangor (JPNS) has gazetted 17 areas as Water Catchment Reserves, comprising 44,543 hectares in the Permanent Reserved Forest in Selangor.

According to JPNS, there are several impacts of human activities in the forest on river resources. Some of these include uncontrolled and illegal logging and deforestation that result in the sedimentation of river systems, lowering of water tables that in turn give rise to drying up of river beds and impacting of peat swamp forests, change in microclimatic conditions, degradation of soil, and frequent occurrence of floods.

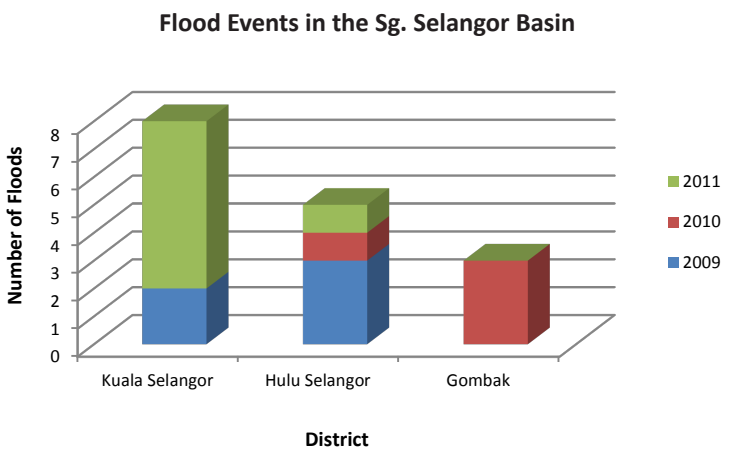
Although forest-based processing mills are located outside the forest, discharge from the mills can flow into the drainage systems and find its way into the waterways. Any discharges are monitored by the respective local authorities and JAS. JPNS can only give advice to the miller.

Based on past cases, LUAS has identified two tributaries to be monitored, which are Sg. Rawang and Sg. Sembah.

FLOODING

Over the years, flood mitigation works have been carried out to reduce the effects and occurrences of floods. However, according to JPS, flooding problems are no longer limited to rainy seasons and they are increasing from year to year. This could be due to changes in the monsoon winds that bring in the rains twice a year, from October to January and from March to May.

There were 16 flood events from 2009 to 2011 in the Sg. Selangor Basin. The district that was most hit for all three years was Kuala Selangor at 8 flood events, followed by Hulu Selangor at 5 and Gombak at 3.



Source: Laporan Banjir Tahunan Negeri Selangor and WP for 2009, 2010 and 2011, JPS

In terms of floods on a yearly basis, there were five floods in 2009, four in 2010 and seven in 2011.

The causes of flooding were similar across all districts and from year to year, which are shown in the following table.

Causes of Flooding
Rapid growth of the construction sector for housing, highways and other major developments
Sedimentation, riverbank erosion and dumping of solid waste into major rivers and streams that hinder smooth river flow
Fast flow of water and increased sedimentation due to rapid development in the basin
Inadequate drainage systems that are unable to accommodate large volumes of water
Construction activities on the river reserves
Uncontrolled waste disposal resulting in clogged drains and causing spillovers
Insufficient capacity of the river caused by changes in river sections

Source: JPS Flood Reports for Selangor 2009, 2010 and 2011

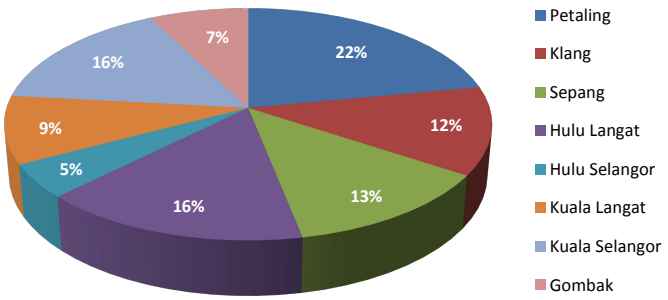
The list below shows a summary of floods that have occurred over the past three years.

