Asian Monsoon Region

ICHARM International Symposium

"Local Practices of Integrated Flood Risk Management under Changing Natural and Social Conditions"

Experiences in Asian Monsoon Region

Dato' Paduka Ir. Hj. Keizrul bin Abdullah
Member, ICHARM International Advisory Board
30 September 2008

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Floods are an integral part of the Asian landscape

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THE NATIONAL ENGLISH LANGUAGE DAILY
3659 Wednesday October 24, 2001 24 Pages, VNĐ4500

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es Jiang to Hà Nội. — VNA/VNS Photo

VN, Laos to broaden judicial co-operation

HÀ NỘI — Việt Nam and Laos yesterday vowed to boost co-operation and training in their judicial systems.

Deputy Prime Minister Nguyễn Tấn Dũng said lawyers and judges would increase their exchange of information and experience, in a bid to improve their performances in court.

Legal co-operation was just one of a range of fields slated for expanded co-operation, Dũng told visiting Lao Justice Minister Khamoune Boupha in Hà Nội.

Dũng praised the fine development of the special friendship between the parties, governments and people of the two neighbouring nations.

He said leaders on both sides of the border had tried their hardest to fulfil the pledges made i bilateral pacts and agreements.

Justice Minister Khamoune ar rived here on Monday to meet hi Vietnamese counterpart, Justic Minister Nguyễn Đình Lộc.

He told Dũng he was please with the results of these talks.

The two justice ministers re viewed the implementation of th Minutes of Co-operation for 200 01 and discussed measures to im prove their ties in the future.

Both ministers vowed to focu on the control of local courts an surveillance of th implementation of civil cou decisions.

The Vietnamese Justice Min istry proffered continued assist ance to Laos in training legal offi cials in a range of courses. — VN

Central provinces count cost of heavy rains, death toll mounts

Keeping afloat: Residents of Hội An in Quảng Nam Province navigate the streets. — VNA/VNS Photo Công Điển

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Wide swathes of Philippines still under water

MANILA, Sat. — The death toll from recent floods has climbed to 25, with wide swathes of the northern Philippines still under water, disaster officials said today.

The floods, triggered by a week of heavy monsoon rains, had affected about 1.3 million people in metropolitan Manila and the main island of Luzon, Social Welfare Secretary Corazon Soliman said, appealing for relief supplies, clothes, food and bottled water.

The National Disaster Co-ordinating Council said many roads remained under water or were blocked by landslides.

Army soldiers travelled in rubber boats to flood-soaked villages in Tarlac province today to rescue children, women and the elderly trapped in their homes. Some of the men told the soldiers they were staying behind to guard their property.

Air force helicopters had rescued dozens of people from the rooftops of their homes in Tarlac.

Residents waded through knee-deep swift-flowing floodwaters in the town of Paniqui in Tarlac.

The disaster council said in a report the death toll had risen to 25, with most of dead drowning in floodwaters and swollen rivers and creeks.

The report said the rice-growing provinces of Pangasinan and Pampanga were the worst hit, with more than 600,000 people affected.

Pangasinan officials declared yesterday their province under a state of calamity, which allows them quick access to emergency funds for relief and rehabilitation.

The Office of Civil Defence said thousands in several northern provinces had been evacuated and others were trapped in their homes by the sudden rise of the water overnight Thursday when authorities were forced to open gates of dams north of Manila to prevent damage.

Meteorologists said seasonal rains were worsened by Typhoon Aere, which hit the northern Philippines before heading to Taiwan and southeastern China, and Typhoon Chaba. — AP

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Historical site of Ayuthaya, Thailand

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Johor, Malaysia, Jan 2007

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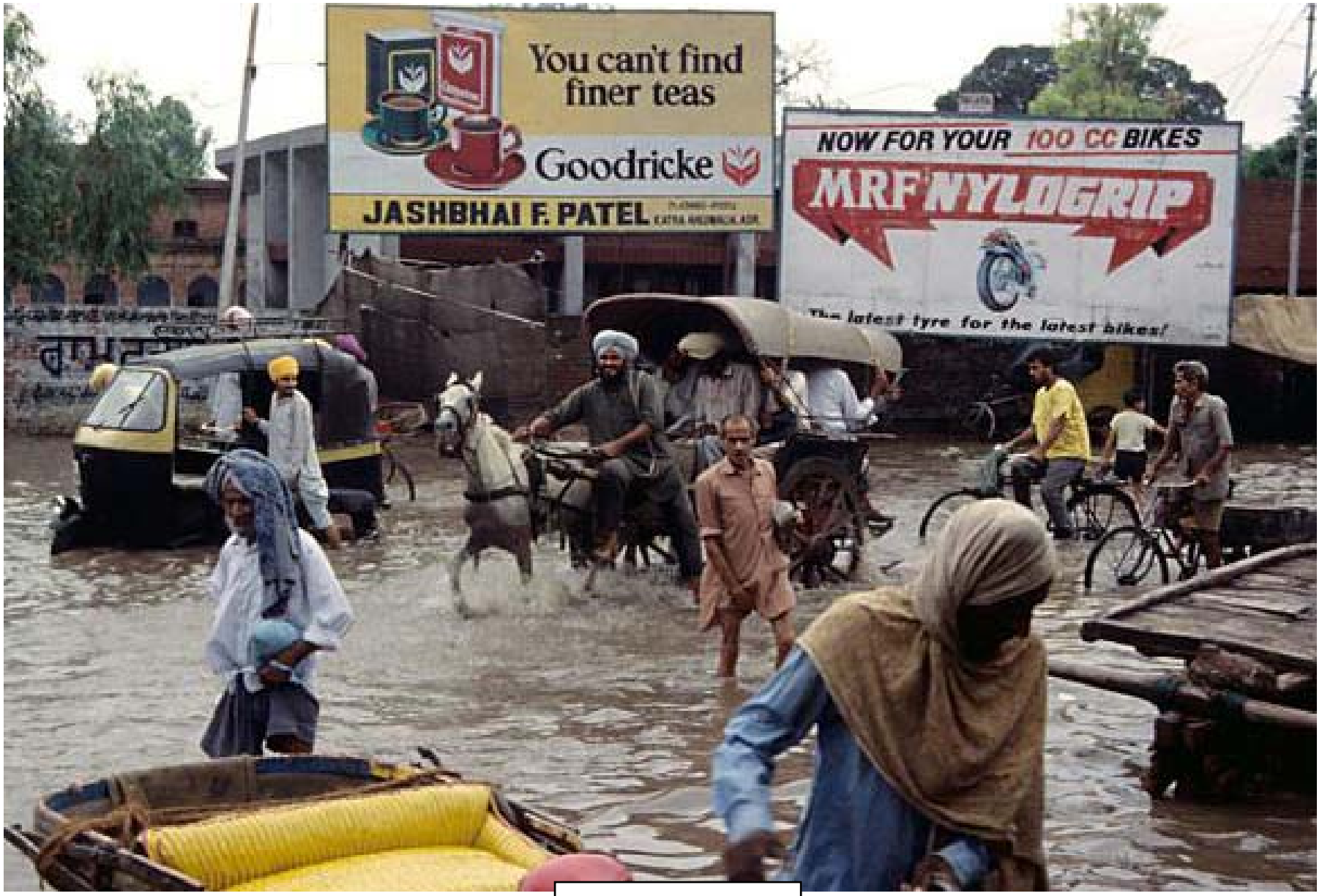

