



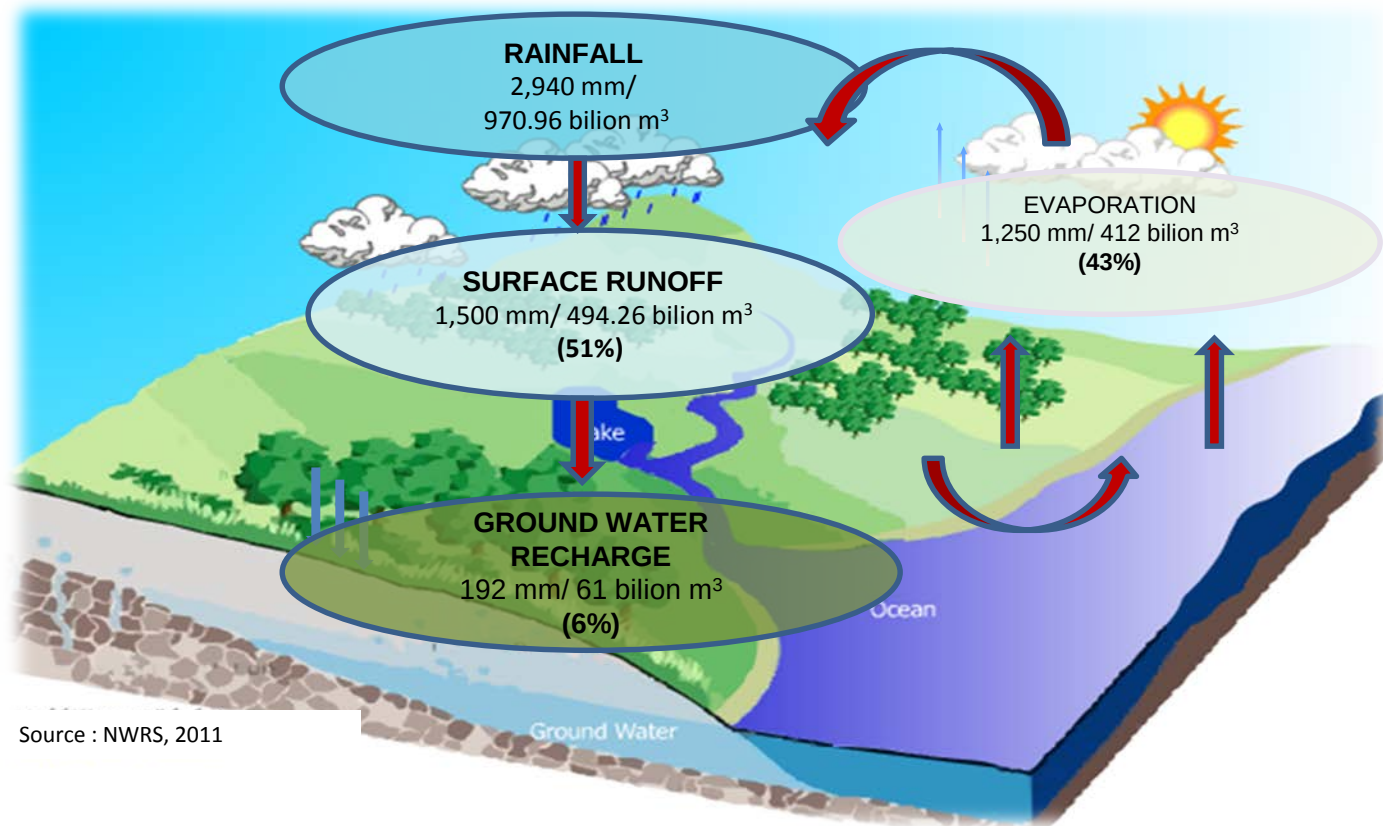
STATE GOVERNMENT OF NEGERI SEMBILAN

WATER RESOURCES & WATER TREATMENT PROCESS

HYDROLOGICAL CYCLE

WHAT WE HAVE NOW : WATER AVAILABILITY IN MALAYSIA

{Based on The Review of The National Water Resources Study 2000-2050} (2011)



