
MYWAC
MALAYSIAN WATER ENGINEERS ACTION COMMITTEE
32ND ANNUAL CONFERENCE 2019
The Future of Water Supply: Sustainability and Digital Transformation
Concurrent Event:
MALAYSIA - NETHERLANDS SYMPOSIUM AND WORKSHOP ON
SUSTAINABLE WATER TREATMENT PLANT RESIDUALS MANAGEMENT IN MALAYSIA
Supported by:
Partner:
PBA
SWAN
SPAN
26TH – 28TH NOVEMBER 2019
BAYVIEW BEACH RESORT,
BATU FERRINGHI, PENANG

TOTAL MAXIMUM DAILY LOAD
-A Solution to Dry Spell Pollution?

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PRESENTATION OUTLINE

1. INTRODUCTION	• Source of River Pollution • Point Sources & Non Point Sources
2. REGULATORY CONTROL	• Environmental Quality Act 1974 • Environmental Quality Regulations
3. WATER QUALITY STANDARDS	• National Water Quality Standards • Effluent Discharge Standards
4. WAY FORWARD	• Pollution Load Control

Sources of River Water Pollution

- Point Source- Subject and Not Subjected to Environmental Quality Act 1974
- Non-Point Source- Not subjected to Environmental Quality Act 1974 (except prescribed activities subjected to EIA Order 2015)
- Human activity

Point Source- Efluent & sewage discharges

Non-Point Source – **Surface run-off** from agricultural, livestock farming, residential, commercial, forest logging, land clearing and other activities

Point Sources

Industries

Sewage Treatment System

Wet Market

Restaurants

Food Courts

Fish Ponds

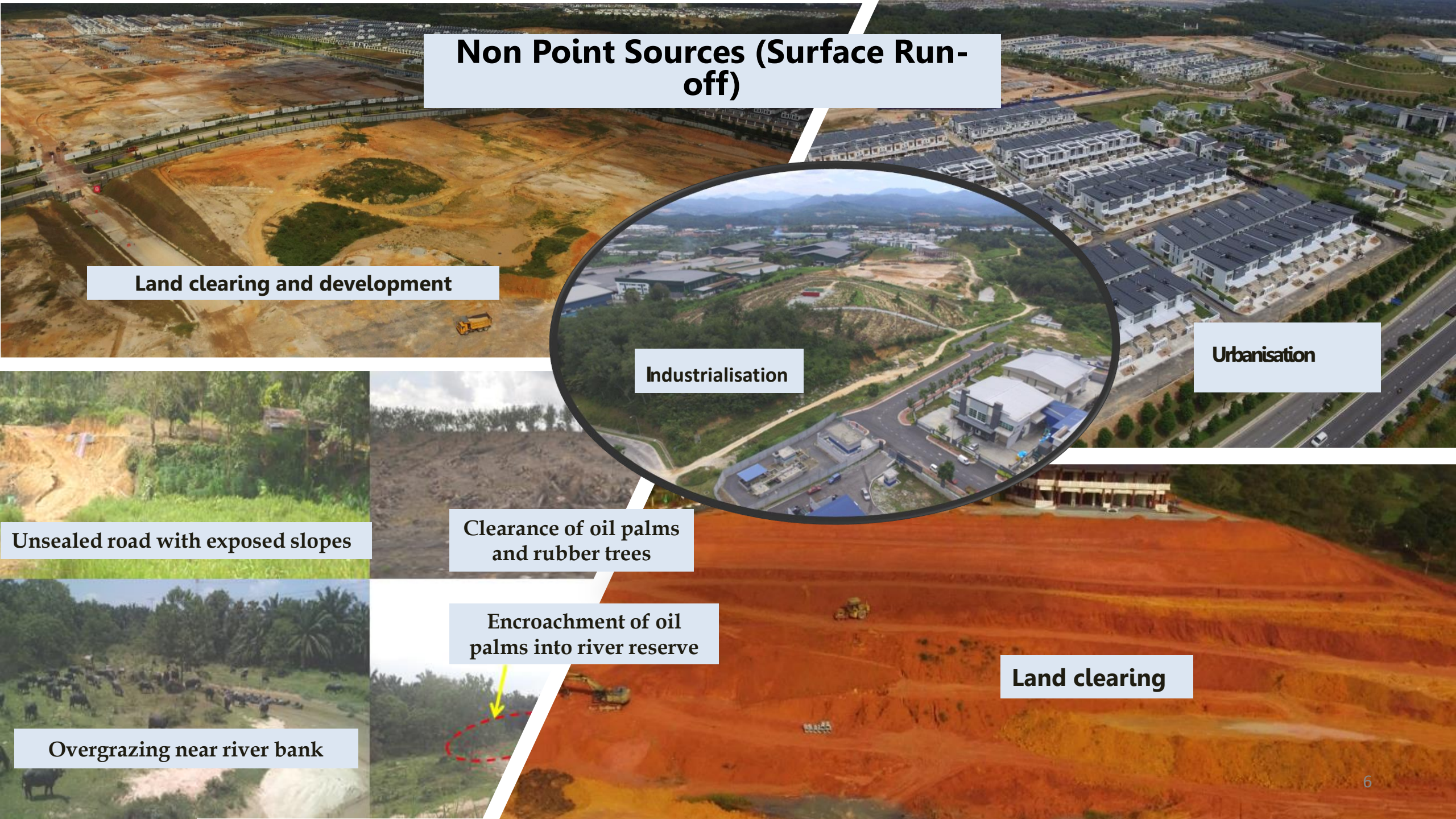
Livestock Farms

Car wash

Landfill

Laundromats

Non Point Sources (Surface Run-off)