India

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India

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China

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Pakistan

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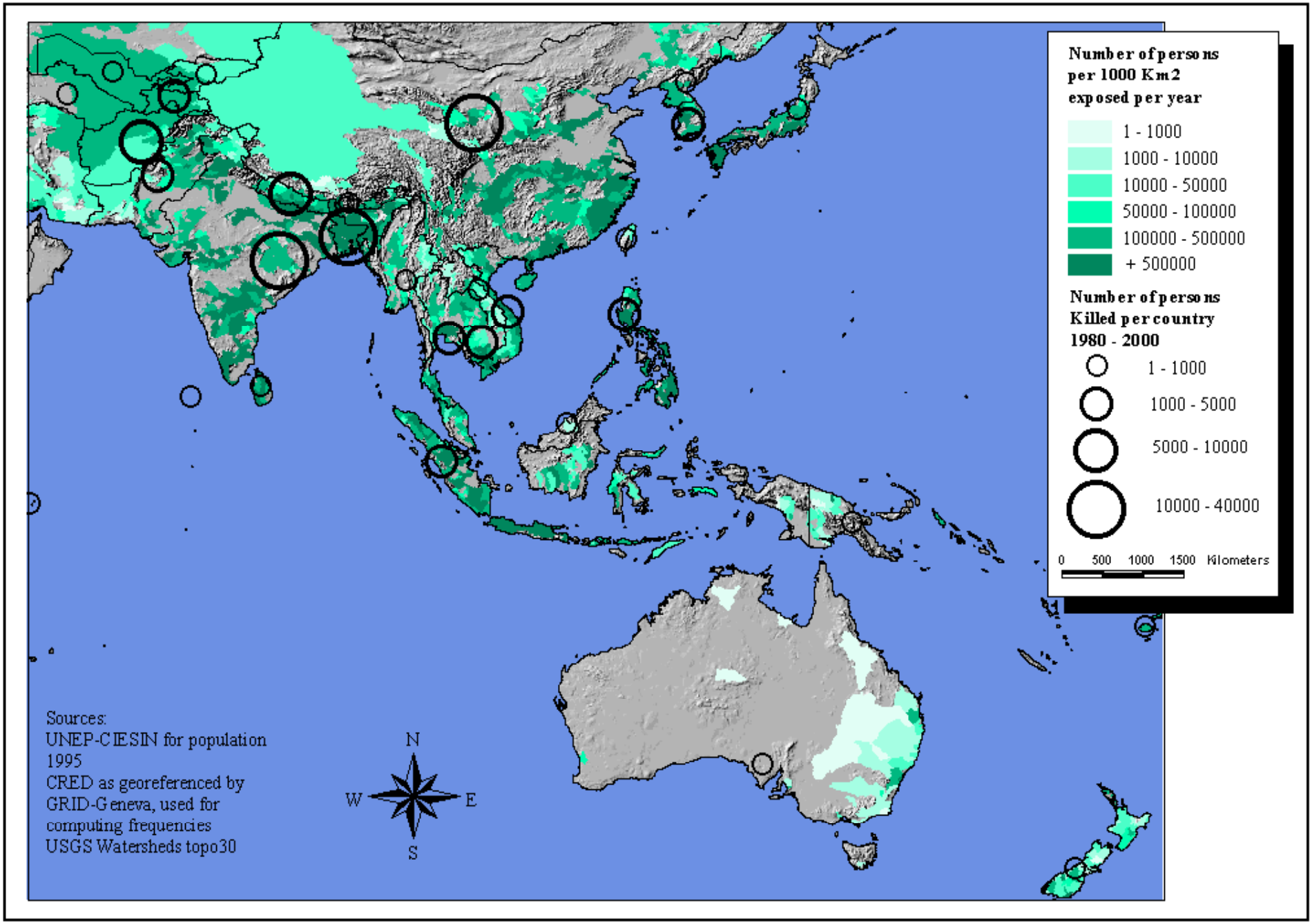
Bangladesh

Density of persons exposed to Flood in Asia and Pacific



Cartography and analysis UNEP/DEWA/GRID-Geneva, November 2001

Asian Monsoon Region

Outline of Presentation

I. Floods in Asian Monsoon Region

II. Changing Conditions

III. Need for Sustainable Approach

IV. New Approaches to Manage Floods

V. Conclusion

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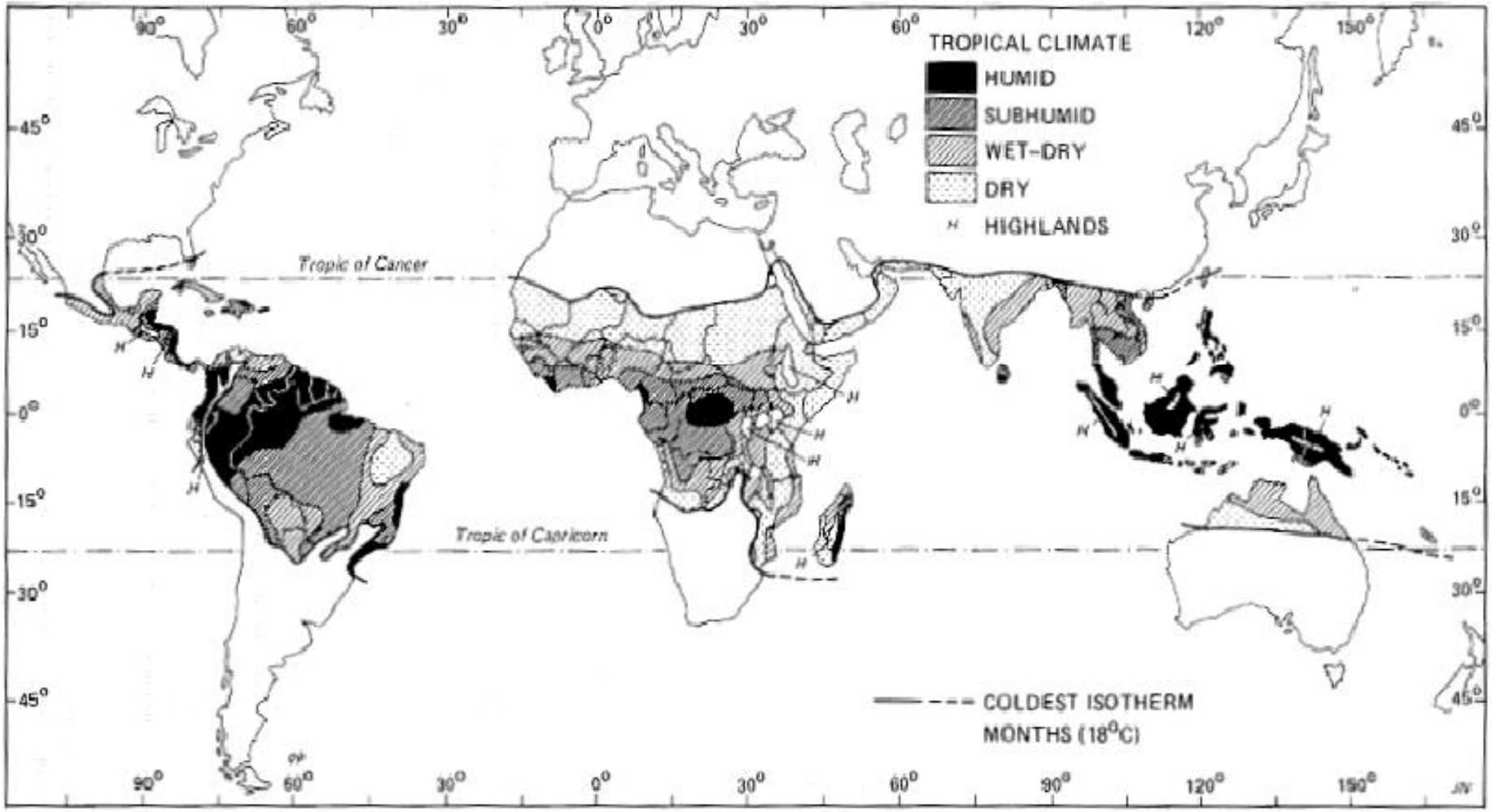
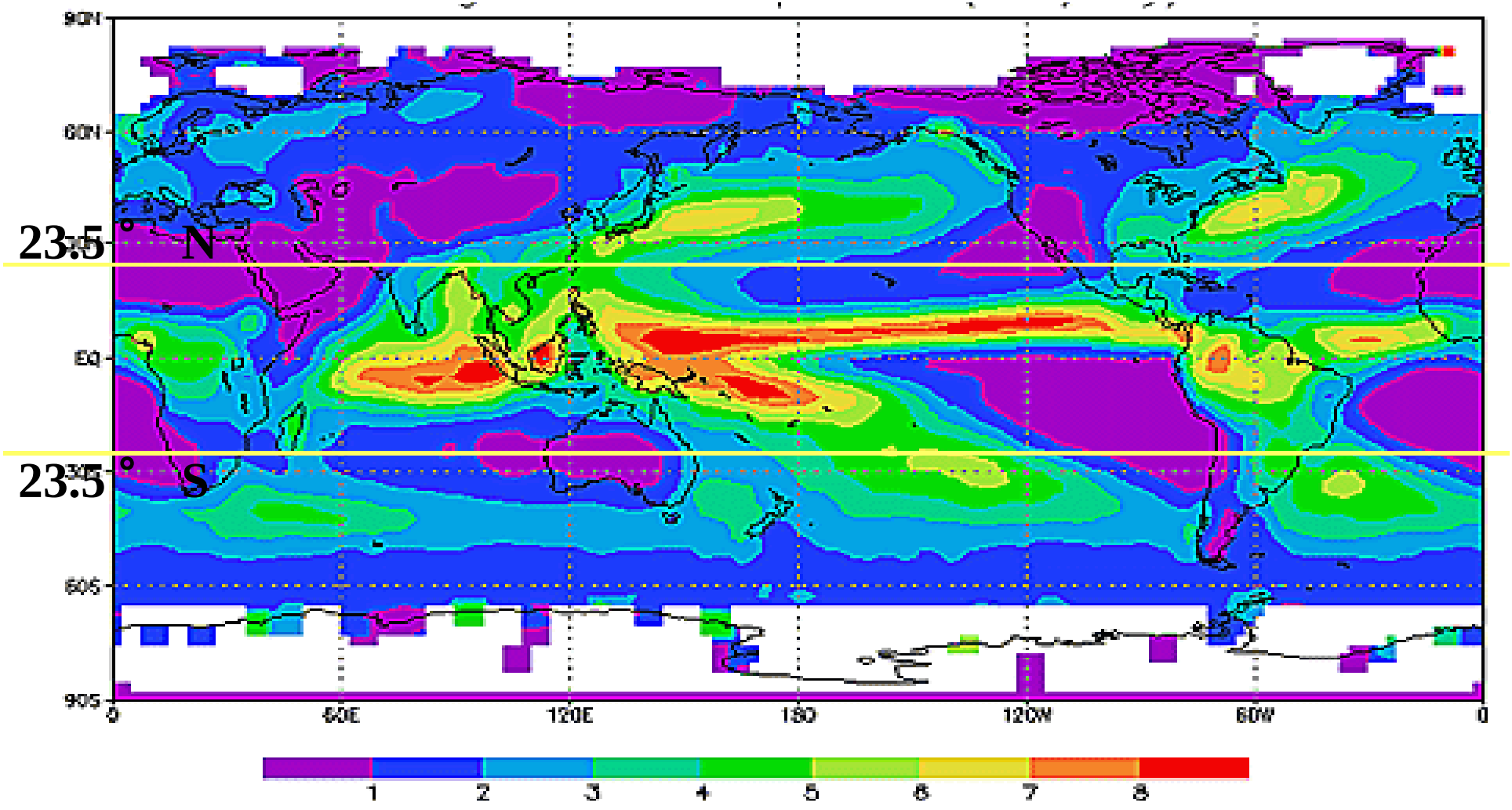