Source : NWRS, 2011

CLIMATE



Average Annual Rainfall

- ✓ Peninsular Malaysia 2500 mm
- ✓ Sabah 3000 mm
- ✓ Sarawak 3500 mm

Extreme Events

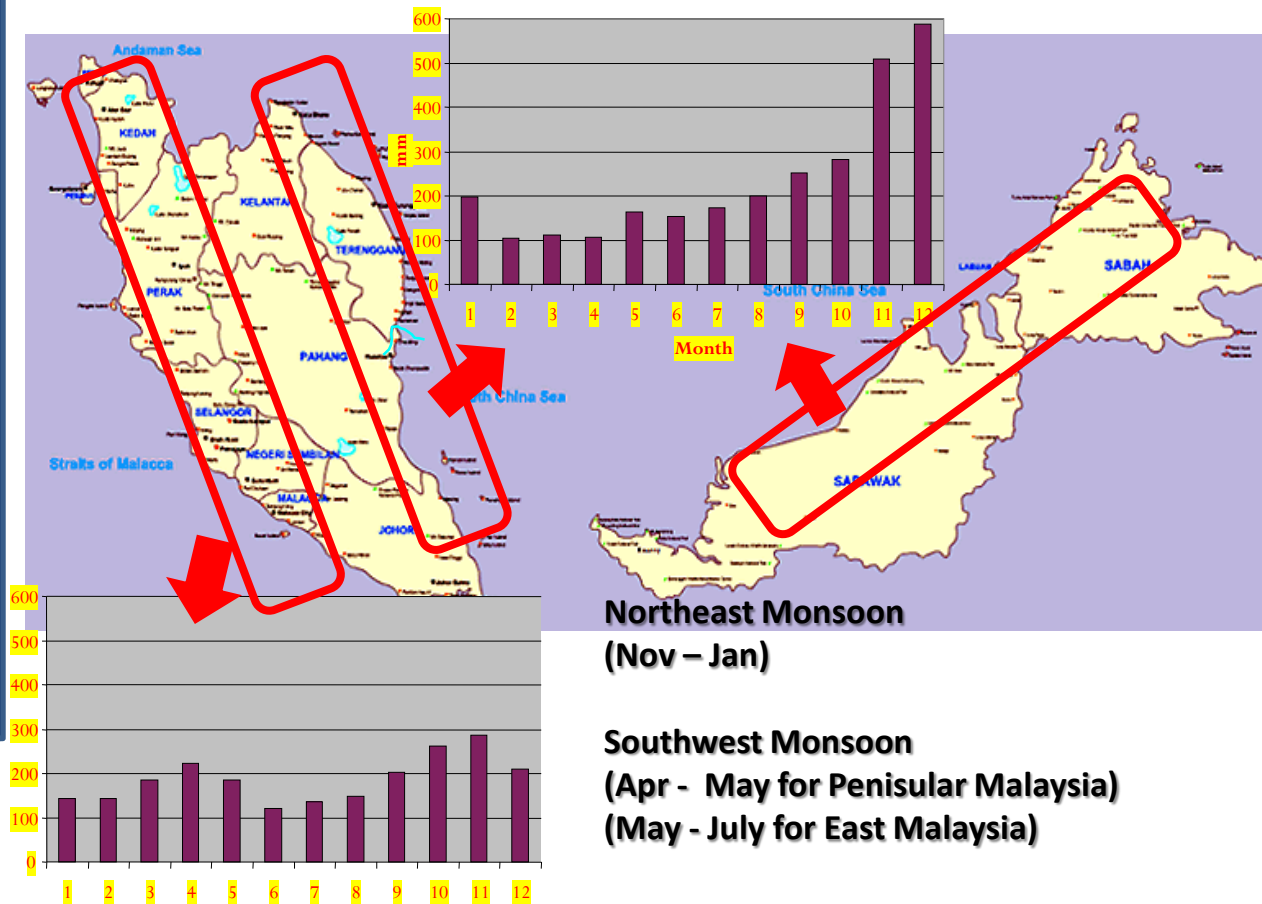
- ✓ 60  - 2 hrs
- ✓ 10  - 2 hrs

Average Annual Rainfall

1800 - 2200 mm

Extreme Events

- ✓ 250mm in 12 hrs
- ✓ 100mm in 1 – 2 hrs



TYPE OF WATER RESOURCES IN NEGERI SEMBILAN

SURFACE WATER

1. Dam water
2. River water

DAMS IN NEGERI SEMBILAN

NO	DAM	DISTRICT	STORAGE CAPACITY (M3)	YEAR IN OPERATION
1	Sg Terip	Seremban	45,408,800	1987
2	Sg Beringin (Pedas)	Rembau	896,810	1990
3	Talang	Kuala Pilah	40,289,590	1992
4	Kelinchi	Kuala Pilah	58,009,620	1998
5	Gemencheh	Tampin	2,980,000	1999
6	Ulu Sepri	Rembau	339,858	2010
7	Teriang	Jelevu	62,500,000	2014
		TOTAL CAPACITY (M3)	210,424,678	

