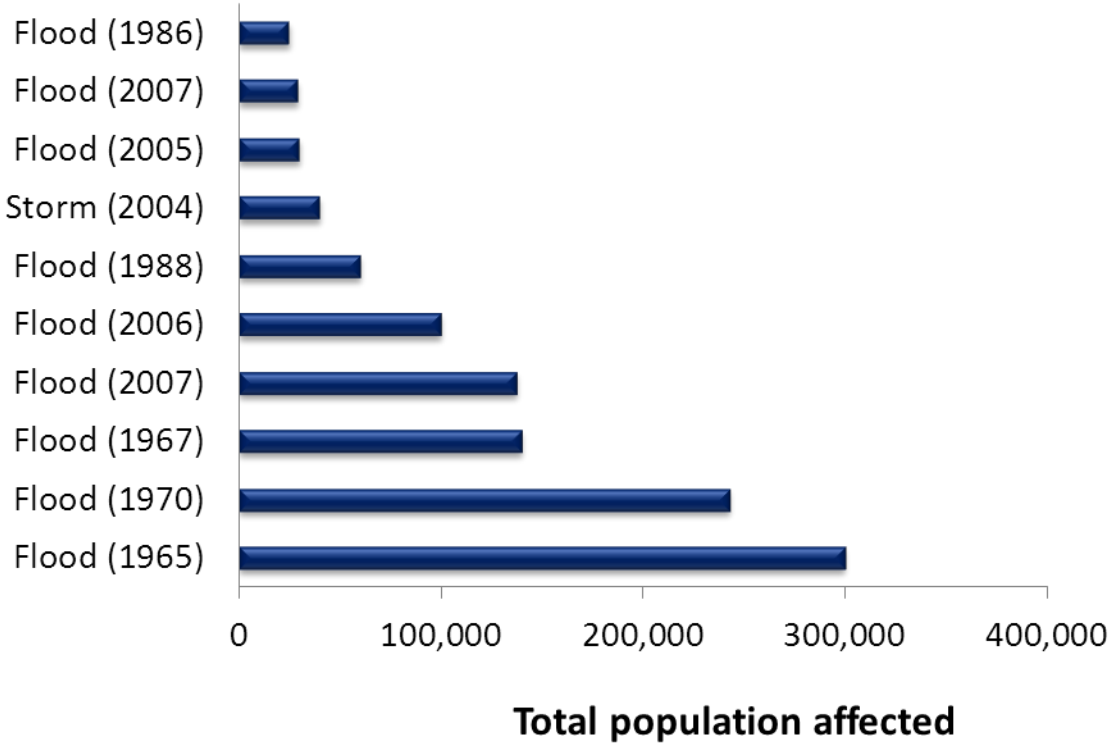
IMPACT OF CLIMATE CHANGE AND AND ADAPTATION PLAN IN MALAYSIA

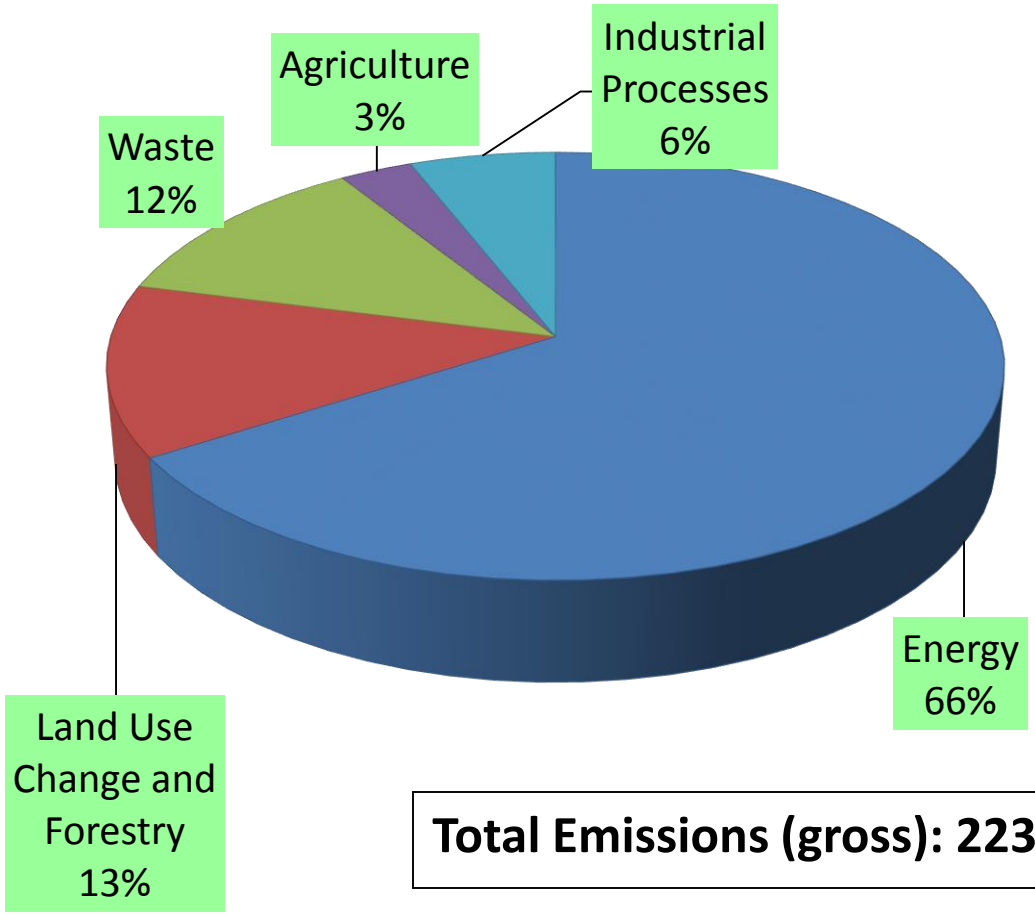
Extreme rainfall events

Top Natural Disasters in Malaysia for the period 1900 to 2012



(source: www.emdat.be/result-country-profile)

GHG INVENTORY IN MALAYSIA



Energy Sector:

- Power Generation (47%)
- Transportation (29%) and
- Manufacturing Industries (21%)
- Others i.e. residential, commercial, agriculture (3%)

Total Emissions (gross): 223.1 Mt CO_2eq

(Source:NRE MALAYSIA - NC2, 2010)

OBSERVATION OF CLIAMTE CHANGE IN MALAYSIA

- Temperature:
  - Increase mean surface temperature: Rate of warming based on 40 years record (1969-2009) increases from 0.6°C to 1.2°C per 50 years (*Source: MMD 2009*)
- Rainfall
  - Increased rainfall intensity -> 1-hour rainfall intensity (2000-2007) increase by 17% compared to 1970s values *(Source: JPS)*
  - "Above average" rainfall
    - In 2007: Massive floods in Batu Pahat, Johor Baru, Kluang, Kota Tinggi, Mersing, Muar, and Segamat ->Typhoon Utor
    - Flood losses ~ RM 1.5 billion