Humid Tropic Region

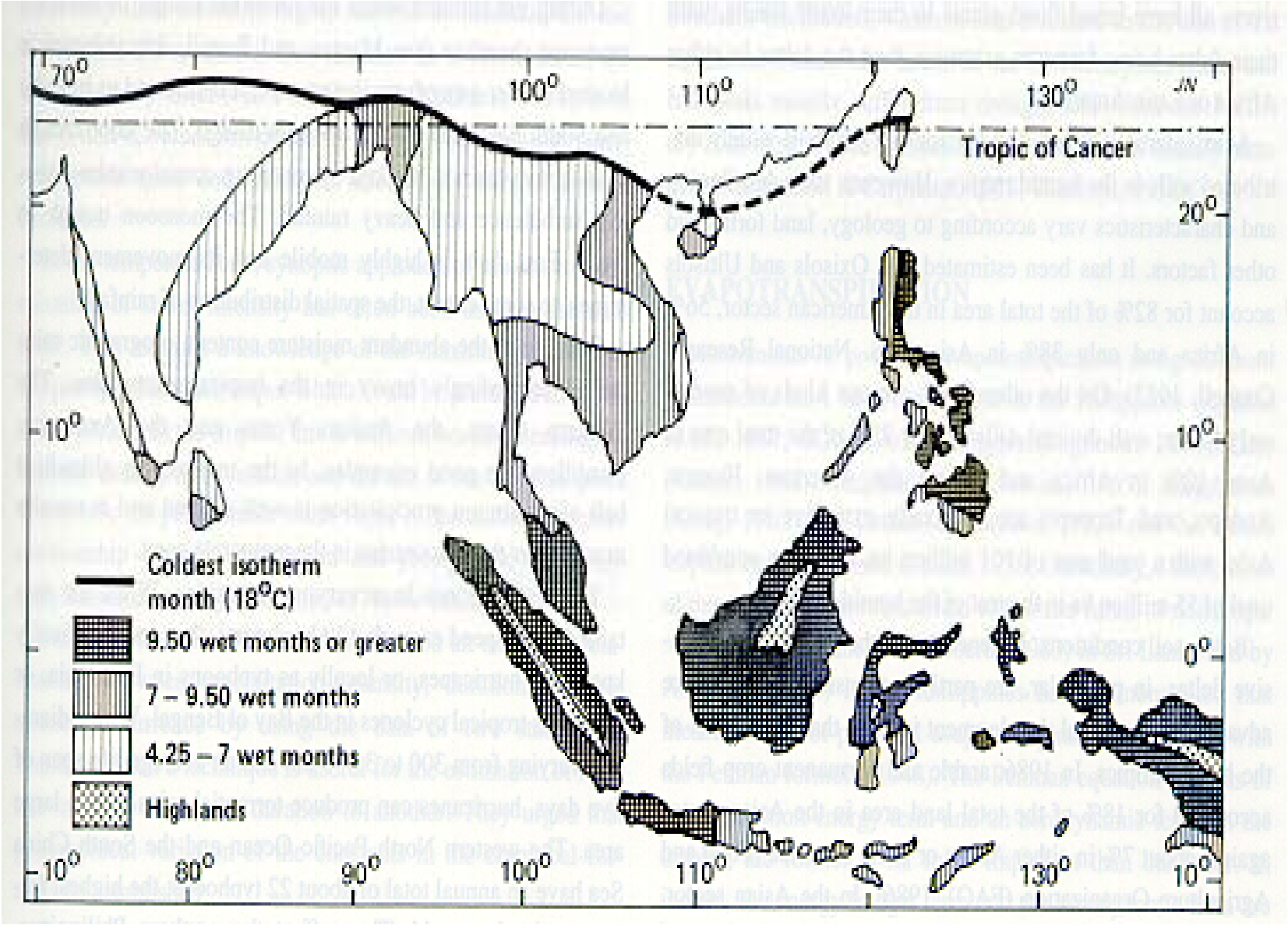
Between 23.5 ° N & S of Equator

Monthly precipitation of > 100 mm for 4½ months

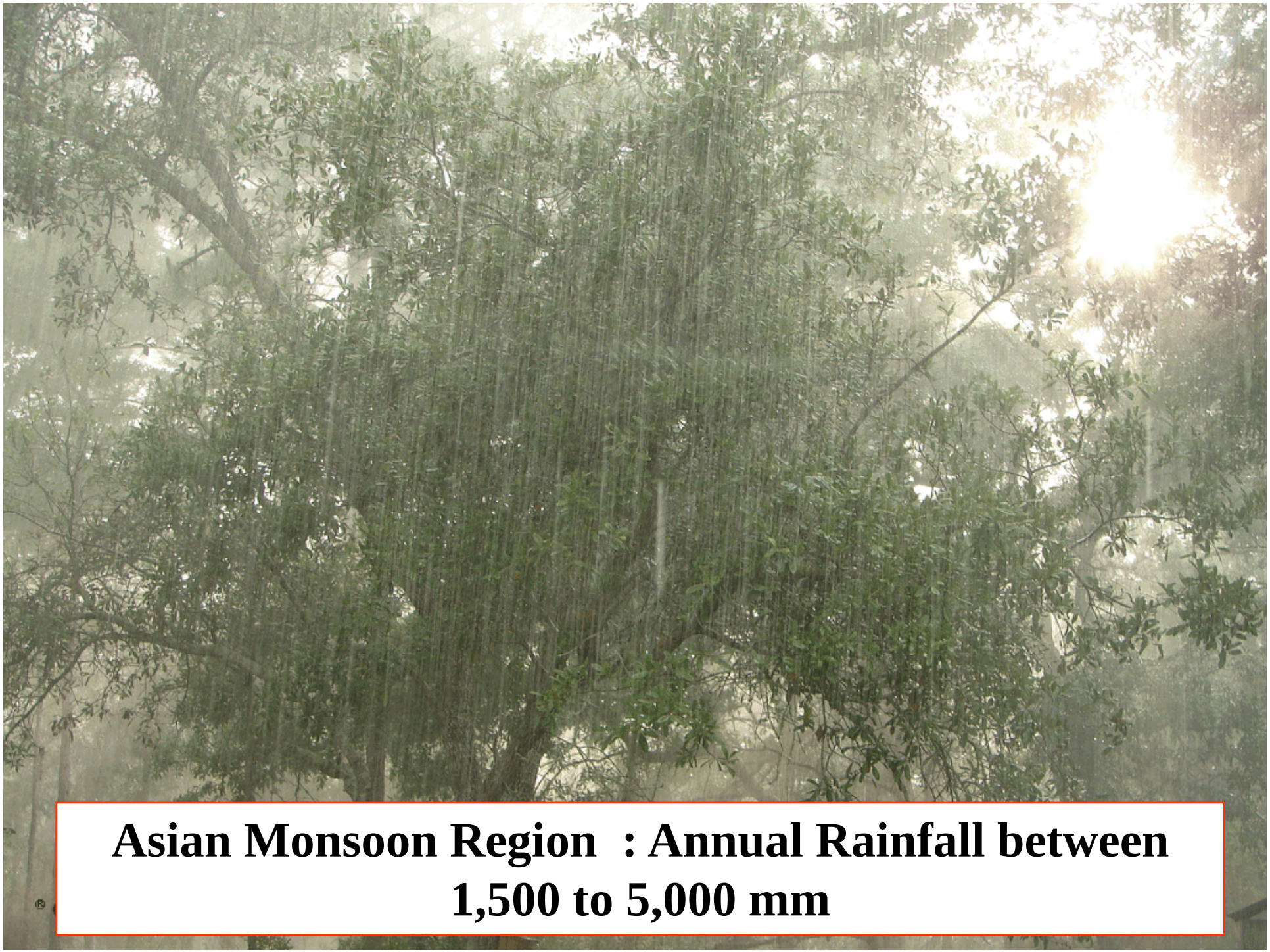
HUMID TROPICS – 23.5ºN & S OF THE EQUATOR