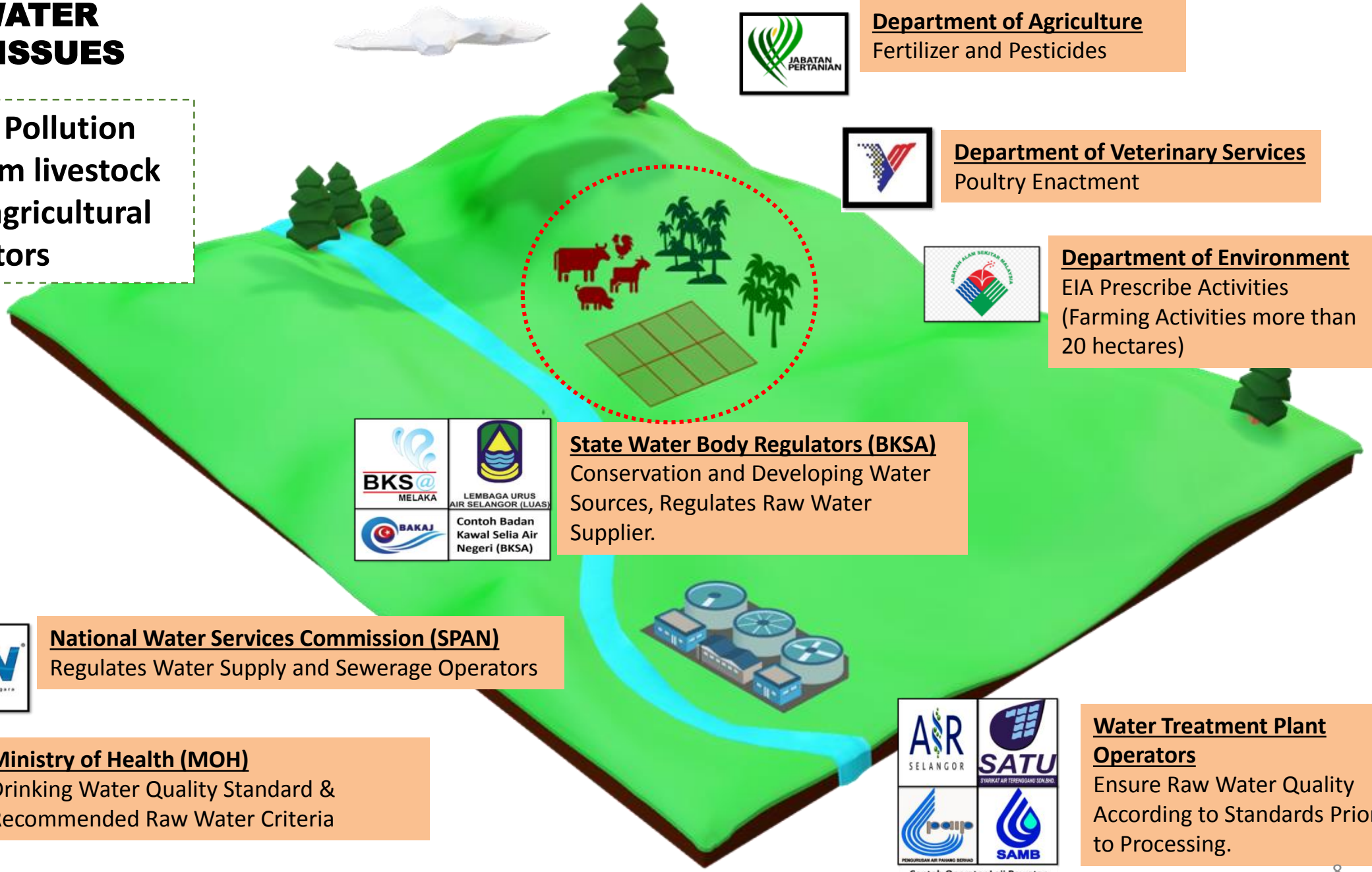
Regulatory Control

2. REGULATORY CONTROL

- **Environmental Quality Act 1974**
- **Environmental Quality Regulations**

RIVER WATER QUALITY ISSUES

Scenario: Pollution sources from livestock farm and agricultural sectors



Department of Agriculture
Fertilizer and Pesticides

Department of Veterinary Services
Poultry Enactment

Department of Environment
EIA Prescribe Activities
(Farming Activities more than 20 hectares)

State Water Body Regulators (BKSA)
Conservation and Developing Water Sources, Regulates Raw Water Supplier.