Year	No. of Floods	District	Location
2009	2	Kuala Selangor	Kg. Jaya Setia, Jawa Selangor Estate and Taman Suria Bestari Jaya; Kampung Rantau Panjang, Bestari Jaya
	3	Hulu Selangor	Kg. Jawa, Kg. Pasir; Taman Seri Cahaya, Kg. Sentosa, Kg. Rantau Panjang, Kg. Sekolah, Kg. Sg. Masin, Kg. Genting Malik and Kg. Rawang Putar
2010	1	Hulu Selangor	Kompleks Penghulu Ulu Bernam
	3	Gombak	Kg. Melayu Sungai Buloh; Batu Arang and Tasik Putri; Jalan JKR, Bandar Baru Kundang, Jambatan JKR, Kg. Muhibbah
2011	7	Kuala Selangor	Kg. Permatang, Kg. Hujung Permatang, Kg. Bukit Belimbing; Kg. Sentosa; Ladang Bukit Talang, Kg. Sri Tiram, Kg. Sri Makmur; Kg. Bukit Kerayong; Kg. Raja Musa, Kg. Sri Makmur, Ladang Raja Musa; Kg. Ban RB, Sg. Sireh
	1	Hulu Selangor	Kawasan Industri Kg. Mat Taib

Source: JPS Selangor 2011

Among the three river basins for Sg. Klang, Sg. Selangor and Sg. Langat, Sg. Selangor fares slightly better than the other basins in terms of flood frequency. In terms of budget, the district of Petaling received the biggest portion of the budget (22%), followed by Kuala Selangor (16%) and Hulu Langat (16%).

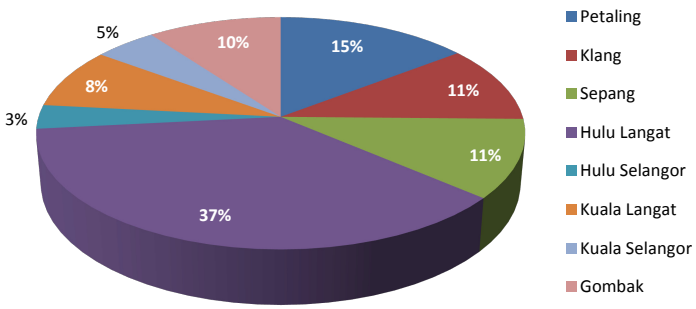
Budget Apportionment for Flood Mitigation Works 2009



Source: Laporan Banjir Tahunan Negeri Selangor for 2009, JPS

In 2010, 44 major areas were hit with floods. Areas within the Petaling district had the highest number of floods at 15 and Sepang with 10. In terms of flood mitigation works, the budget shrank from the previous year to RM15,386,420. The district of Hulu Langat received the biggest portion (37%), in response to the massive flooding in the previous year. This is followed by Petaling (15%) and Klang and Sepang (both at 11%).

Budget Apportionment for Flood Mitigation Works 2010

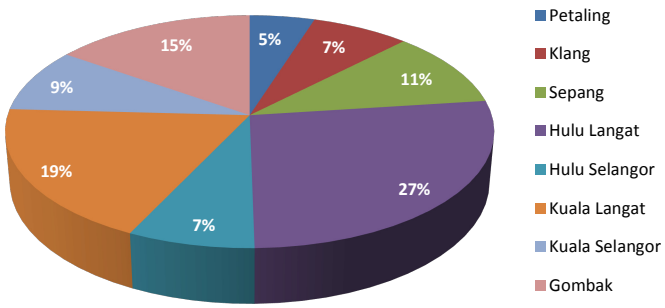


Source: Laporan Banjir Tahunan Negeri Selangor for 2010

In 2011, the number of major areas affected by floods jumped to 70. Areas with the highest flood impact were in the Petaling district (12), Hulu Langat (13), and Kuala Langat (12). Conversely, the flood mitigation works budget had shrunk to RM10,048,482. The districts with

the most works were Hulu Langat (27%), Kuala Langat (19%) and Gombak (15%). Hulu Selangor received the smallest pieces of the pie, which corresponds to the relatively low incidence of floods.