PROJECTION

Climate Parameter	Peninsular Malaysia [RegHCM-PM]	Sabah [RegHCM-SS]	Sarawak [RegHCM-SS]
Annual mean surface temp.	1.0-1.5°C [2050]	[2050] 1.3-1.7°C [2100] 2.9–3.5°C	[2050] 1.0-1.5°C [2100] 3.0-3.3°C
Max. Monthly Rainfall	[2050] +113mm(12%)	[2050] +59mm (5.1%) [2100] +111mm (9%)	[2050] +150mm (8%) [2100] +282mm (32%)

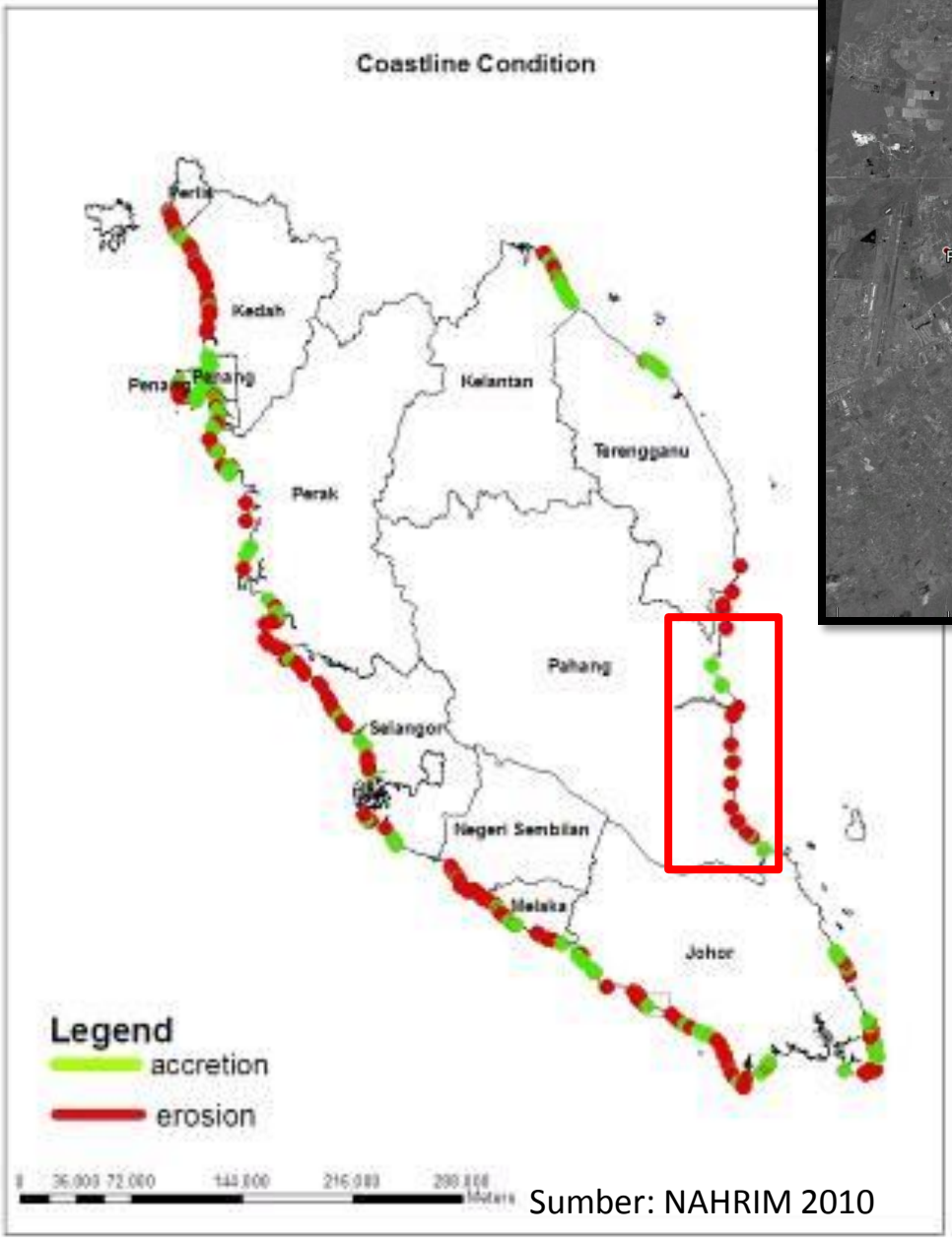
(Sumber: NAHRIM RegHCM-PM (2006), NAHRIM RegHCM-SS (2010))

SEA LEVEL RISE

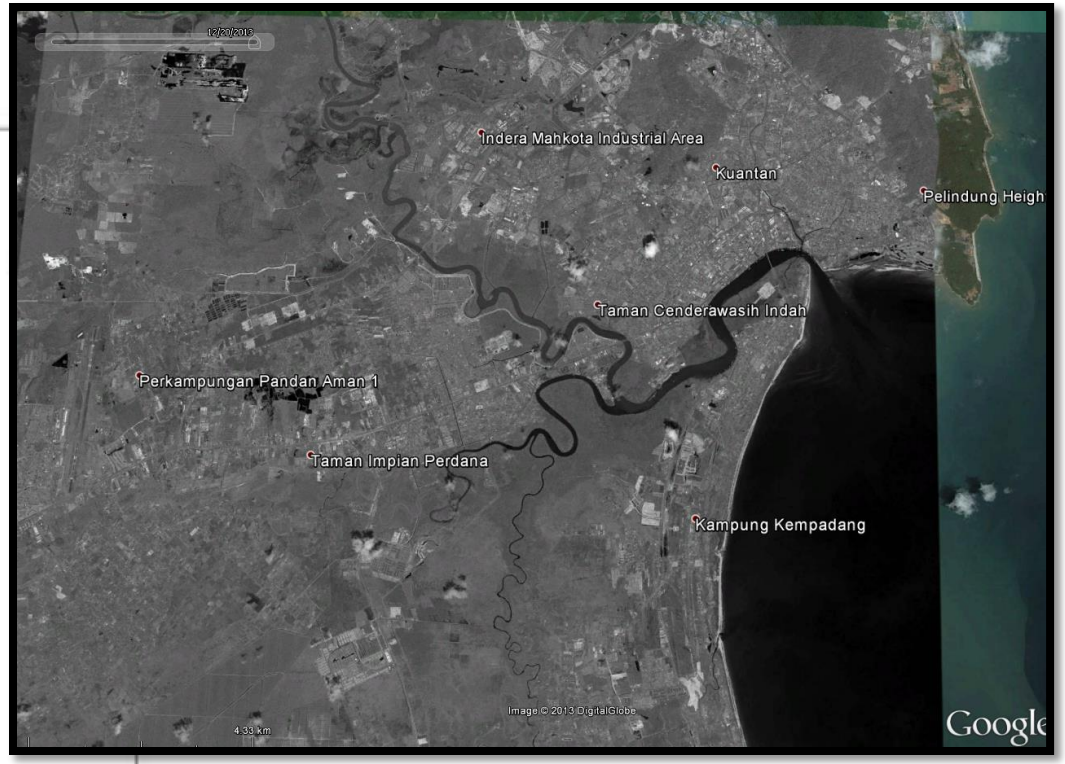
Erosion and accretion in Peninsular Malaysia for a period of 10 years