National Water Services Commission (SPAN)
Regulates Water Supply and Sewerage Operators

Ministry of Health (MOH)
Drinking Water Quality Standard & Recommended Raw Water Criteria

Water Treatment Plant Operators
Ensure Raw Water Quality According to Standards Prior to Processing.

Scenario : Pollution Sources from Mixed Use Development

Local Authorities (LA)

Act 133, Act 171, Act 172

Accountable to planning, development implementation and operation

Department of Mineral and Geoscience (JMG)
Quarry Permit (Iron Ore, Gold and others)

Department of Lands and Mines (PTG)
Regulate Sand Mining

Department of Environment (DOE)
Regulate Industrial Effluent, Sewerage, Hazardous wastes, and EIA Projects

LA
Earthwork, Sedimentation Control

LA
Discharge from Housing and Commercial (Restaurants, Eateries, Wet Markets, Laundries, and Car Wash)

Department of Irrigation and Drainage (DID)

River

Solid Waste and Public Cleansing Management Corporation (SWCorp)
Regulate services of solid wastes

Sewerage Services Department (JPP)
Regulate Sewerage Industry

Indah Water Consortium (IWK)
Sewerage Plant Operator

National Water Services Commission (SPAN)
Regulates Water and Sewerage Operators

National Solid Waste Management Department (NSWMD)
Act 672
Solid Waste Management

Ministry of Health (MOH)
Drinking Water Quality Standard and Recommended Raw Water Quality

Water Treatment Plant Operators

State Water Body Regulators (BKSA)

Contoh Operator Loji Rawatan Air (LRA)

Contoh Badan Kawal Selia Air Negeri (BKSA)

Pollution Control: Regulation On Effluent / Wastewater Discharge

Environmental Quality Act 1974

Control of pollution from targeted industrial sectors (through **end-of-pipe** control)

- Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977
- Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations 1978
- Environmental Quality (Sewage and Industrial Effluent) Regulations 1979.

Post - 2008:

(Cleaner production approach, proper operation and maintenance of Industrial Effluent Treatment Systems, Sewage Treatment Systems and Leachate Treatment Systems)

- Environmental Quality (Industrial Effluent) Regulations 2009
- Environmental Quality (Sewage) Regulations 2009
- Environmental Quality (Pollution Control)(Landfill & Transfer Station) Regulations 2009

Pollution Control: Regulation On Effluent

Standard A	Standard B
Upstream of water intake More stringent than standard B	Downstream of water intake

Acceptable Conditions For Discharge Of

Industrial Effluent Or Mixed Effluent Of Standards A And B

	Parameter	Unit	Standard A	Standard B
	(1)	(2)	(3)	(4)
i.	Temperature	°C	40	40
ii.	pH Value	–	6.0-9.0	5.5-9.0
iii.	BOD_5 at 20oC	mg/L	20	50
iv.	Suspended Solids	mg/L	50	100
v.	Mercury	mg/L	0.005	0.05
vi.	Cadmium	mg/L	0.01	0.02
vii.	Chromium, Hexavalent	mg/L	0.05	0.05
viii.	Chromium, Trivalent	mg/L	0.20	1.0
ix.	Arsenic	mg/L	0.05	0.10
x.	Cyanide	mg/L	0.05	0.10
xi.	Lead	mg/L	0.10	0.5
xii.	Copper	mg/L	0.20	1.0
xiii.	Manganese	mg/L	0.20	1.0
xiv.	Nickel	mg/L	0.20	1.0
xv.	Tin	mg/L	0.20	1.0
xvi.	Zinc	mg/L	2.0	2.0
xvii.	Boron	mg/L	1.0	4.0
xviii.	Iron (Fe)	mg/L	1.0	5.0
xix.	Silver	mg/L	0.1	1.0
xx.	Aluminium	mg/L	10	15
xxi.	Selenium	mg/L	0.02	0.5
xxii.	Barium	mg/L	1.0	2.0
xxiii.	Fluoride	mg/L	2.0	5.0
xxiv.	Formaldehyde	mg/L	1.0	2.0
xxv.	Phenol	mg/L	0.001	1.0
xxvi.	Free Chlorine	mg/L	1.0	2.0
xxvii.	Sulphide	mg/L	0.50	0.50
xxviii.	Oil and Grease	mg/L	1.0	10
xxix.	Ammoniacal Nitrogen	mg/L	10	20
xxx.	Colour ADMI*		100	200