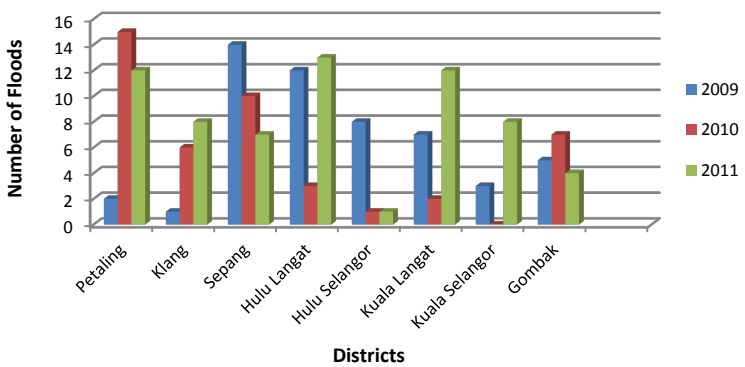
Budget Apportionment for Flood Mitigation Works 2011



Source: Laporan Banjir Tahunan Negeri Selangor for 2011

The graph below shows districts that are the most hit with floods over the past 3 years.

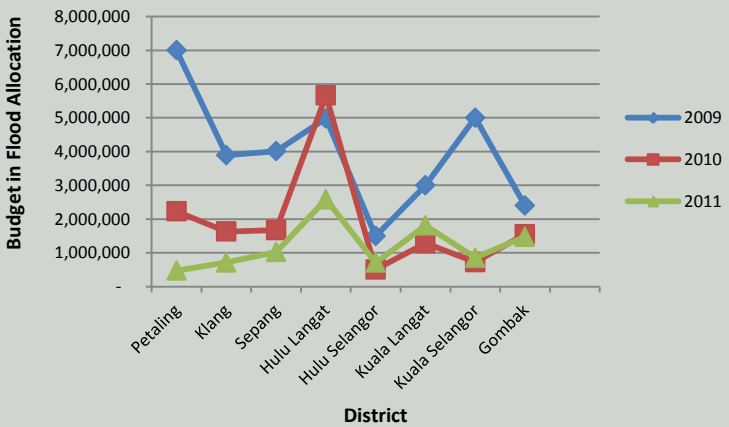
Areas Most Hit by Floods



FOCUS
No. of Floods

Indicator 7: Impact – Number of Flood Incidents

In 2009, there were 11 areas within the Hulu Selangor and Kuala Selangor districts that were stricken by flooding in the Sg. Selangor basin, while in 2010 there was 1 area and in 2011, 9 areas. The number of areas affected by floods have decreased from 2009 to 2011. Correspondingly, the amount of budget for floods have decreased.



Source: Laporan Banjir JPS Selangor 2009, 2010 and 2011

COMMERCIAL FISHING

Jabatan Perikanan Malaysia

DOF is an agency that regulates fishery and aquaculture activities through vessel licensing and fishing and transport licensing

The commercial fishing industry for Selangor yielded 383,433 metric tonnes during the years 2009 to 2011, valued at RM471.56 million. Within the Sg. Selangor river basin alone, fish landings have been growing steadily at 37,086 metric tonnes in 2009; 47,302 metric tonnes in 2010; and 28,758 metric tonnes in 2011. Altogether this represents a fish yield of 113,146 metric tonnes within the basin.

Some of the fish species caught in the Sg. Selangor basin are bawal, kerapu, malong, kembong, among others.