Annual Average Precipitation mm/day (1988 -1996)



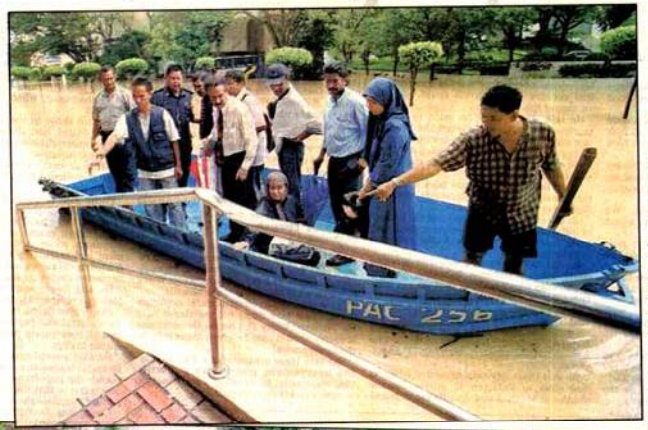
Asian Monsoon (Humid Tropic) Region



Asian Monsoon Region : Annual Rainfall between 1,500 to 5,000 mm

Water, water, water everywhere

NST pictures by Nushairi Nawi, Mokhsin Abidin, Syaharim Abidin and Amirudin Sahib



BOAT PEOPLE ... A City Hall rescue squad ferrying office workers who were stranded along Jalan Melaka, to safety.

IN DISTRESS ... Office workers in Jalan Melaka had to wait hours for the flood waters to recede before being able to head home after work.

SAFETY FIRST ... Office workers on board a boat being escorted to higher grounds by rescue personnel.

HELPING HANDS ... Two rescue team members escorting a woman across the flooded street along Jalan Ampang.

ALTOGETHER ... Members of City Hall's rescue squad and passers-by helping to push one of the many cars which were caught in the floods to higher grounds

NOT SPARED ... Motorcyles parked along Jalan Tun H.S. Lee were nearly submerged

Several hours of heavy rain and KL almost comes to a standstill

By Adrian David and V. Ramanan
news@nstp.com.my

KUALA LUMPUR, Mon. — In a near repeat of the incident in April this year, the city was again in chaos for several hours today, after a torrential downpour caused flash floods and traffic jams.

Gridlocks were caused by floods in major roads such as Jalan Ampang, Jalan Datuk Keramat, Jalan Tun Perak, Jalan Yap Kwan Seng, Jalan Melaka, Jalan Dang Wangi, Jalan Sultan Ismail, Jalan Tun H.S. Lee and Jalan Masjid India in the city, and Jalan Gasing and the Federal Highway in Petaling Jaya.

The downpour, which began about 2pm and lasted for three hours, caused sections of the roads to be submerged, making them unpassable to motor vehicles. Several cars were also stalled, while traffic lights went out at some of the junctions.

Water also entered the basements and several offices located on the ground floor of the low-lying buildings.

Sales executive Raymond Tan said he had gone to pick up a client near the Texas Instruments factory in Datuk Keramat to send him to the Concorde Hotel in Jalan Sultan Ismail when he encountered the jam along Jalan Ampang. He added that the Concorde Hotel, which is prone to floods, had an electrical failure when they arrived.

"The area around Datuk Keramat near the light industrial factories was also flooded," he said.

In Brickfields, parts of Jalan Sultan Abdul Samad and Lorong Sultan Abdul Samad were flooded, causing minor inconviences for parents and schoolbus operators to pick students from Sekolah Kebangsaan La Salle, Brickfields.

Many of the children were seen playing in the ankle deep water, while waiting to be picked up.

Volunteers were also seen sweeping away flood water at the entrance of the Our Lady of Fatima church opposite the school.

A regular church goer, Lucien Wijesuria said it was quite normal for the church to get flooded when there was a heavy downpour.

"Whenever the Sungai Klang bank overflows, the church gets affected. We have been complaining about it for a long time now, but the authorities don't respond," he said.

Other low lying areas in the Federal capital were also flooded as the Sungai Klang overflowed its banks.

On the outskirts, the worst affected areas were notably the Jalan Chan Sow Lin-Sungei Besi area near the Royal Malaysian Air Force station.

Following the downpour, hundreds of motorists were stranded on flooded roads.

City traffic police spokesman said more than 20 vehicles near the light-rail transit station in Jalan Tun Perak had submerged.

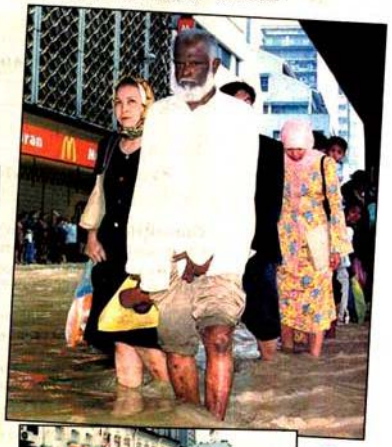
A spokesman added that the worst hit areas were Jalan Ampang and Jalan Sungei Besi.

Meanwhile, City Hall's rescue squad were on standby with boats to assist office workers and others who were stranded after work.

In Taman Kosas, Ampang, 100 houses in Phase two and another 200 units in Phase three were flooded but the occupants were not evacuated as the flood waters subsided after the rain had stopped.

The rain also caused landslides in Kampung Datuk Mufti 5 and the banks of Sungai Datuk Ahmad Razali to collapse. Both places are in Ampang.

Dozens of residents of Kampung Fajar Hilir, Hulu Klang, had to be temporarily evacuated to the Finas building after most of their houses were flooded.



KNEE DEEP ... Office workers wading through the flood waters along

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Towns Inundated

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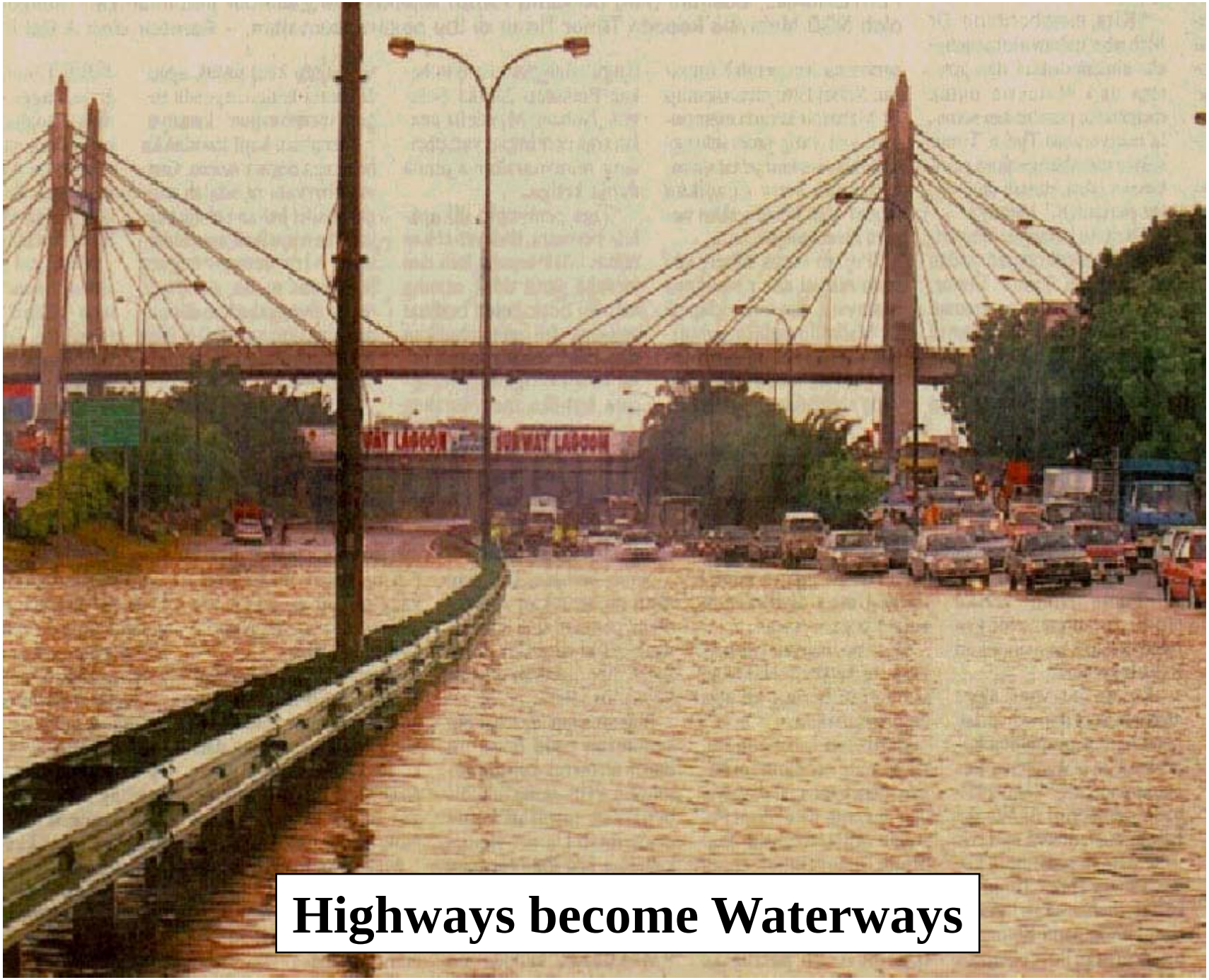