DAMS IN NEGERI SEMBILAN

DAM	WATER SOURCES	RESERVOIR CAPACITY (Million Liters)	CURRENT CAPACITY (Million Liters)	FULL PERCENTAGE (%)
Sg. Terip	Sg. Terip, Sg. Lubok Buaya, Sg. Batu, Sg. Gantor	45,408.80	42,117.92	92.75
Kelinchi	Sg. Kelinchi, Sg. Penoi, Sg. Kong	58,009.62	38,752.01	66.80
Talang	Sg. Muar	40,289.59	40,289.59	100.00
Sg. Beringin	Sg. Beringin	896.81	896.81	100.00
Gemencheh	Sg. Salah, Sg. Jelai water transfer	29,800.00	20,944.00	70.28
Ulu Sepri	Sg. Batu Hampar	3,398.58	3,398.68	100.00
Teriang	Sg. Teriang	62,500.00	62,500.00	100.00
JUMLAH		240,303.40	208,899.01	87.00

GEMENCHEH DAM



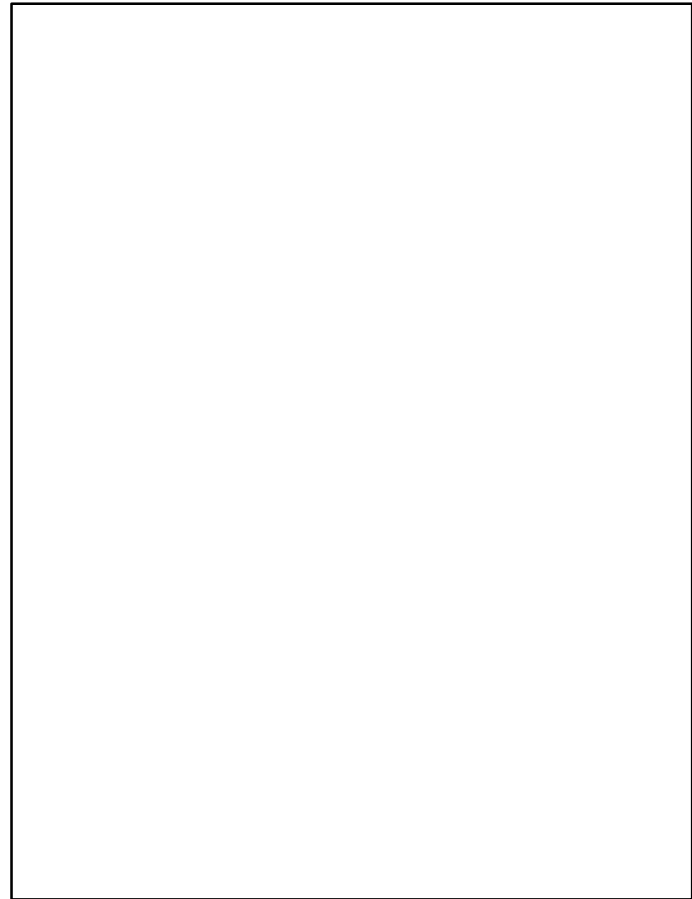
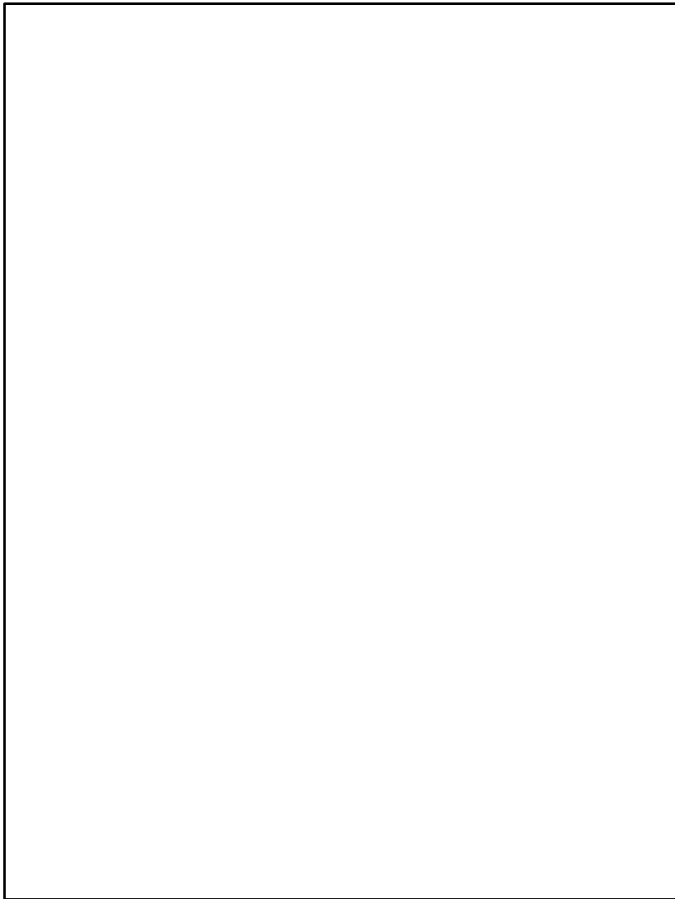
MAJOR RIVERS IN NEGERI SEMBILAN