Negeri	Panjang Pantai (km)	Hakisan (km)	Penokokkan (km)	Stabil (km)
Perlis	20	12.70	3.95	3.35
Kedah	148	32.10	2.43	113.47
Pulau Pinang	152	13.09	15.49	123.42
Perak	230	79.40	14.91	135.69
Selangor	213	106.80	14.13	92.07
N. Sembilan	58	8.97	2.13	46.90
Melaka	73	17.16	0.89	54.95
Johor	492	101.64	69.13	321.23
Pahang	271	105.55	12.39	153.06
Terengganu	244	28.55	5.41	210.04
Kelantan	271	6.40	1.49	263.11
Jumlah (KM)	2172	512.36	142.35	1517.29
(%)	-	23.59	6.55	69.86

Status Perubahan garis pantai di Negeri Pahang



Sumber: NAHRIM 2010



SLR 2010

Sumber: NAHRIM & CHRL (2010).

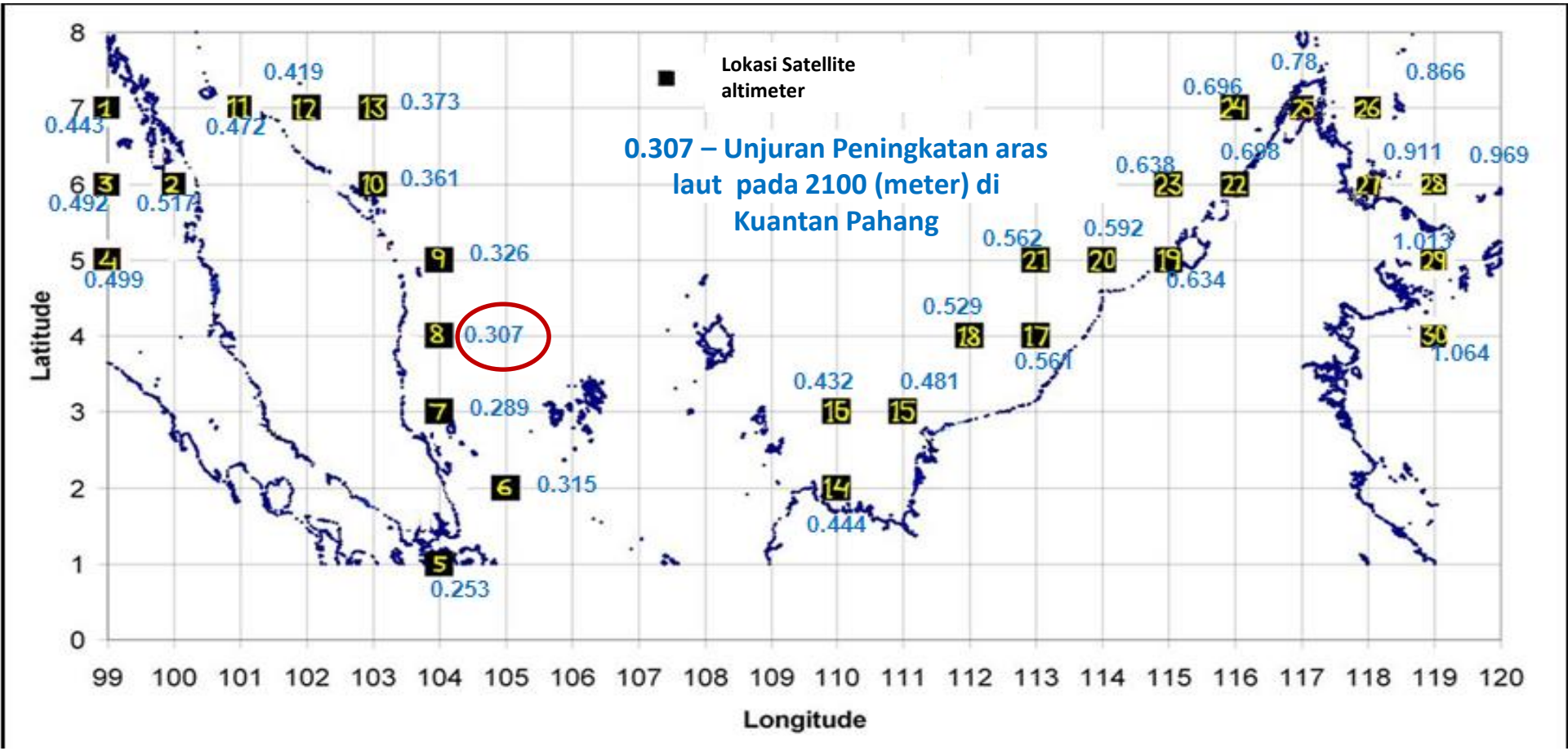
Jadual 1 : Kadar SLR (mm/yr) berdasarkan data satellite altimeter

No. Stesen	Lokasi	latitut	longitud	Kadar Kenaikan Aras Laut (mm/tahun)
S1	Perairan Laut Andaman	7	99	5.02
S2	Sempadan Malaysia (Perlis-Thailand)	6	100	6.08
S3	Perairan Selat Melaka	6	99	5.70
S4	Sempadan P.Pinang - Perak	5	99	6.45
S5	Selat Johor	1	104	3.87
S6	Perairan Mersing	2	105	3.68
S7	Pulau Tioman	3	104	2.88
S8	Persisiran Pantai Pekan	4	104	2.73
S9	Cherating	5	104	2.78
S10	Pulau Perhentian Terengganu	6	103	3.46
S11	Perairan Thailand	7	101	5.20
S12	Sempadan Malaysia (Kelantan–Thailand)	7	102	4.29
S13	Perairan Kelantan	7	103	3.49
S14	Perairan Kuching dan Bau	2	110	4
S15	Perairan Sarikei-Sibu	3	111	4.13
S16	Luar Persisir Sarawak	3	110	3.82
S17	Perairan Bintulu	4	113	4.74
S18	Perairan Mukah	4	112	4.51
S19	Perairan Brunei	5	115	5.37
S20	Perairan Miri	5	114	5.11
S21	Luar Persisir Miri - Brunei	5	113	4.84
S22	Persisiran Pantai Kota Kinabalu	6	116	5.23
S23	Perairan Labuan	6	115	5.27
S24	Teluk Marudu, Kota Marudu-Kudat	7	116	5.17
S25	Perairan Pitas	7	117	5.06
S26	Laut Sulu	7	118	5.25
S27	Beluran	6	118	5.57
S28	Perairan Sandakan	6	119	5.64
S29	Perairan Lahad Datu	5	119	6.28
S30	Perairan Tawau	4	119	7

Study on SLR 2010

Sourcer: NAHRIM & CHRL (2010).