Highways become Waterways

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Flood victims being evacuated

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Businesses hardest hit

Shops hold spur-of-the-moment sales held to cut losses

By THO XIN YI
thoxinyi@thestar.com.my
Photos by M. AZHAR ARIF, BRIAN MOH and KAMAL SELLEHUDDIN

FLASH floods which hit Kuala Lumpur on Sunday brought disastrous results for traders in Masjid India.

To cut the damage done to their businesses many stores held impromptu sales yesterday, selling their flood-soaked goods from the sidewalks.

Members of the public who chanced upon these sales seized the opportunity to bag the bargains.

Saanthi Silks in Jalan Melayu was seen selling off its sarees, sarongs and Punjabi suits at cheap prices.

"We have no choice. Throwing them away would be a complete waste so we've decided to sell them cheap," said shop owner, Rajasekaran Teagarajan.

He said Sunday's incident was the worst flood they had ever experienced.

The prices of sarees that were usually sold between RM60 and RM70 each went down as low as RM30 during the sale while other goods were even cheaper.

A shop assistant caught the public's attention by yelling, "Sepuluh ringgit satu! (RM10 each)!"

"Although flood warnings had been issued by the Kuala Lumpur City Hall (DBKL), it was impossible for us to move the goods to higher ground because the water rose too fast," said Rajasekaran.

Over at Seahorse Enterprise, damaged bed sheets were going for a song. People grabbed them left and right, some even took to washing the sheets on the spot under the pipe.

"This is not the first time we are holding a cheap sale because of the floods. City Hall should really do something to solve this problem that hit us on a regular basis," said shop owner Tan Ah Moh.

St Mary's Cathedral, which is located beside Sungai Gombak, was seriously affected by the floodwater.

Almost everything on the ground

▸ TURN TO P4

Bargain: The public seized the opportunity to buy the damaged bed sheets at cheap prices at Seahorse Enterprise, Masjid India.

Crowd pullers: Flood-soaked sarees, sarongs and Punjabi suits up for grabs at Saanthi Silks in Jalan Melayu.

Waterlogged: A damaged stationery shop.

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LANS Koperal Shamsuddin Jusoh menyampaikan maklumat mengenai banjir di Besut menggunakan telefon awam selepas Balai Polis Trafik Besut dinaiki air sedalam 0.8 meter, semalam. Semua komputer di balai polis itu juga ditenggelami air dan tidak dapat digunakan. – Gambar Shahrizal Md Noor

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NEW STRAITS TIMES

NATION

Two boys drown as floods worsen

KOTA BARU, Wed. — A four-year-old boy drowned in a drain at Kubang Kual in Rantau Panjang.

A police spokesman said Muhammad Yusri Abdul Aziz was playing near his house when he slipped and fell into the drain at 11am today.

"His body was found by family members about 30 minutes later near the area," he said.

In Bachok, a two-year-old boy drowned after he slipped and fell into an irrigation canal at Kampung Alur Ganu on Monday.

District police chief, Deputy Superintendent Soaihami Rahim identified the victim as Mohammad Haslam Zahari.

He said the boy drowned about 6.30pm and his body was found a few minutes later by his mother.

He said Mohammad was playing near the irrigation canal with his siblings when the incident happened.

Meanwhile, 1,284 people in the State were evacuated to five flood relief centres in Gua Musang, Tanah Merah, Jeli, Kuala Krai and Pasir Mas.

By 6pm, those in villages in water one to three metres deep had been evacuated. They were sent to flood relief centres in Jeli (878 people), Tanah Merah (132), Kuala Krai (125), Gua Musang (120) and Pasir Mas (29).

He said several roads in the districts had also been closed, including Km9 Kampung Kajang-Panglima Bayu-Rantau Panjang, Kampung Gual Raja Jerangau-Gual Ipoh and Chekok Ipoh-Kusial, all in Tanah Merah.

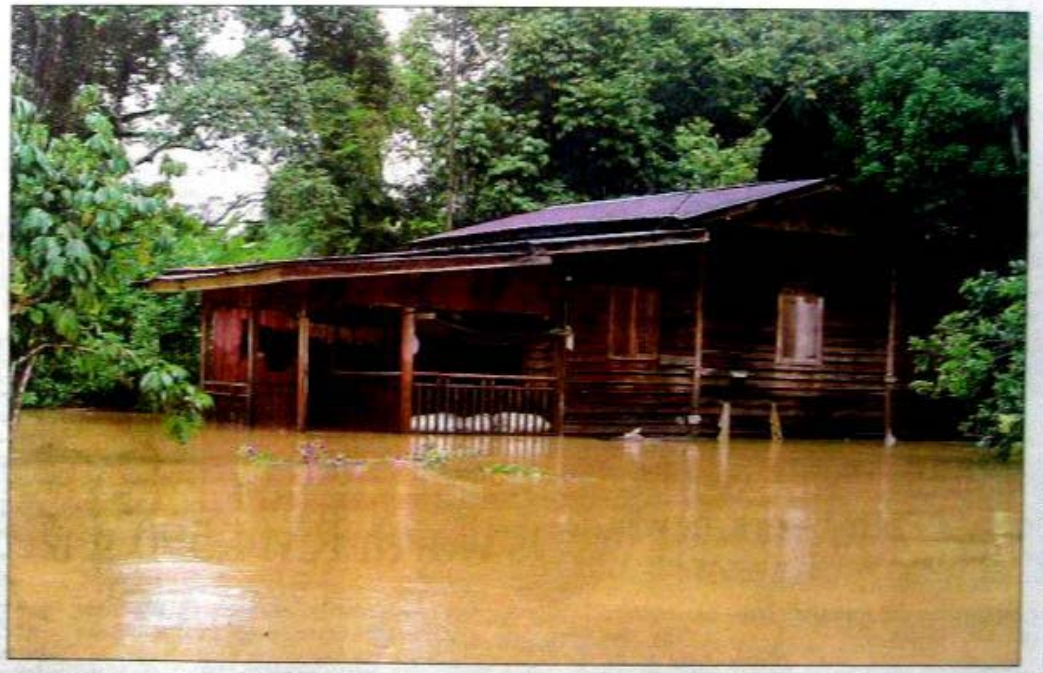
In Machang, the roads closed to all traffic were Jalan Temangan Batu 30 and Jalan Temangan Batu Lama.

Three others opened only to heavy vehicles were Jalan Besar Temangan, Jalan Kampung Pertok and Jalan Paloh Rawa.

He said at 4pm today, the water level at all the State's assessment points had risen since the same time yesterday. The water level at the Sultan's pier was 5.25m today, passing the danger level of 5.00m.

Others that had passed the danger level were Kuala Krai 25.90m (danger level 25.00m), Sungai Golok 10.06m (danger level 9.00m) and Guillemard Bridge 17.63m (danger level 16.00m).

The levels at Sungai Galas and Sungai Lebir are above the warning level.



HIT BADLY: A house in Kampung Nibong, Tanah Merah, which was hit by flood waters yesterday.

Landslides at 10 stretches in Kelantan

JELI, Wed. — Minor landslides were reported at 10 stretches, from Air Lanas here to the East-West Highway, following continuous rain.

There was no report of casualties.

Kelantan police chief Datuk Mohd Najib Abdul Aziz said the highway was still open to traffic as diversions

Number of evacuees rises to 705 due to heavy downpour

KUANTAN, Wed. — The number of evacuees here rose to 705 today as more areas were hit by floods due to heavy rains over the last three days.