NO	RIVER	DISTRICT	NO OF WATER TREATMENT PLANT	TOTAL PRODUCTION CAPACITY (MLD)
1	Sg Linggi	Seremban	1	116.41
2	Sg Muar	Kuala Pilah	7	137.90
3	Sg Petaseh	Jelevu	1	139.00
4	Sg Gunung Berembun	Seremban	1	17.51
5	Sg Kemin	Jelevu	1	9.01
6	Sg Kenaboi	Jelevu	1	4.56
7	Sg Triang	Jelevu	1	9.13
8	Sg Batu Hampar	Rembau	1	4.86
9	Sg Rembau	Rembau	1	50.84

MAJOR RIVERS IN NEGERI SEMBILAN

NO	RIVER	DISTRICT	NO OF WATER TREATMENT PLANT	TOTAL PRODUCTION CAPACITY (MLD)
10	Sg Jelei	Kuala Pilah	2	13.81
11	Sg Batang Terachi	Kuala Pilah	1	3.65
12	Sg Tengkek	Kuala Pilah	1	1.29

SG REMBAU



HOW WE MANAGE WATER RESOURCES

1. All water resources are own by the state (Negeri Sembilan).
2. Water resources are managed by the Negeri Sembilan Water Regulatory Body known as Badan Kawal Selia Air Negeri Sembilan (BKSA NS) with assistance from the water operator Syarikat Air Negeri Sembilan Sdn Bhd (SAINS).
3. Other government agencies such as Department of Irrigation and Drainage (DID) and Department of Environment (DOE) also involve indirectly in ensuring the water resource are preserved and maintained.

Water Resources Management

The Negeri Sembilan Water Regulatory Body (BKSA) is responsible for monitoring and licensing abstraction of raw water (surface or ground water) and Syarikat Air Negeri Sembilan Sdn. Bhd. (SAINS) is responsible for supplying clean and treated water to consumers.

Raw Water

BKSA and Department Of Environment (DOE) also carries out monitoring and raw water sampling when water source pollutions especially pollution in rivers are detected. Both department carries out enforcement based on their jurisdiction and law to curb water pollution. Only pollution related to industrial waste are under DOE's jurisdiction and the rest falls under BKSA's jurisdiction.

DUTIES OF BKSA NS

1. To ensure the catchment areas are gazetted.
2. To ensure the security of raw water supply for water treatment plant operations.
3. To study availability of new water resources and plan for future development.
4. To ensure the security of catchment areas and dams.
5. To ensure water pollutions are controlled and monitored.
6. To ensure dams maintenance, safety and security audits are carried out.
7. To issue licenses for raw water abstractions.
8. To issue and collect raw water bills.
9. To handle all legal issues pertaining to raw water resources

Treated Water

SAINS carries out periodic water level and water quality checking at all the water treatment plant intakes. Immediate action to identify point sources and containment action will be carried if any of the raw water parameters indicates alarming level. Some of the monitored parameters are turbidity, colour of water (hazen), iron, manganese, ammonia, alum, fluoride, coliform and e-coli. Besides SAINS, the Health Ministry through it's Engineering Department through out the district health departments also carries out continuous inspection to ensure treated water at all the water treatment plants passes the required standards and are safe for consumption. The Health Ministry through it's Drinking Water Quality Control Program closely monitors violations at water treatment plants and among the violation parameters that are monitored are e-coli and free chlorine, e-coli, turbidity, free chlorine and aluminium.