Some of the fish species found in Sg. Selangor basin			
Alu-alu	Aruan tasek	Bawal hitam	Bawal putih
Bawal selatan	Bawal tambak	Belana/kedera	Beliak mata
Bulan-bulan	Cermin/sagai	Cincaru	Daun baharu
Duri/pulutan	Gelama	Gerut-gerut	Jenahak
Kembong	Kerapu	Ketam baru	Kikek
Kurau	Lala	Lumi-lumi	Malong
Merah	Parang-parang	Pari	Siakap
Sotong biasa	Sotong katak	Talang	Tamban sisek
Tenggiri	Terubok	Udang harimau	Udang putih

Source: DOF 2012

Fishermen's catch at jetty in Sg. Selangor

Actions Taken

According to Jabatan Perikanan Selangor (DOF), most of the species listed above have suffered a reduction in population. This is confirmed by the Malaysia Fisheries Development Board (LKIM), who says that one of their concerns is that the over the past years, the volume of fish landing is not increasing.

To overcome this, the Resources Management Unit under DOF has rolled out an initiative to release specific fish species in certain river areas.

Species	Quantity	Value (RM)	Location
Baung	50,000	Sg. Kuantan, Teluk Siam	Kuala Selangor
Udang Galah	30,000	1,800	Sg. Langat

LKIM is an agency that provides assistance to local fishermen through financial incentives, skills development and technology improvement

Patin	1,500	975	Sg. Semenyih
Baung	7000	4,900	Sg. Semenyih

Fish Releases in 2011 in the Sg. Selangor basin
Source: DOF 2012

In terms of fishing licenses issued, DOF has not been issuing any inland fishing licenses because at this point in time, the River Fishing Act has not yet been enforced in Selangor. Once enforced, the penalty for illegal fishing will be RM20,000 or jail sentence of not more than two years, or both.

COASTAL WATERS

Pollution caused by solid waste mismanagement is a serious environmental problem. Industrial, commercial and domestic activities produce solid waste, which enters coastal waters through the drainage systems and rivers.

Solid waste destroys the ecosystem, smothering the habitats, ruining the aesthetic value of coastal vistas and resulting in risks to human health. It also obstructs the flow of water in storm water drains and rivers, causing floods.

Jeti Tajung Keramat

PUBLIC AWARENESS AND PARTICIPATION

Preservation and protection of water resources requires the efforts of the government, the private sector, civil societies and the general public. Thus, programmes involving the public play an important part in ensuring that communities become aware of the environmental changes around them and take action to make sure that natural resources are protected for future generations to enjoy.

To this end, there are several awareness and participation programmes that have been initiated in the areas of river protection.

RIVER CARE Since 2008 LUAS' **QUA QUA** programme has been working with students, teachers, NGOs, public and private sectors, and the general public in monitoring the quality of river water within their communities. It aims to educate participants on methods of detecting river pollution sources and creating awareness of the importance of caring, protecting and appreciating rivers as the main source of water supply. Carried out along Sg. Liam in the Selangor river basin, the Qua-Qua Programme uses three methods—physical observation, chemical testing and use of biological indicators—to analyse and monitor the quality of water sources and rivers.

Qua-Qua Programme with school children

Another programme, called **River Ranger**, is run by JPS and aims to improve the water quality of rivers in various states. In Selangor, the river that was selected under the programme was Sg. Penchala. Involving the participation of government agencies, NGOs, private sectors and the general public, stakeholders learned to develop and engage in river auditing and conservation projects on rivers within their communities.

MANGROVE PLANTING LUAS has carried out mangrove planting in the area of Sg. Selangor at Taman Alam, Kuala Selangor. The programmes were carried with local authorities and Jabatan Perhutanan to plant approximately 1,000 saplings at each site. The saplings help preserve the natural buffer against tidal waves and strong winds as well as reduce erosion of the shoreline.

RIVER CLEANING This programme is run under the Projek Pembangunan dan Pemuliharaan Sungai Klang. One programme has been carried out at Sg. Liam to raise awareness on the importance of clean water supply and on the public's responsibility in ensuring that rivers are cleared of trash through community service programmes.

CSR Programme for mangrove planting

LUAS with Total Logistics Services (M) Sdn. Bhd.