More than 400 were from 10 villages who had to vacate their homes

The showers were expected to continue until Friday morning, the department said.

Pahang police have denied that the floods had claimed its first victim, as reported in an English daily today.

South Asian flood death toll rises to 397

NEW DELHI, Thurs. — Pouring rain prevented rescue work today in a remote Indian hill area where flash floods washed away dozens of workers at a construction site, while new casualties elsewhere raised South Asia's death toll from the monsoon deluge to 397.

Incessant rains caused a roof to collapse in the Mainpuri district of the northern Indian State of Uttar Pradesh, killing five members of a family as they slept, said Mahesh Srivastav, assistant relief commissioner in the State.

Lightning killed three people as they sheltered under a tree in the neighbouring Etawah district.

Another nine deaths were reported from other areas in the State, bringing Uttar Pradesh's death count to 66 since flooding began there a week ago, Srivastav said.

In western Rajasthan State, three people drowned in a reservoir, while a fourth was killed by lightning, the Press Trust of India news agency said.

That brought the toll from weeks of monsoon flooding in India to 161, including the 19 bodies recovered from piles of mud before rescue work was suspended at the construction site in the hill State of Himachal Pradesh.

Sudden heavy rainfall caused flash floods that swept through a migrant labourers' camp and may have killed up to 100 people, State officials said.

Floods, lightning strikes and mudslides have killed 67 people in Nepal.

In Bangladesh, where 2.5 million people are marooned by overflowing rivers, 169 people have been killed, including 15 new deaths reported today, a relief official said.

Six children and three men drowned in flood waters in Sirajganj district, the worst-hit by this year's floods that have inundated nearly one-third of the delta nation. Also yesterday, another six people died of diarrhea in Gaibandha, 190km north of the Bangladeshi capital, Dhaka.

In Himachal Pradesh, there were about 250 people at the site of the Parvati Hydroelectric Power Project and many were asleep in their tents when the flood hit.

The victims were mostly migrant laborers from Nepal and the Indian States of Bihar and Uttar Pradesh engaged in building a tunnel and bridge for the electric plant on the Pulia Nallah rivulet.

It was not clear how many of them had been accounted for.

Yesterday, Chief Minister Veerbhadra Singh, the State's top elected official, said "more than 100 people may have been killed."

A village further down the hillside in the Garsa area of Kullu district, 350km north of New Delhi, was also hit by the flooding, Veerbhadra Singh said.

If Veerbhadra Singh's estimate is correct, it would raise the toll from six weeks of monsoon rains in South Asia to more than 450.

Flooding and landslides from heavy rains have damaged homes and crops, killed cattle and stranded about seven million people in India, Bangladesh and Nepal since mid-June.

In India's northeast, rain-swollen rivers entered more villages, raising the count of submerged villages in the State of Assam to 4,600.

More than 4.7 million people have been displaced or affected by water in their homes.

There were no reports of new deaths in Assam, but relief officials said today that they were receiving unconfirmed reports of an outbreak of water-borne diseases in some areas.

The monsoon deluge has claimed 20 lives in Assam, 29 in the eastern Indian State of West Bengal, 13 in the eastern State of Bihar, 14 in Rajasthan and four in the capital, New Delhi.

In Bihar, authorities sounded an alert in several districts lying along the Himalayan foothills. Most rivers in the region are flowing above the "danger mark" — when flooding is imminent — and the situation could worsen if rains in the catchment areas continue, said the Central Water Commission's office in Patna, the State's capital.

Relief officials in Bihar estimate more than 1.5 million people there have been affected by the floods, which have destroyed crops and more than a thousand homes. — AP

Outline of Presentation

I. Floods in Asian Monsoon Region

II. Changing Conditions

III. Need for Sustainable Approach

IV. New Approaches to Manage Floods

V. Conclusion

Changing Conditions

Some of the major changes in Natural and Social Conditions over last few decades :

- Population Growth
- Deforestation
- Urbanisation
- Climate Change

Changing Conditions

Some of the major changes in Natural and Social Conditions over last few decades :

- **Population Growth**
- Deforestation
- Urbanisation
- Climate Change

NEW STRAITS TIMES

UN: World is facing disaster

'Population booming at unsustainable rate'

LONDON, Tues. — People are plundering the planet at an unprecedented and unsustainable rate which needs to be curbed quickly to avoid worldwide disaster, the United Nations said today.

"More people are using more resources with more intensity than at any point in human history," the UN said in its annual world population report for 2001.

"The costs of delaying action will increase rapidly over time.

"By 2050, 4.2 billion people (over 45 per cent of the global total) will be living in countries that cannot meet the daily requirement of 50 litres of water per person to meet basic needs."

The population, which has doubled to 6.1 billion in the past 40 years, is projected to surge 50 per cent to 9.3 billion within another half century — with all the growth in developing countries whose resources are already overstretched.

The report said water was being used and polluted at catastrophic rates.

At present 54 per cent of available fresh water supplies are being used annually — two-thirds for agriculture.

This figure is set to surge to 70 per cent by 2025 due to population growth alone, and 90 per cent if consumption in the developing countries reached the levels in the developed world.

Water is already being used at unsustainable rates in many countries, with water tables under some Chinese, Latin American and South Asian cities dropping by more than one metre a year and water from seas and rivers being diverted with occasionally disastrous results.

The report said 1.1 billion people already did not have access to clean water, and in developing nations up to 95 per cent of sewage and 70 per cent of industrial waste was simply being dumped untreated into water courses.

Vital rain forests are being destroyed at the highest rate in history, taking with them crucial sources of biodiversity and contributing to climate warming, thereby boosting already rising sea levels.

The seas continue to be massively overexploited and erosion is taking a rising toll of plant species — one quarter of which could be lost forever by 2025.

The United Nations said food production would have to double and distribution would have to improve to feed the exploding population, with most of the increase coming from higher yielding varieties which needed more environmentally dangerous chemicals to grow.

It said the globalisation of commerce had increased global wealth, but at the same time added to global inequalities, with the hordes of the world's forgotten poor forced to plunder their scarce natural resources simply to survive from day to day.

The global HIV/AIDS epidemic had spiralled out of control and far too little money was being made available to stem it and treat it and its related tide or orphans and outcasts.

A crucial key lay in giving women — who played a major and largely unsung role in rural communities across the globe — a far greater say in society and, equally importantly, in setting the size of their desired families.

"It is clear that providing full access to reproductive health services would be far less costly in the long run than the environmental consequences of the population growth that will result if reproductive health needs are not met," the report said. — Reuters

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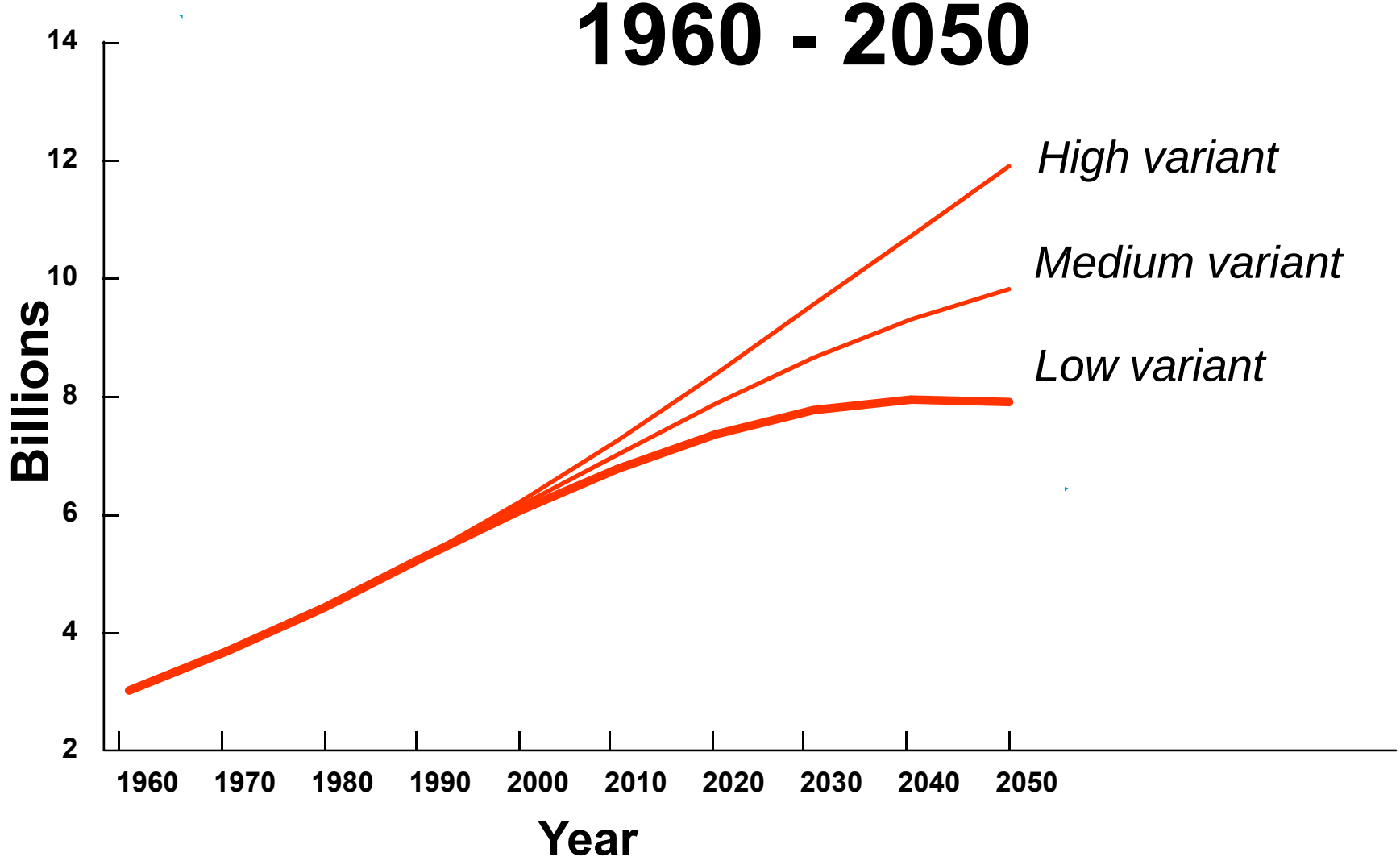
GLOBAL POPULATION 1960 - 2050