WATER TREATMENT PLANTS IN NEGERI SEMBILAN

1	WTP	CAPACITY (MLD)	RAW WATER SOURCE	YEAR IN OPERATION
1	Pantai	18	River	1929
2	Sg Terip	305	River/Dam	1987
3	Ngoi-Ngoi	136	River/Dam	2014
4	Sg Linggi	136	River	1962
5	Kuala Klawang	6	River	1966
6	Titi	11	River	1994
7	Lakai	14	River	1981
8	Pedas Lama	9	Dam	1932
9	Pedas Baru	5	River/Dam	1932
10	Sawah Raja	45	River/Dam	2010

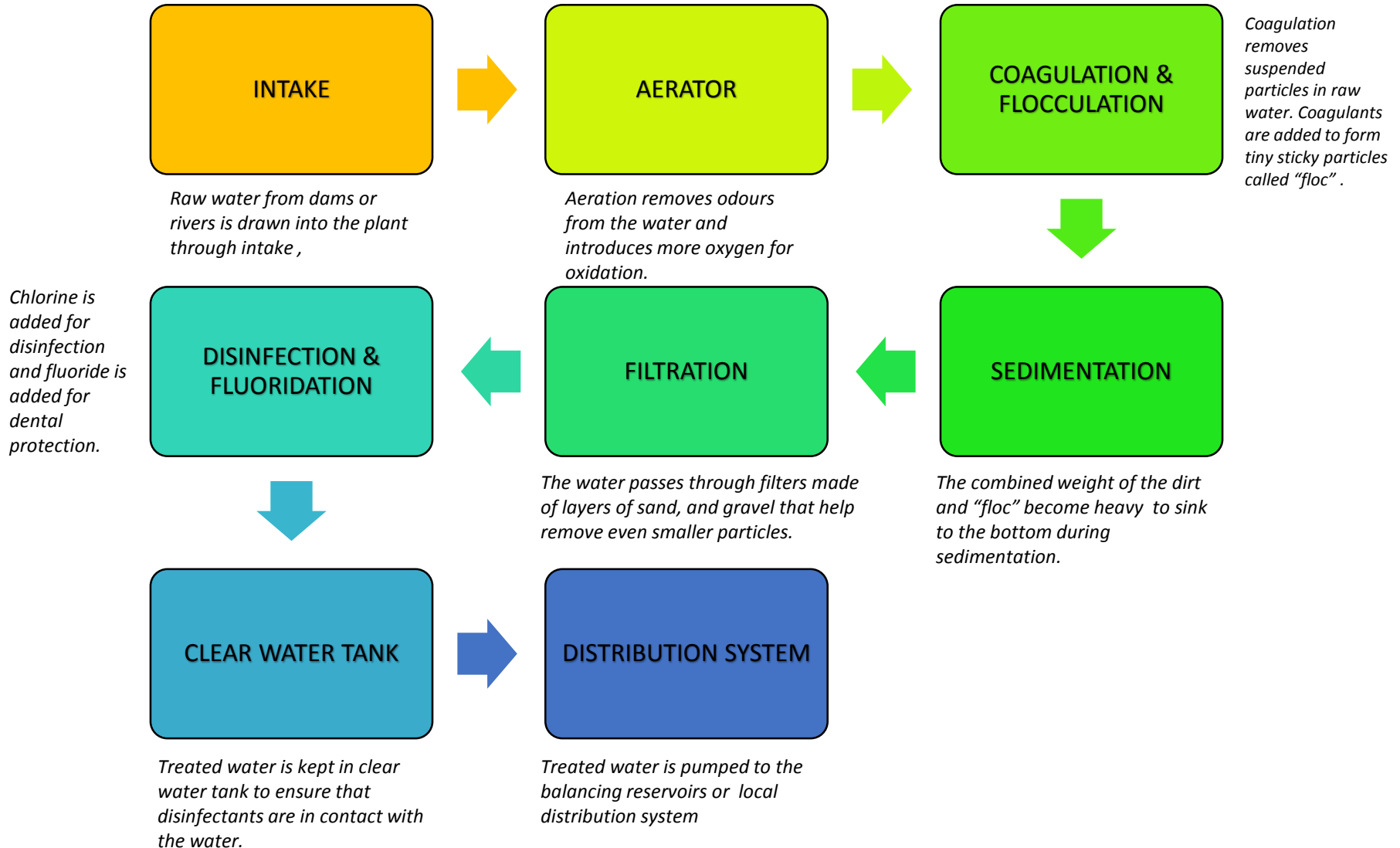
WATER TREATMENT PLANTS IN NEGERI SEMBILAN

1	WTP	CAPACITY (MLD)	RAW WATER SOURCE	YEAR IN OPERATION
11	Gemencheh	45	River/Dam	2002
12	Dangi	14	River	1979
13	Pasir Besar	23	River	1980
14	Gemas	36	River	1996
15	Ulu Bendul	6	River	1979
16	Talang	1	Dam	2001
17	Kuala Pilah	9	River	1949
18	Bukit	2	River	1949
19	Tengkek	2	River	2006
20	Kepis	3	River	1988