SLR Projection for the year 2100



A. Change in Water Quantity/Discharge

Water excess (extreme rainfall, flows)

- Increase in severity of floods
- Increase in soil erosion -> scouring of drainage structures and sedimentation in rivers

Water shortage (drought)

- Reduced inflows to reservoirs
- Reduced stream-flows -> affect raw water abstraction
- Reduced recharge of groundwater

B. Change in Water Quality

Water excess (extreme rainfall, flows)

- Increase in pollution: litters, nutrients and sediments

Water shortage (drought)

- Concentrated pollutant level in streams

6 NATION The Star, FRIDAY 12 OCTOBER 2012

12 Oct 2012

Uncollected rubbish will give rise to floods, Selangor warned

SHAH ALAM: Uncollected rubbish in several areas of the state is worrying and can result in massive floods if the relevant authorities continue to ignore the issue, said Selangor Barisan Nasional coordinator Datuk Seri Mohd Zin Mohamed.

The state Barisan Nasional Rakyat Service Centre, he said, had received many complaints from disgruntled residents on this matter.

"Barisan can only highlight this issue and push for something to be done. The state government should not politicise this anymore as they are ruling the state.

"The people should be their main priority and not anything else," he told reporters here yesterday.

Mohd Zin also claimed that the 50 garbage compressor trucks recently purchased by the state government were yet to be in operation.

"My source told me that these compressors have not passed the checks by the Road Transport Department. It is now obvious that the state (government) has wasted RM14.5mil of the people's money."

The compressors were purchased from China for the Shah Alam City Council and Petaling Jaya City Council.

22 NATION The Star, FRIDAY 12 OCTOBER 2012

12 Oct 2012

'Selangor rivers polluted'

Scientist worried urbanisation threatening state's main water supply

KUALA LUMPUR: Most rivers in Selangor which are the main sources of water supply in the state have been found to be polluted and could potentially become a serious threat to the availability of this basic necessity.

Universiti Putra Malaysia Environmental Forensics Research Centre unit head Dr Hafizan Juahir said the clean water sections of the rivers were getting shorter due to development, especially for housing.

For example, he said, the length of Sungai Langat, the leading source of raw water in the state, was 149.3km -long but the clean water section had been reduced to only 49.3km while the remaining were polluted.

"The entire length of Sungai Langat has entered the Class 3 and 4 categories of being polluted and if the quality worsens, it can be considered a dead river," he said.

He said that in the Hulu Langat district, the situation was more serious as there was too much development especially condominiums, shop houses while population increase had also negatively impacted water quality through washing and domestic waste dumping in the river.

"I am a scientist and a researcher. I speak based on facts of water quality. I see the details of every parameter of water quality or water quality' trend index. There is very little clean water left," he added.

Dr Hafizan said many people were confused about the sources of water and that because the country had frequent rain to fill dams, they believed Malaysia need not worry about its sources of water.

"The dams can only hold water for treatment before we supply it to the consumers. But we should examine closely where is the water from? The source of waste is from the river.

"If we only hope for rain, it won't be sufficient to meet the increasing demand of urbanisation. It is inevitable that demand for clean water will keep increasing," he said.

Dr Hafizan said as pollution worsened, the cost of treating water would become more expensive and this would raise the question of whether the Government could continue providing subsidy.

On the Selangor Government's water policy which emphasised restructuring the water industry rather than overcoming problems such as pollution of water sources and the lack of treated water capacity, Dr Hafizan said: "Without taking into consideration how to control water source pollution, increasing plant capacity and clean water, restructuring would not amount to anything."

He also expressed support for the plan to source water from Sungai Pahang for Selangor, especially since water from Sungai Pahang was not as polluted as rivers in Selangor.

Impact on Water Quantity

I. **Physical changes** such as increased water temperature, more stable vertical stratification and less mixing of water of deep-water lakes,and changes in water discharge, affecting water level and retention time;

II. **Chemical changes**, such as increased nutrient concentrations and water colour (DOC), and decreased oxygen content

III. **Biological changes**, including northwards migration of species and alteration of habitats, affecting the structure and functioning of freshwater ecosystems.

Impacts of Excessive Flowing Water on Water Quality

1. Increased water colour due to increased input of humic substances as dissolved organic carbon (DOC) from the catchment.

2. Increased nutrients. Increased mineralisation and releases of nitrogen, phosphorus and carbon from soil organic matter and increased run-off and erosion will result in increased nutrient loads.

3. Reduced oxygen content. Increased biological respiration rates result in lower dissolved oxygen concentrations, particularly in summer low-flow periods and in the bottom layers of lakes. Higher temperature and lower oxygen concentrations will cause stress and may reduce the habitats in the lakes and rivers

Impact on Water Quality

Nutrient Concentration and Pollutant Loading

High temperature, Intense rainfall
Increase surface and sediment runoff

algal bloom

macrophyte bloom

Hazardous Substances in the waterway

- Affecting the **distribution** and **mobility** of **hazardous substances** in freshwater systems.

- Increase air and water temperature lead to changes migration and biological uptake of atmospherically-transported toxic organic pollutants

Example :