*ADMI–A

LIST OF EIA GUIDELINES & PUBLICATIONS

1. A Handbook Of EIA Guidelines

2. Environmental Requirements – A Guide For Investors

3. EIA Guidelines For Coastal Resort Development Projects

4. EIA Guidelines For Industrial Projects

5. EIA Guidelines For Toxic and Hazardous Waste Treatment and Disposal Projects

6. EIA Guidelines for Groundwater and/or Surface Water Supply Projects.

7. EIA Guidelines for Dam and/or Reservoir Projects.

8. EIA Guidelines For Municipal Solid Waste and Sewage Treatment and Disposal Projects

9.EIA Guidelines For Industrial Estate Development

10. Guidelines For The Siting and Zoning Of Industries

11. Environmental Impact Assessment (EIA) – Procedure and Requirements In Malaysia.

12. EIA Guidelines For Petroleum Industries

13. EIA Guidelines for Risk Assessment

14. EIA Guidelines for Drainage and/or Irrigation Projects

National Water Quality Standard

3. WATER Quality Standards

- **National Water Quality Standards**
- **Effluent Discharge Standards**

NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA

PARAMETER	UNIT	CLASS					
		I	IIA	IIB	III	IV	V
Ammoniacal Nitrogen	mg/l	0.1	0.3	0.3	0.9	2.7	> 2.7
Biochemical Oxygen Demand	mg/l	1	3	3	6	12	> 12
Chemical Oxygen Demand	mg/l	10	25	25	50	100	> 100
Dissolved Oxygen	mg/l	7	5 - 7	5 - 7	3 - 5	< 3	< 1
pH	-	6.5 - 8.5	6 - 9	6 - 9	5 - 9	5 - 9	-
Colour	TCU	15	150	150	-	-	-
Electrical Conductivity*	µS/cm	1000	1000	-	-	6000	-
Floatables	-	N	N	N	-	-	-
Odour	-	N	N	N	-	-	-
Salinity	%	0.5	1	-	-	2	-
Taste	-	N	N	N	-	-	-
Total Dissolved Solid	mg/l	500	1000	-	-	4000	-
Total Suspended Solid	mg/l	25	50	50	150	300	300
Temperature	oC	-	Normal + 2 °C	-	Normal + 2 °C	-	-
Turbidity	NTU	5	50	50	-	-	-
Faecal Coliform**	count/100 ml	10	100	400	5000 (20000)a	5000 (20000)a	-
Total Coliform	count/100 ml	100	5000	5000	50000	50000	> 50000

Notes :

N : No visible floatable materials or debris, no objectional odour or no objectional taste
* : Related parameters, only one recommended for use
** : Geometric mean
a : Maximum not to be exceeded

DOE Water Quality Classification Based On Water Quality Index

SUB INDEX & WATER QUALITY INDEX	INDEX RANGE		
	CLEAN	SLIGHTLY POLLUTED	POLLUTED
Biochemical Oxygen Demand (BOD)	91 - 100	80 - 90	0 - 79
Ammoniacal Nitrogen (NH_3-N)	92 - 100	71 - 91	0 - 70
Suspended Solids (SS)	76 - 100	70 - 75	0 - 69
Water Quality Index (WQI)	81 - 100	60 - 80	0 - 59

DOE Water Quality Index Classification

PARAMETER	UNIT	CLASS				
		I	II	III	IV	V
Ammoniacal Nitrogen	mg/l	< 0.1	0.1 – 0.3	0.3 – 0.9	0.9 – 2.7	> 2.7
Biochemical Oxygen Demand	mg/l	< 1	1 – 3	3 – 6	6 – 12	> 12
Chemical Oxygen Demand	mg/l	< 10	10 – 25	25 – 50	50 – 100	> 100
Dissolved Oxygen	mg/l	> 7	5 – 7	3 – 5	1 – 3	< 1
pH	-	> 7.0	6.0 – 7.0	5.0 – 6.0	< 5.0	> 5.0
Total Suspended Solid	mg/l	< 25	25 – 50	50 – 150	150 – 300	> 300
Water Quality Index (WQI)		> 92.7	76.5 – 92.7	51.9 – 76.5	31.0 – 51.9	< 31.0

WQI - a method that combined numerous water quality parameters into one concise and objective value representing the state of water quality trends in a river.

WQI = (0.22 x SIDO) + [0.19 x SIBOD] + [0.16 x SICOD] + [0.15 x SIAN] + [0.16 x SISS] + [0.12 x SIpH]

SIDO	SIBOD	SICOD	SIAN	SISS	SIpH
Sub-Index **Dissolved Oxygen** (in % saturation)	Sub-Index **Biochemical Oxygen Demand**	Sub-Index **Chemical Oxygen Demand**	Sub-Index **Ammoniacal Nitrogen**	Sub-Index **Suspended Solids**	Sub-Index **pH**

WATER CLASSIFICATION & BENEFICIAL USES

Class I — > 92.7

Conservation of natural environment.

Water Supply I – Practically no treatment necessary.

Fishery I – Very sensitive aquatic species.

Class IIA — 76.5 – 92.7

Water Supply II – Conventional treatment required.

Fishery II – Sensitive aquatic species.

Class IIB — 76.5 – 92.7

Recreational use with body contact.

Class III — 51.9 – 76.5

Water Supply III – Extensive treatment required.

Fishery III – Common, of economic value and tolerant species; livestock drinking.