WATER TREATMENT PLANTS IN NEGERI SEMBILAN

1	WTP	CAPACITY (MLD)	RAW WATER SOURCE	YEAR IN OPERATION
21	Bahau	4	River	1972
22	Jempol	55	River	1978
23	Kuala Jelai	114	River	1980
	TOTAL	999		

BASIC WATER TREATMENT PROCESS



BASIC WATER TREATMENT PROCESS

- *Raw water from dams or rivers is drawn into the plant through intake structures. Debris are removed from the raw water by coarse and fine screens before the water enters the low lift pumps*
- *Aeration removes odours from the water and introduces more oxygen for oxidation purpose.*
- *Coagulation removes dirt and other particles suspended in water. Coagulants, rapidly add electrochemical charges that attract the small particles to form tiny sticky particles called “floc” which attract the dirt particles.*
- *By slower mixing, turbulence causes the flocculated water to form larger floc particles that become cohesive and increase in mass. The combined weight of the dirt and the alum (floc) become heavy enough to sink to the bottom during sedimentation.*
- *The water passes through filters, some made of layers of sand and gravel that help remove even smaller particles. Filters are periodically backwashed to clean off accumulated floc and other trapped impurities.*
- *A small amount of chlorine is added or some other disinfection method is used to kill any bacteria or microorganisms that may be in the water.*
- *Fluoridation is a process where silicofluoride compounds are added to treated drinking water to artificially raise the fluoride concentration to within a specified range; for example between 0.4 to 0.6 mg/L (ppm). Fluoridation is a local public health dental policy.*
- *Treated water is kept in clear water tank to ensure that disinfectants are in contact with the water long enough to inactivate disease causing organisms.*
- *Treated water is pumped through high lift pumps to other pumping stations, balancing reservoirs or local distribution system.*