Ref: UN

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Population

- 100 % increase in population between 1960 and 2000
- Another 50 % increase by 2050
- Most of this increase will be in developing countries

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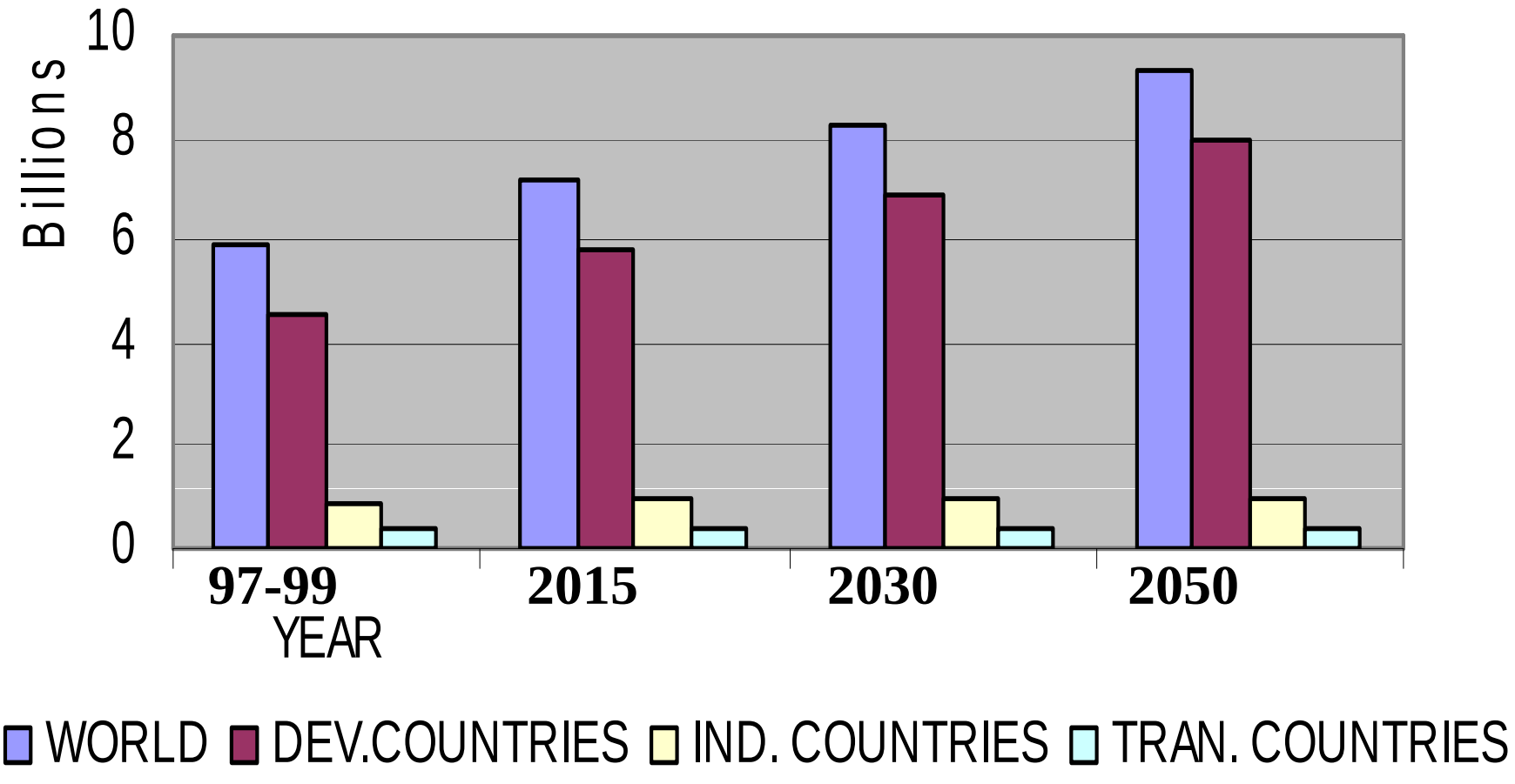
POPULATION DISTRIBUTION



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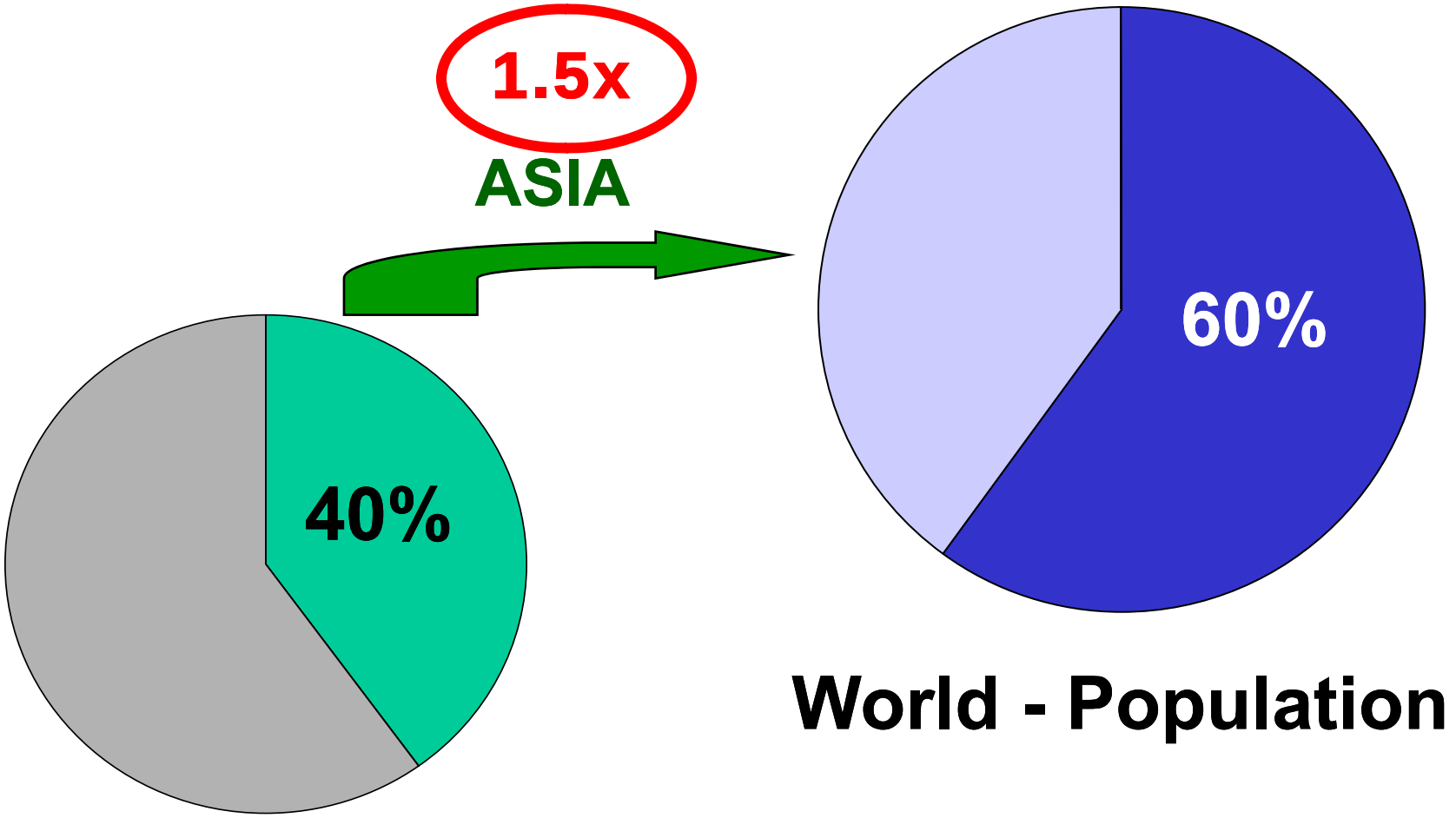