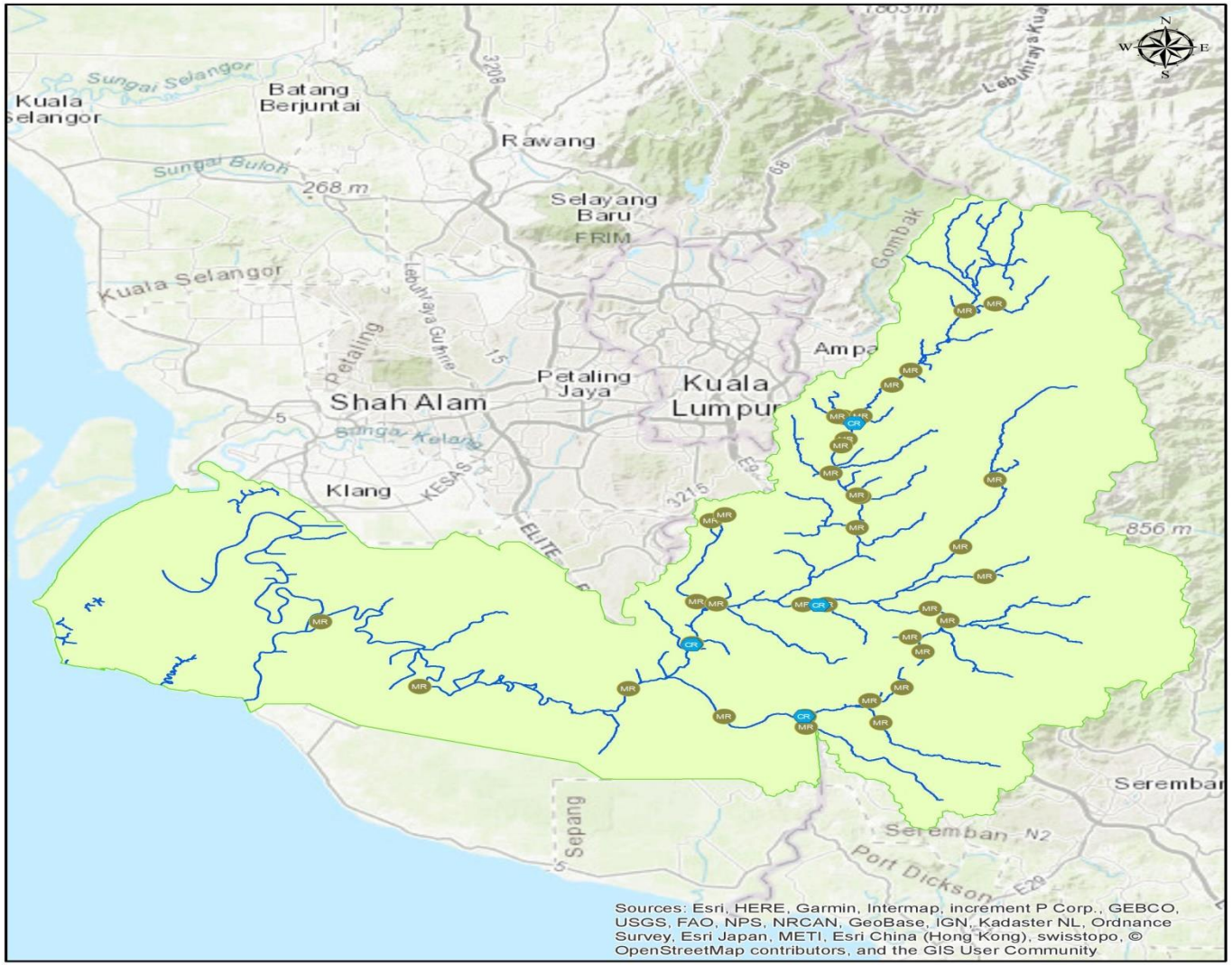
Class IV — 31.0 – 51.9

Irrigation

Class V — < 31.0

None of the listed uses

STESEN MRWQM DAN CRWQM DI LEMBANGAN LANGAT



RIVER	NO OF STATIONS
ANAK CHUAU	1
BALAK	1
BATANG BENAR	2
BATANG LABU	8
BATANG NILAI	2
BERANANG	1
BUAH	1
CHUAU	2
JIJAN	1
LANGAT	9
LIMAU MANIS	1
PAJAM	1
RINCHING	2
SEMENYIH	3
SERING	1
CRWQM	4
TOTAL	**40**