- Loading of hazardous substances may increase due to

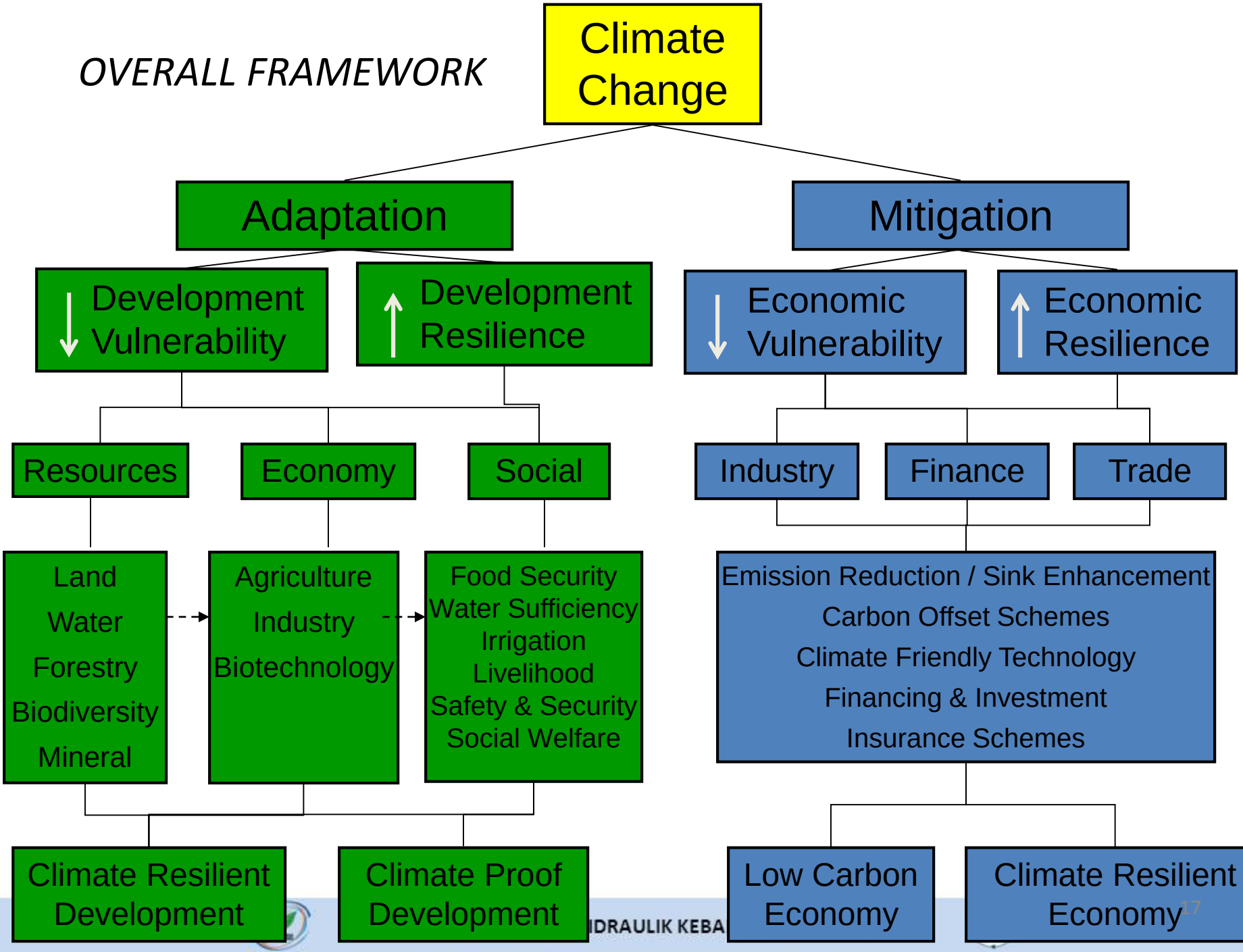
I. sewage overflow,

II. higher pesticide use and run-off due to heavy rains,

III. higher temperatures increase the degradation rate of some pesticides and organic pollutants, which may reduce their concentrations in rivers and lakes.

ADAPTATION

OVERALL FRAMEWORK

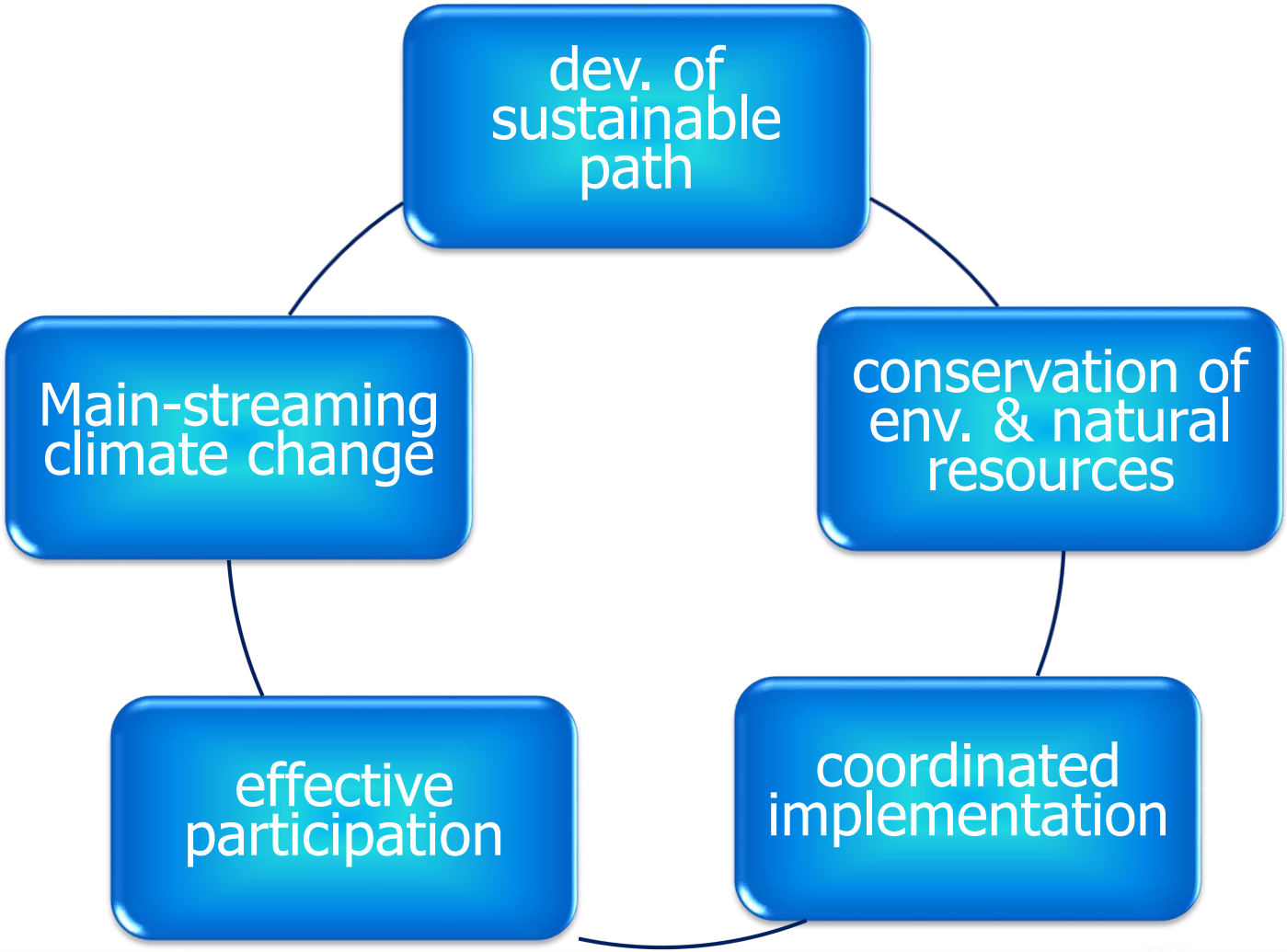


Adaptation Measures

to provide greater coherent for addressing climate change:

- ↗ information sharing to enhance and develop National Climate Services;
- ↗ design specifications involving water management infrastructure should take climate change projections as key factor;
- ↗ Integrated Shoreline Management Plan (ISMP) should be formulated and supported by appropriate legislative;
- ↗ re-designing cities and towns to ensure sustainable regions with green townships, low carbon environment;
- ↗ promote renewable energy (RE) to overcome the initial barriers & improving public transportation as means to control emissions from vehicles;
- ↗ Enhance R&D and technology transfer & formulation of NGTP and NPCC

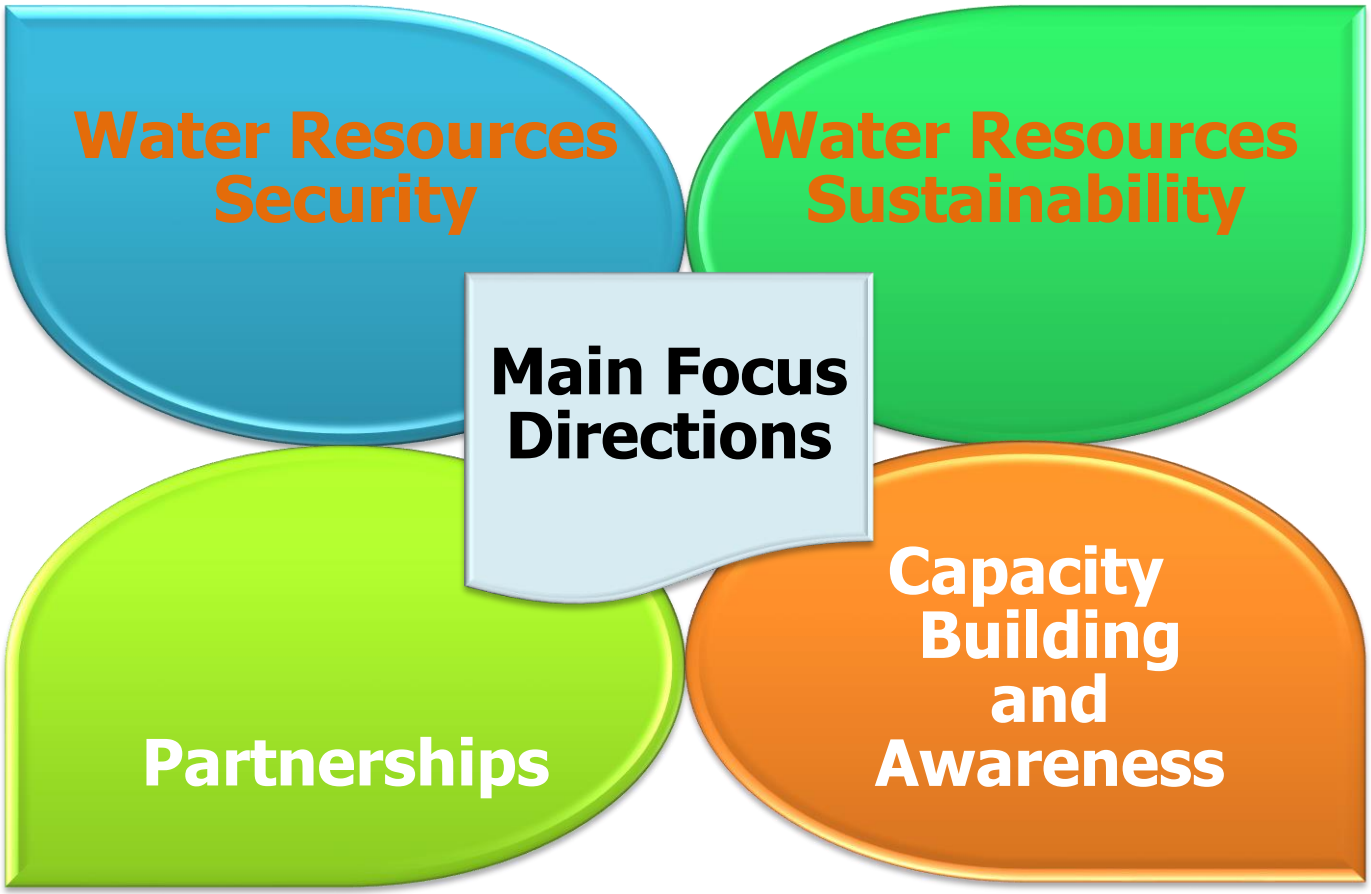
National Policy On Climate Change
..5 main principles..



National Green Technology Policy
..4 main pillar..

- Officially launched by the Honorable Prime Minister of Malaysia in July 2009;
- **Policy statement** - Green technology shall be a driver to accelerate the national economy and promote sustainable development;
- **Main Pillars**:
  - ↗ **Energy** - seek to attain energy independence & promote efficient utilization
  - ↗ **Environment** - conserve and minimize the impact on the environment
  - ↗ **Economy** - enhance the national
  - ↗ economic development through the use of technology
  - ↗ **Social** - improve the quality of life for all
- **Main initiative** – to support GreenTech in mitigation and adaptation which are to curtail GHG and increase carbon sinks; and to reduce vulnerability and build resilience

National Water Resources Policy 2012*
..4 key core area..



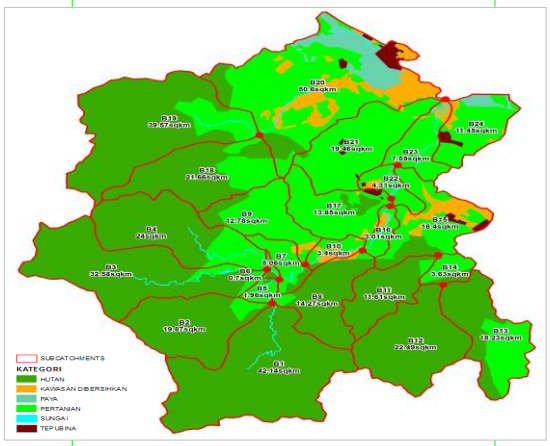
*Note: * launched by Deputy Prime Minister on 24 March 2012 in the opening ceremony of National World Water Day 2012*

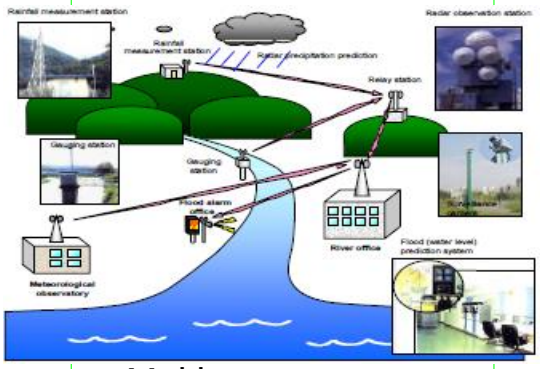
Implementation Framework

Adaptation on Water Resources

Kawalan Air Larian Permukaan – Pengurusan Air Hujan

Pelan Pengurusan Lembangan Sungai dan Guna Tanah





Maklumat semasa: Sistem Ramalan dan Amaran Banjir

Kawalan Air Larian Permukaan – Kapasiti Penyimpanan (Empangan)