COASTAL CLEANING A total of 11 beach cleanup programmes were carried out, out of which two were done at Remis Beach and Redang Beach. This programme was important as many of the beaches are popular tourist sites.


Coastal Cleaning

COOKING OIL RECYCLING The Water Resources Conservation Progamme through Cooking Oil Recycling encourages the public to recycle used cooking oil by selling it to recognised LUAS corporate partners that will convert it into biodiesel. This programme, which is run at schools and communities, has several benefits as it promotes environmentally friendly alternative energy sources, brings income to the communities and controls the source of pollution which is oil, a substance that sewage treatment plants often difficult to process.


Cooking Oil Recycling Programme

There were other public awareness programmes conducted by agencies during the years 2009 to 2011.

Jabatan Perhutanan carries out programmes for school children at the Sg Tekala Amenity Forest every year, in collaboration with TrEES, JPS and also LUAS.

JAS Selangor carried out briefings and talks to industry groups, schoolchildren, universities, local authorities and the general public. Programmes included activities at Paya Indah Wetlands for ecosystem protection and school camps in Ulu Klang to promote forest and river ecosystem awareness.

APPENDIX A. WATER QUALITY INDEX

Since 2001, JAS has been conducting water quality monitoring programme to detect changes in river water quality and to identify pollution sources. JAS collects water samples at regular intervals from designated stations to determine physic-chemical and biological characteristics.

The WQI serves as a basis for environmental assessment, whereby categorisation and designation of classes according to beneficial usage as stipulated in the National Water Quality Standards for Malaysia (NWQS).

The WQI is calculated based on six parameters, which are dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), ammoniacal nitrogen, total suspended solids (TSS), and pH.

WQI Class	Range	Water Usage Description
I	<92.7	Conservation of natural environment
		Water supply I – practically no treatment needed (except disinfection or boiling only)
		Fishery I – very sensitive aquatic species
II	76.5 – 92.7	Water supply II – conventional treatment required
		Fishery II – sensitive aquatic species
		Recreational use with body contact
III	51.9-76.5	Water supply III – extensive treatment required
		Fishery III – common, of economic value and tolerant species
IV	31.0-51.9	Irrigation only
V	<31.0	Water unsuitable for any of the above uses

Source: JAS 2011

APPENDIX B. EFFLUENT STANDARD

Until 2008, effluent discharges were stipulated under the Environmental Quality Act 1974 and the Environmental Quality (Sewage and Industrial Effluent) Regulations 1979.

In 2009, revisions were introduced by Kementerian Sumber Asli dan Alam Sekitar, resulting in two sets of regulations—the Environmental Quality (Sewage) Regulations 2009 (EQSR) and the Environmental Quality (Industrial Effluent) Regulations 2009.

Standard	Temp (C)	pH	BOD	COD	SS	NH_3-N	NO_3-N	P	O&G
Category 1 (Rivers)									
Standard A	40	6.0-9.0	20	120	50	10	20	5	5
Standard B	40	5.5-9.0	50	200	100	20	50	10	10
Category 1 (Lakes)									
Standard A	40	6.0-9.0	20	120	50	5	10	5	5
Standard B	40	5.5-9.0	50	200	100	5	10	10	10
Category 2									
Standard A	n/a	n/a	20	120	50	50	n/a	n/a	20
Standard B	n/a	n/a	50	200	100	50	n/a	n/a	20
Category 3									
CST (STD A & B)	n/a	n/a	200	n/a	180	n/a	n/a	n/a	n/a
IT (STD A & B)	n/a	n/a	175	n/a	150	100	n/a	n/a	n/a
OP (STD A & B)	n/a	n/a	120	360	150	70	n/a	n/a	n/a
AL (STD A & B)	n/a	n/a	100	300	120	80	n/a	n/a	n/a
MP (STD A)	n/a	n/a	60	180	100	60	n/a	n/a	20
MP (STD B)	n/a	n/a	60	240	120	60	n/a	n/a	20

Schedule of EQA 1974 (Sewage and Industrial Effluent), Revision as of December 2009
Source: IWK 2012

APPENDIX C. POTENTIAL SOURCES OF RAW WATER POLLUTION

Shows the categories of pollution found in river water and how they are measured. Possible sources of pollution are listed.