Langat River Basin: Beneficial Uses Of Water

Main uses:
Water Supply

Recreational Use

Fish Ponds

Livestock Watering

Crop Irrigation

4. WAY FORWARD

- **Pollution Load Control**

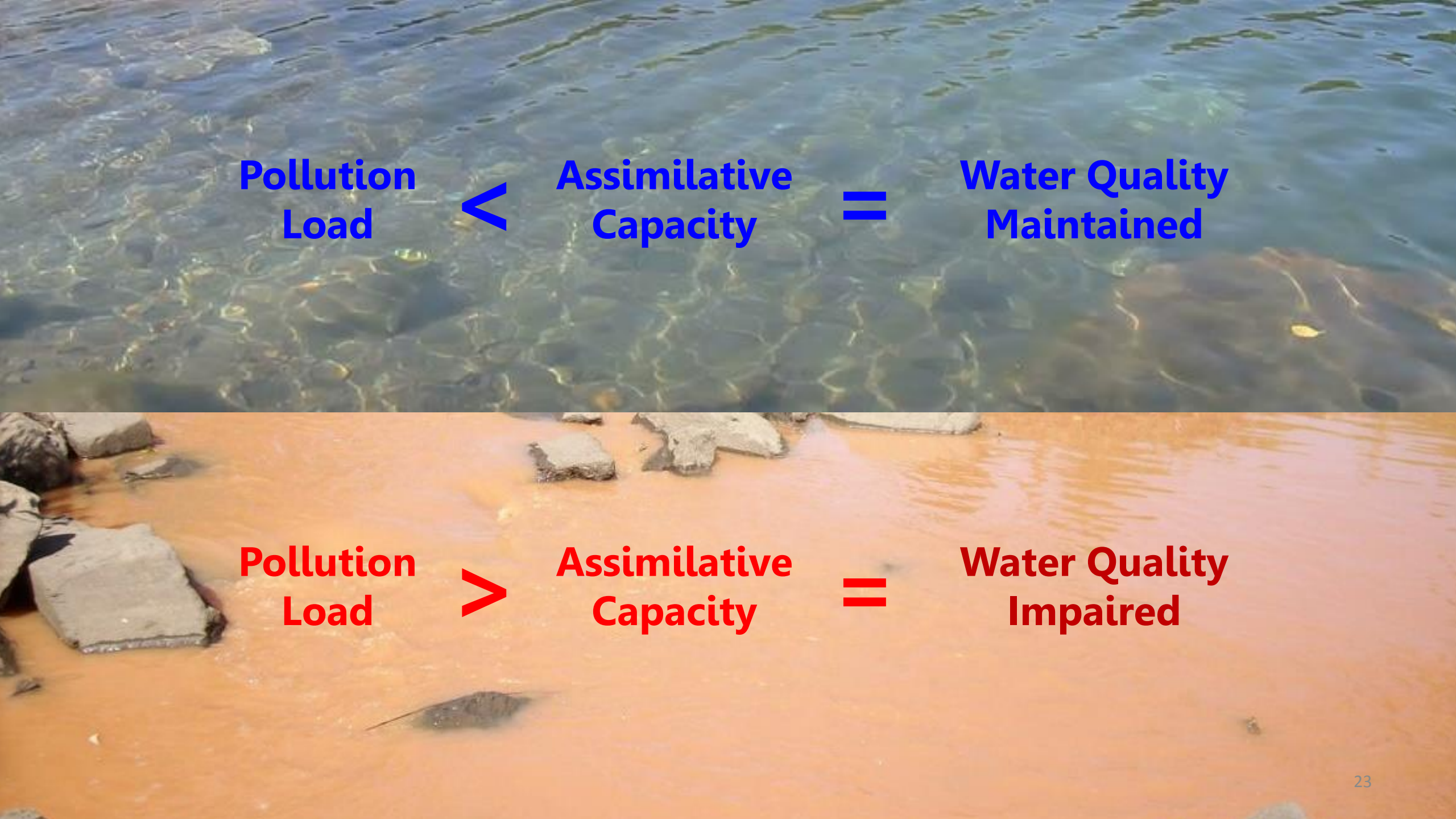
Limitation of Pollutant Concentration Standard

Pollution control base on pollutant concentration of effluent discharged is no longer effective due to:

- Only focus on individual point source;
- Only control sources subjected to Environmental Quality Act 1974. Sources not subjected to EQA is hardly control;
- Unable to predict cumulative impact from various sources;
- Does not reflect the actual pollutant loading entering a water body

Assimilative Capacity of a River

- Assimilative Capacity refers to the ability of a natural body of water (lake, river, sea) to cleanse itself **(self purification);** its capacity to receive waste waters or toxic substances without harmful effects and damage to aquatic life and to humans who consume the water.


Pollution Load
<
Assimilative Capacity
=
Water Quality Maintained
Pollution Load
>
Assimilative Capacity
=
Water Quality Impaired

TMDL Historical Perspective

- Prior to 1970s, ambient based water quality legislation in the US was State administered but overwhelmingly failed.
- 1972 US Clean Water Act prescribed a National Pollutant Discharge Elimination System (NPDES) focusing on achieving effluent standards for pollution control.
- Despite committed implementation, standards were often not met (largely due to unregulated non-point source pollutants) which resulted in a series of lawsuits in the 1980s.
- Attention was given to TMDL (under Section 303(d) CWA) which marked a return to ambient standards but in the form of prescriptions.