Rain Water Harvesting

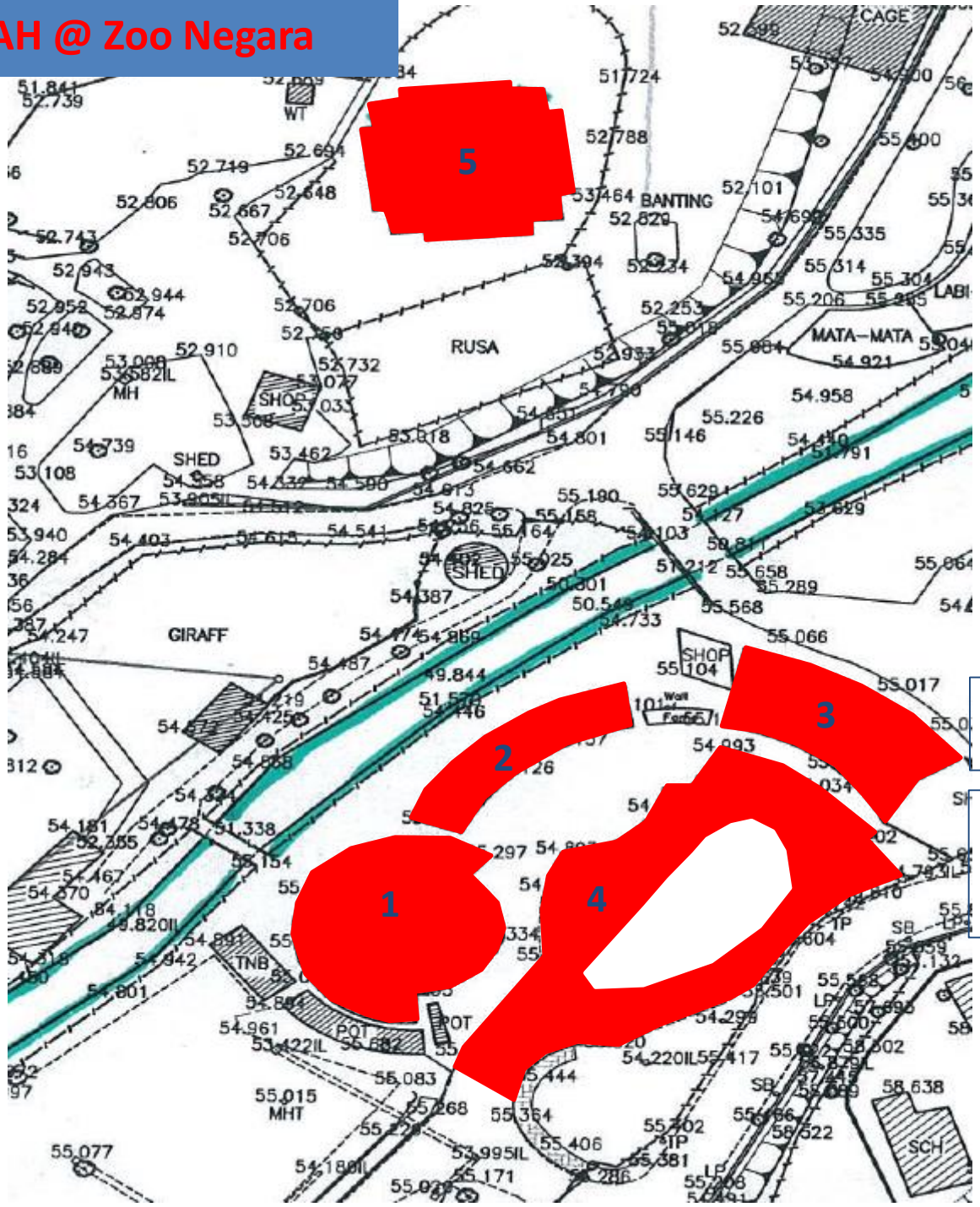
5000m² of rainwater catchment area

500m³ underground water tank

Pump system to pump rainwater to lake through a water feature

- **RWH for portable uses.**
- **Storing 500m³ for the daily consumption of 30m³.**
- **Rain water collected from a roof top and parking area - 5000m².**

SPAH @ Zoo Negara



Catchment area:

Roof:

[1] Admin office = 1134 m^2

[2] Ticket counter = 300 m^2

[3] Entrance = 720 m^2

[5] Surau = 1000 m^2

Surface runoff:

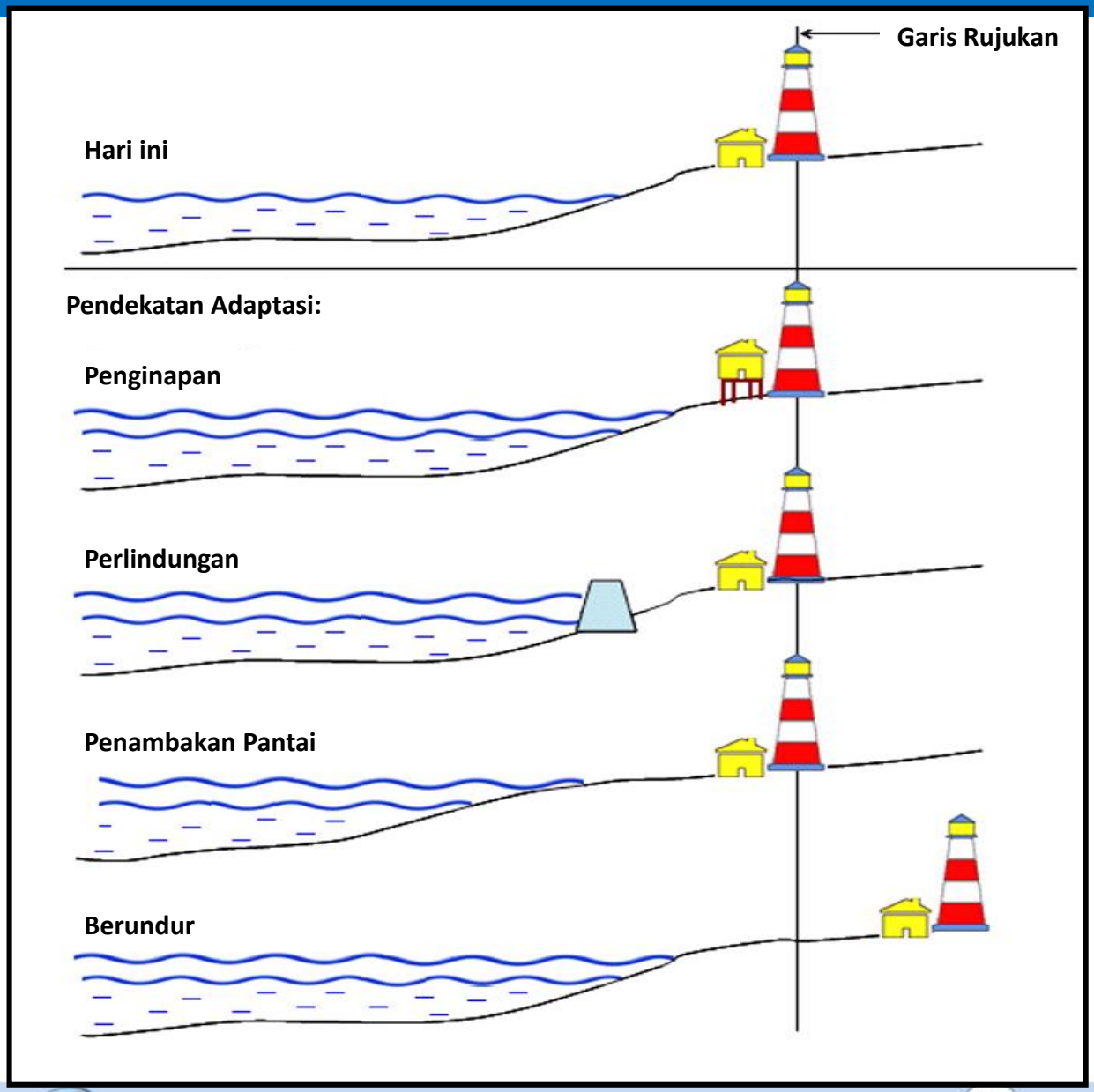
[4] VIP parking lot = 1920 m^2

Total = 5074 m^2

Daily water demand = 50 m^3/d
(losses from evaporation & seepage)

Volume for
Rainwater = 30 m^3/d
Groundwater = 20 m^3/d

SLR



Sumber: DID Manual, 2009

Platform Elevation

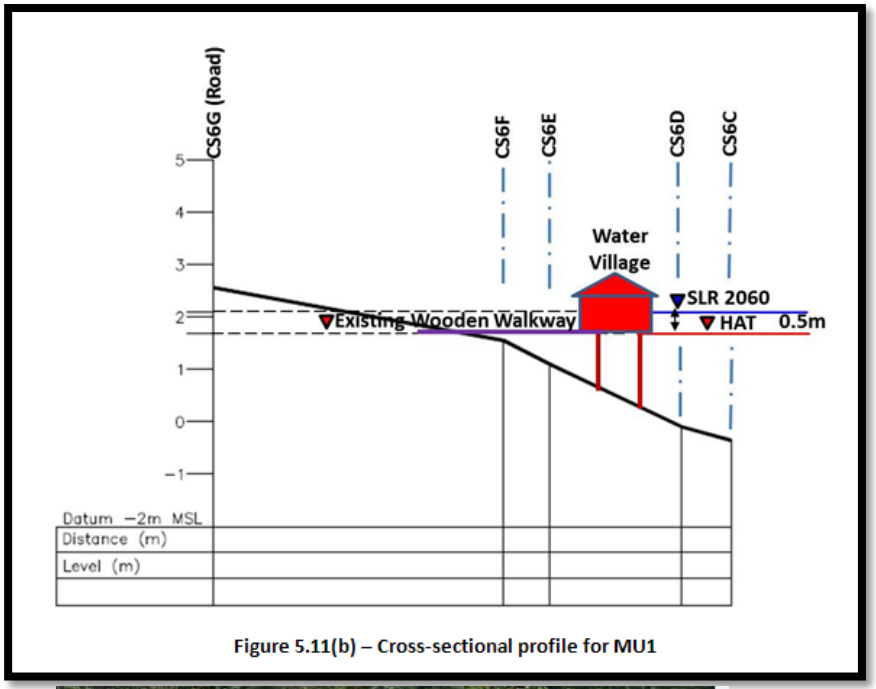


Figure 5.11(b) – Cross-sectional profile for MU1

Points	Latitude	Longitude	MSL Height (m)	Description
SAND	N 5° 50' 32.65519"	E 118° 07' 14.10183"	79.253	MyRTKnet GPS CORS station
CS3A	N 5° 50' 19.06140"	E 118° 07' 18.52206"	1.691	Located at the edge of the loading jetty
CS3B	N 5° 50' 19.60156"	E 118° 07' 18.60090"	2.602	Located at the roadside
CS3C	N 5° 50' 20.85568"	E 118° 07' 17.97333"	2.545	Located at the roadside
CS3D	N 5° 50' 22.19281"	E 118° 07' 16.69635"	2.303	Located at the parking lot nearby Sandakan central market

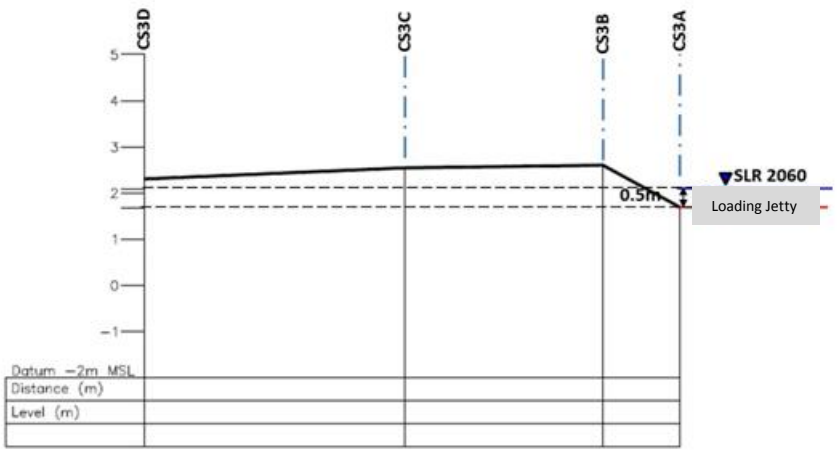


Figure 5.15(a) – Cross-sectional profile for MU5 at the loading jetty at Market Building

The Way Forward

- Continued Research and Development into Vulnerabilities, Adaptive Needs, and Innovative and Cost-effective Mitigation Measures;
- Coordinating Roadmaps to ensure Cross-cutting Issues are Addressed in a Holistic and Comprehensive manner;
- Enhanced Engagement with Local Communities and Corporate Entities;
- Development of a Carbon Disclosure Programme for the Private Sector, and,
- Continued Active Engagement at the International Level to Facilitate Sustainable Development in line with National and Global Objectives.
- Mainstreaming climate change adaptation options into planning and development .

Initiatives at the National Level

- Endorsement of National Climate Change Policy and National Green Technology Policy
- Integration of renewable, energy, energy efficiency and solid waste management in the 10th Malaysia Plan
- Voluntary carbon offset scheme involving corporate sector
- Provide Green Technology Financing Scheme (GTFS)
- Formulated Low Carbon Cities Framework & Assessment System (LCCF)
- National Water Resources Policy 2012