Group	Parameter	General Potential Sources
Microbiological	Total Coliform	Sewage effluent – residential and livestock farming
Physical	Turbidity	Earthworks, sand mining, heavy rainfall
	Color	Industrial effluent, mining pools, swamps
	pH	Industrial effluents, swamps
Inorganic	BODs	Agriculture, natural vegetation, leachate, waste disposal, livestock farming, industrial effluents, earthworks, swamps
	COD	Agriculture, natural vegetation, leachate, waste disposal, livestock farming, industrial effluents, earthworks, swamps
	Ammonia	Domestic waste, industrial effluent, leachate, sewage effluent
	Total nitrogen	Agriculture, natural vegetation
Iron & Manganese	Industrial effluent, earthworks	
Heavy Metals		Industrial effluent, earthworks
Pesticides		Agriculture, recreation

Source: SYABAS EIS 2011

APPENDIX D. LIST OF PARAMETERS AND LIMITS OF DISCHARGE

Shows activities, related parameters and limit of discharge to be inspected and monitored by LUAS.

Activity	Parameter	Limit for Discharge
Freshwater aquaculture in ponds or cages	Ammoniacal Nitrogen (NH3-N)	5 mg/l
	Biochemical Oxygen Demand (BOD5) at 20oC	50 mg/l
	Total Suspended Solid (TSS)	100 mg/l
	Nitrogen Nitrogen (TN)	10 mg/l
	Phosphorus (TP)	1 mg/l
Marine shrimp aquaculture in ponds	Ammoniacal Nitrogen (NH3-N)	5 mg/l
	Biochemical Oxygen Demand (BOD5) at 20oC	50 mg/l
	Total Suspended Solid (TSS)	100 mg/l
	Nitrogen Nitrogen (TN)	10 mg/l
	Phosphorus (TP)	1 mg/l
Development and earthworks	Total Suspended Solid (TSS)	100 mg/l
	Oil and grease	10 mg/l
Livestock other than pigs	Ammoniacal Nitrogen (NH3-N)	200 mg/l
	Biochemical Oxygen Demand (BOD5) at 20oC	200 mg/l
	Chemical Oxygen Demand (COD)	500 mg/l
	Total Suspended Solid (TSS)	500 mg/l
Swine livestock	Ammoniacal Nitrogen (NH3-N)	200 mg/l
	Biochemical Oxygen Demand (BOD5) at 20oC	50 mg/l
	Chemical Oxygen Demand (COD)	500 mg/l
	Total Suspended Solid (TSS)	100 mg/l
Pets	Ammoniacal Nitrogen (NH3-N)	300 mg/l
	Biochemical Oxygen Demand (BOD5) at 20oC	50 mg/l
	Chemical Oxygen Demand (COD)	500 mg/l
	Total Suspended Solid (TSS)	250 mg/l
Mining-related activities	Total Suspended Solid (TSS)	50 mg/l
	Oil and grease	1 mg/l

Source: LUAS 2012

APPENDIX E. CONTRIBUTORS

State government and private agencies have generously contributed their time, effort, and thoughts towards making this booklet as resourceful as possible. In this way, LUAS is the enabler of the dissemination of information provided by the agencies for the use of all people interested in preserving and caring for our precious water resources. We extend our gratitude to these contributors.

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Majlis Bandaraya Subang Jaya
Majlis Bandaraya Shah Alam
Majlis Perbandaran Klang

Majlis Daerah Hulu Selangor
Majlis Daerah Kuala Selangor
Majlis Perbandaran Selayang
Jabatan Ketua Pengarah Tanah dan Galian
Pejabat Daerah dan Tanah Kuala Selangor
Pejabat Daerah dan Tanah Gombak
Pejabat Daerah dan Tanah Hulu Selangor
Pejabat Daerah dan Tanah Petaling
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