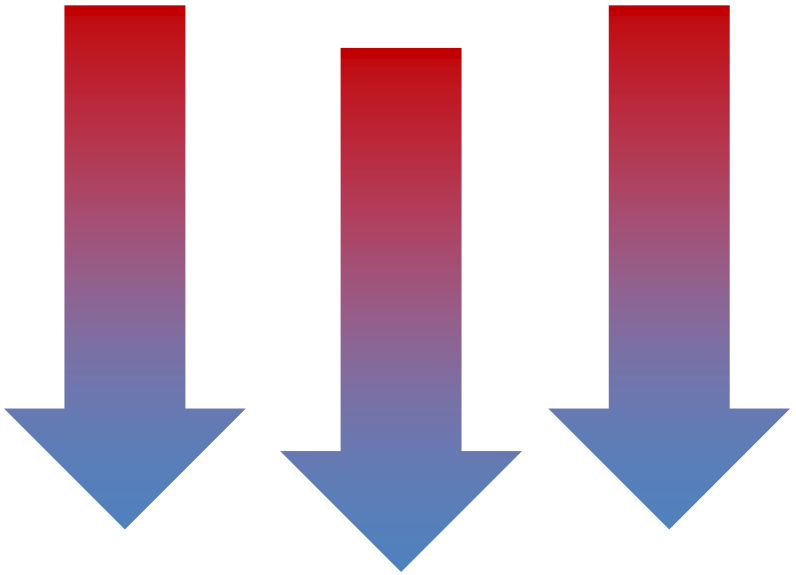
WAY FORWARD

Implementation of TOTAL MAXIMUM DAILY LOAD (TMDL)

As A Long Term Strategy To Improve Water Quality

What is TMDL?

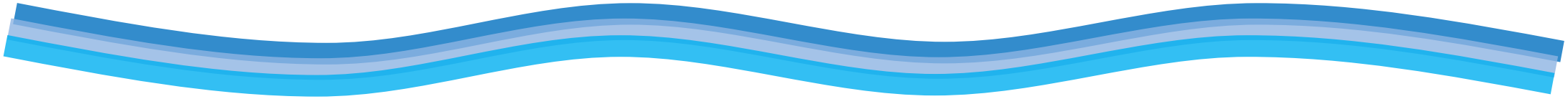
Pollution Sources and Polluters



Ambient River Water Quality

A pollution allocation budget that states the **maximum** amount of pollutants that can be received by a water body, without affecting beneficial uses.

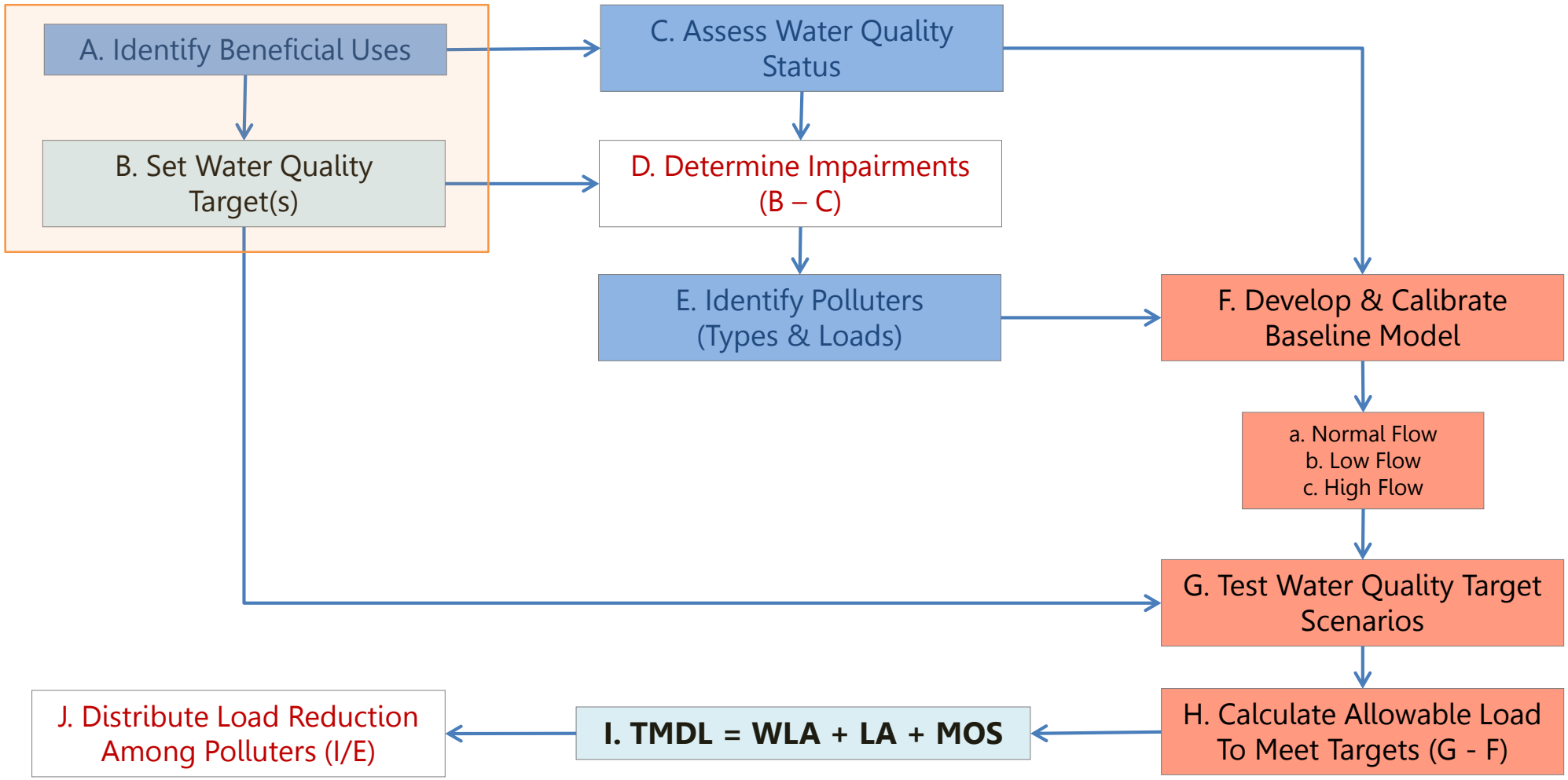
TMDL addresses the ‘carrying capacity’ of a river – pollution loads that can be received/assimilated by a river without adversely affecting its beneficial uses