1. CONVENTIONAL TECHNOLOGY



1. AERATION



2. BAFFLE
FLOCCULATION



3. LOVO
SEDIMENTATION



4. FILTRATION

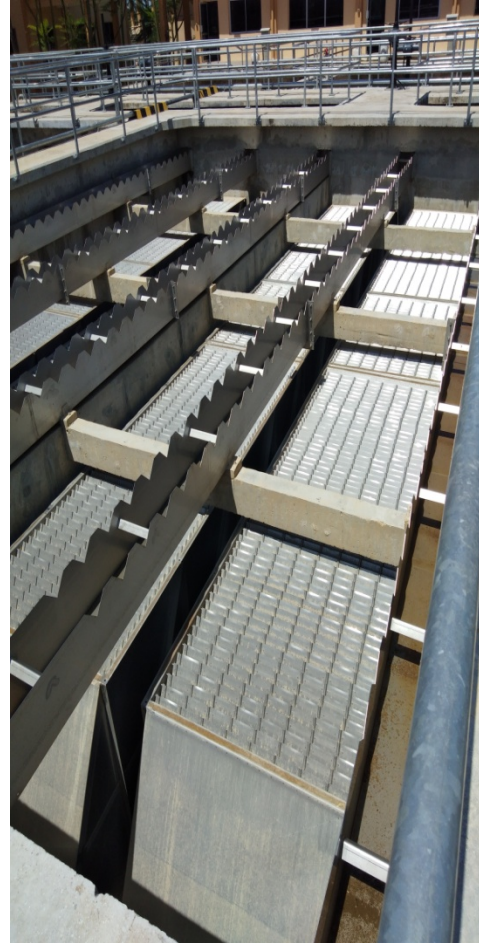
2. SLUDGE BLANKET WITH CLARIFIER TECHNOLOGY



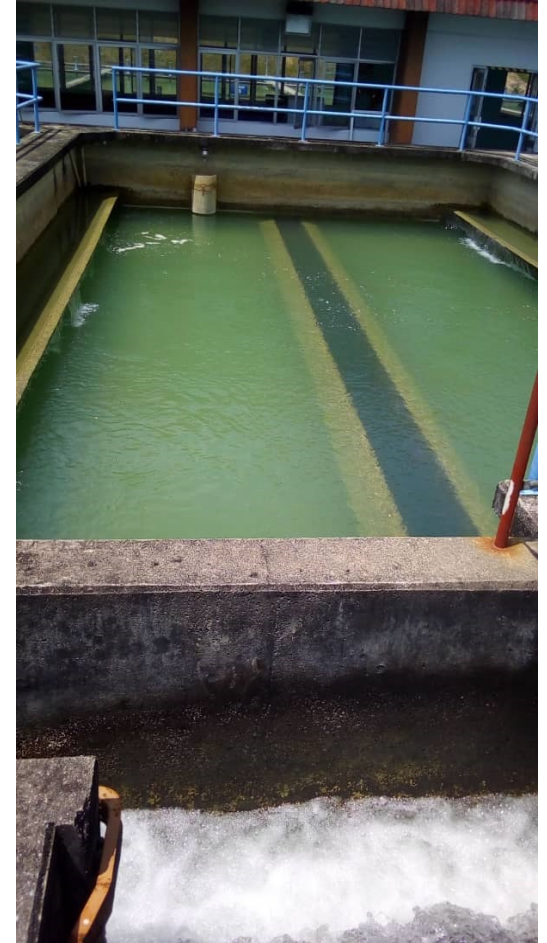
1. AERATION



2. MIXING CHAMBER



3. LAMELLA
CLARIFICATION



4. FILTRATION

3. DISSOLVED AIR FLOATATION TECHNOLOGY

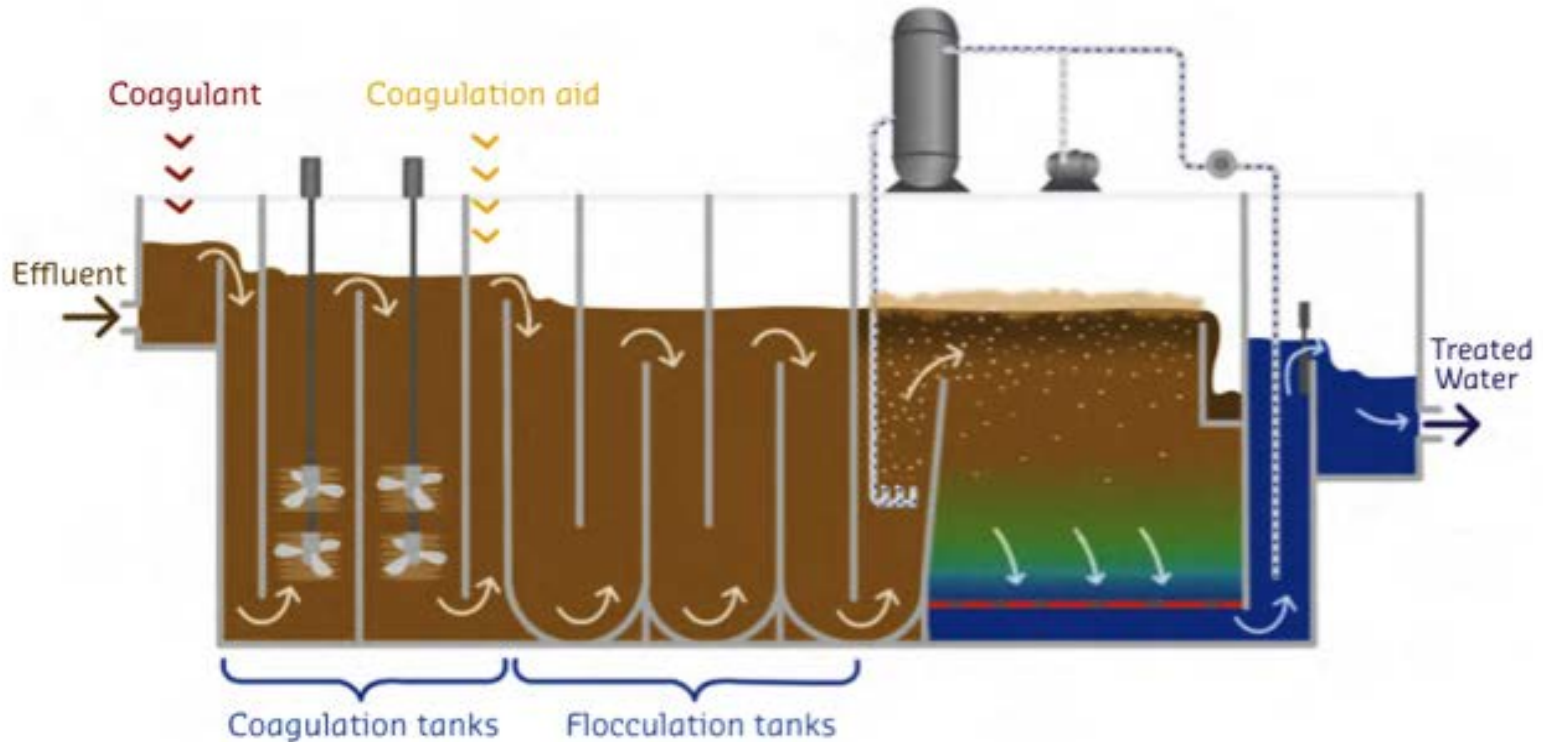
1. AERATION

2. FLOCCULATION

3. SATURATION

4. FLOATATION & FILTRATION

DISSOLVED AIR FLOTATION (DAF)



Dissolved air flotation (DAF) is a water treatment process that clarifies water by removing suspended solids. The removal is achieved by dissolving air in the water under pressure and then releasing the air at atmospheric pressure in a flotation tank. The released air forms tiny bubbles which adhere to the suspended matter causing the suspended matter to float to the surface of the water. Sludge is removed by overflowing them to the sludge channel.

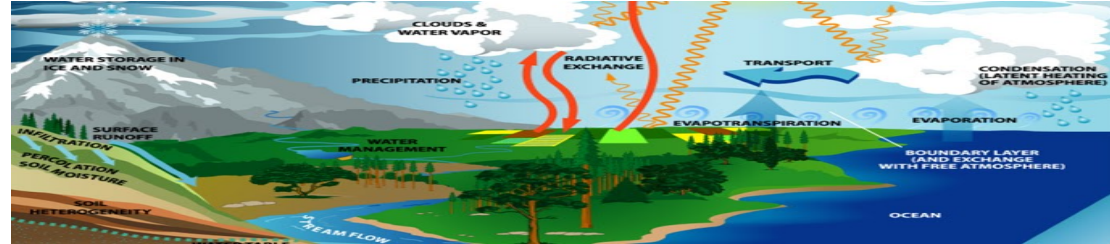
CHALLENGES IN MAINTAINING AND FINDING WATER RESOURCES

1. Uncontrolled development of forest or water catchment areas.
2. Control of Water Pollutions due to illegal industrial discharge, sand mining and agricultural activities.
3. Irregular climate changes due to global warming.
4. High operational cost for transferring raw water from the source to the storage areas (dams).

CURRENT AND LONG TERM PLAN FOR WATER TREATMENT PLANT IN NEGERI SEMBILAN

1. To carry out comprehensive water resources study to identify new water resources including surface water and groundwater.
2. To build off-river storage (bunded storage) in order to store water at the downstream during rainy seasons.
3. To study the possibility of interstate raw water transfer.
4. To reduce per capita water consumption from 250 liter/head/day to 180 liter/head/day.