TMDL = Point Sources (WLA) + Non-Point Sources (LA) + MOS

WLA is the waste load allocation from point sources (kg/day)
LA is the load allocation from non-point sources (kg/day); and
MOS represents the margin of safety (%)

The TMDL Process



Stakeholders of Water Resources Management

Jabatan Pertanian Negeri Selangor

Pejabat Perkhidmatan Veterinar Daerah Hulu Langat & Negeri Sembilan

Pengurusan Air Selangor

Kementerian Tenaga, Teknologi Hijau dan Air

Suruhanjaya Perkhidmatan Air Negara

Jabatan Pengairan dan Saliran

Indah Water Konsortium

Lembaga Urus Air Selangor

Majlis Perbandaran Sepang

Majlis Perbandaran Kajang

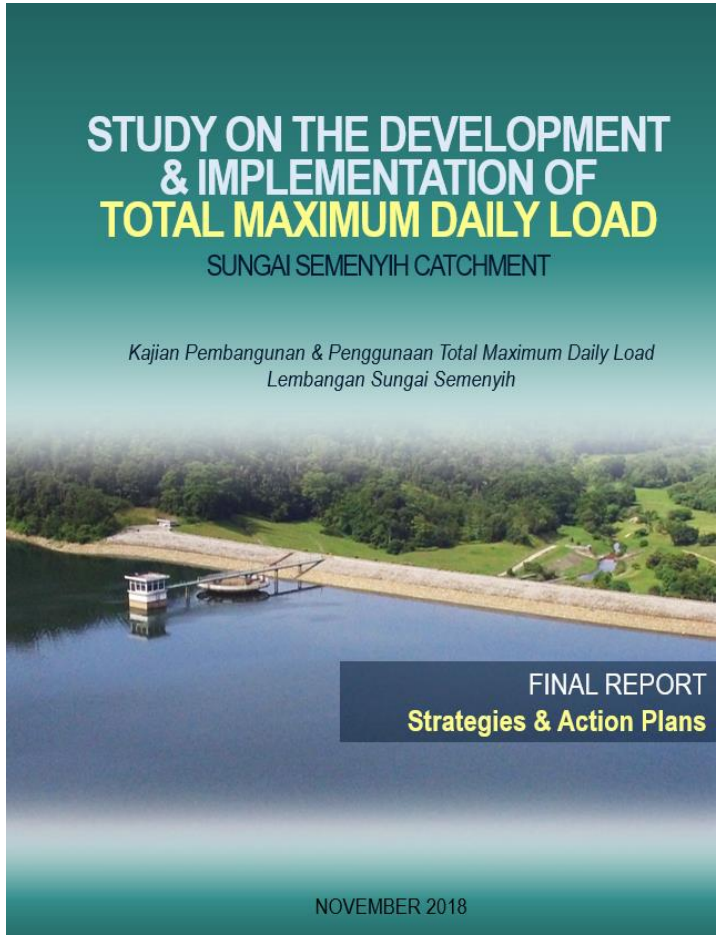
Majlis Perbandaran Nilai

Pengurusan Aset Air Berhad

Jabatan Bekalan Air

Jabatan Perkhidmatan Pembetungan

TMDL Strategies: Integrated Approach For Sustainable Pollution Management



- Point Source Pollution
- Non-Point Source Pollution
- Monitoring and Assessment Framework
- Capacity Building and Public Awareness
- Financial Mechanism and Incentives
- Institutional and Legal Actions

TMDL Implementation include all stakeholders involved in water resource management. Every agency shall play their role as a collective pollution control

Effective TMDL implementation will result to positive impact on river water quality in short, medium and long term

EXPECTED OUTCOME OF TMDL

River Pollution reduced

Pollutant overloading controlled & Eliminated

Pollution Control Measures increased

Achieve targeted water quality

THANK YOU