5. To encourage rain water harvesting for new housing development areas.
6. To encourage the usage of recycle water.
7. Building new water treatment plants according to supply vs demand study complete with distributions network.

OUR way F>>RWARD



NATIONAL WATER RESOURCES POLICY

Launch by Minister of NRE - 2012

- NWRP embraces a complementary stand to other existing other national policy related to water resources;
- In all, **17 national policies related to water resources under 9 ministries**, are referred;
- It looks at **existing legal provisions** and **institutional mandates** and **provide policy direction** for Integrated Water Resources Management (**IWRM**);
- It recognises the resources **ownership**, multitude of **stakeholders** and potential **roles** of all stakeholders for effective governance.

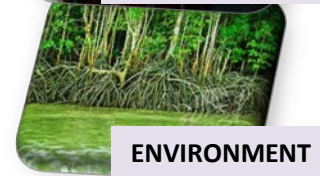
Policy Statement

"The security and sustainability of water resources shall be made a national priority to ensure adequate and safe water for all, through sustainable use, conservation and effective management of water resources enabled by a mechanism of shared partnership involving all stakeholders".

Policy Principle

- WATER RESOURCES
- WATER RESOURCES SUSTAINABILITY
- COLLABORATIVE GOVERNANCE

WATER FOR :



Conclusion

- i. Negeri Sembilan has sufficient water resources and based on study in 2016, it's raw water supply is sufficient up to year 2060.
- ii. Pollution at water sources especially in rivers are still under control and measures to implement effective monitoring and enforcement actions are continuously being carried out.
- iii. More engagement with the public to create awareness and tighter legislative action will be carried to sustain and preserve water resources for future generation.



THANK YOU



STATE GOVERNMENT OF NEGERI SEMBILAN