ASIA - Population vs Land Area

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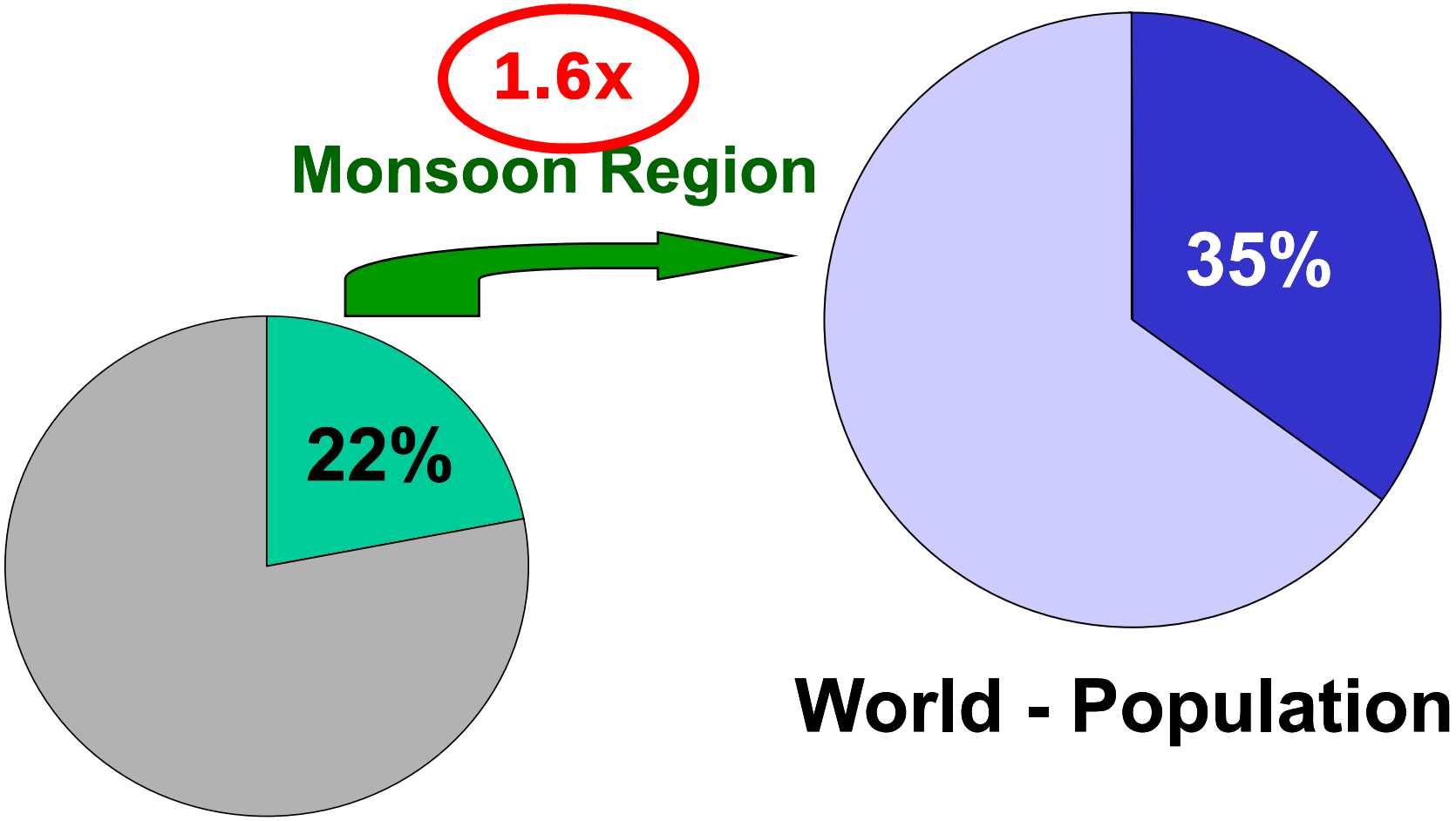

Ref : Szollosi-Nagy, 1993

Monsoon Region - Population vs Land Area

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Population

- 100 % increase in population between 1960 and 2000
- Another 50 % increase by 2050
- Most of this increase will be in developing countries
- Food production must increase to feed increase in population
- Increase in area needed

Changing Conditions

Some of the major changes in Natural and Social Conditions over last few decades :

- Population Growth
- Deforestation
- Urbanisation
- Climate Change

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Deforested Areas

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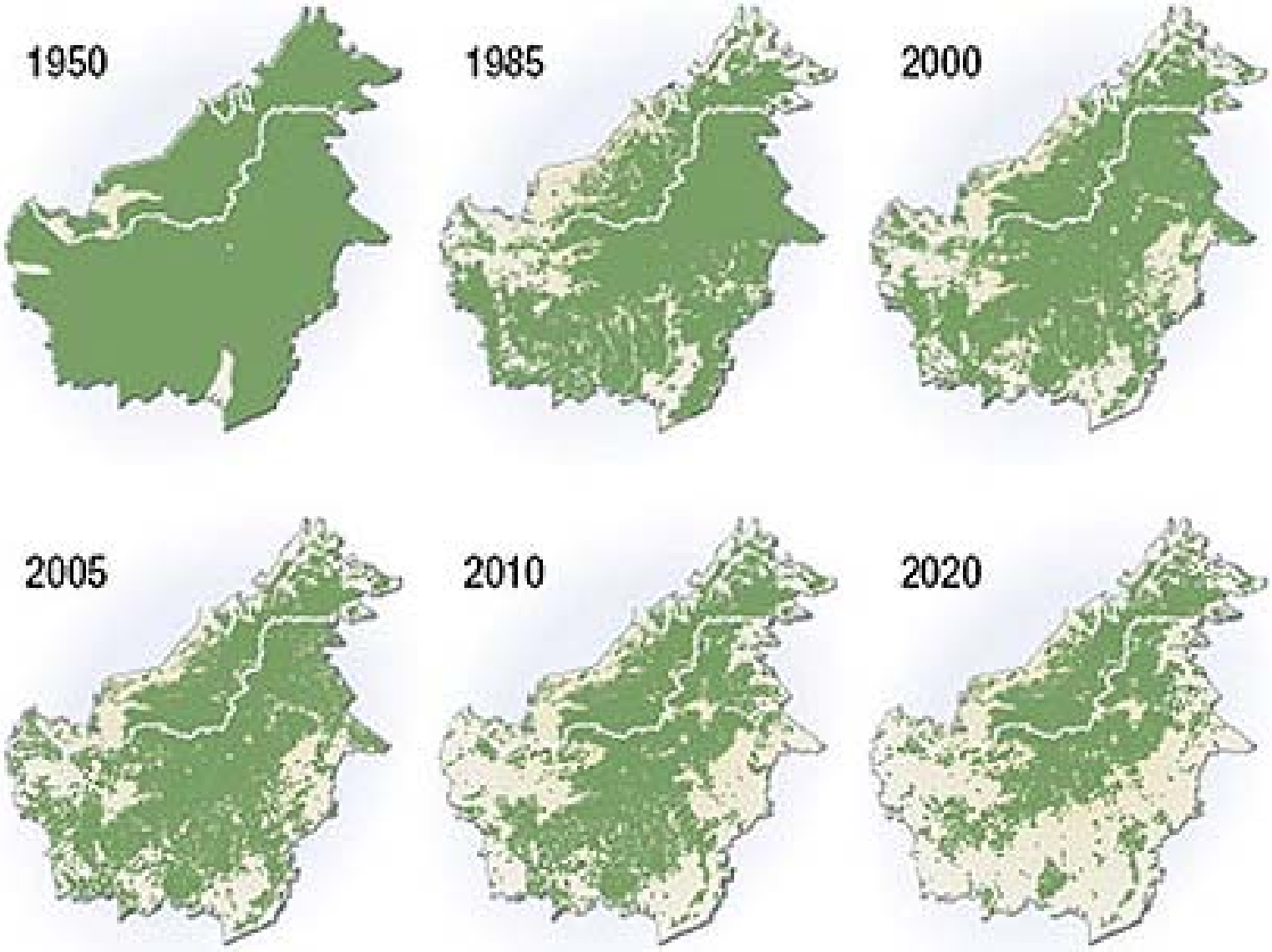
Average Annual Deforestation in Asian and Pacific Countries, 1976-1980

Country	Deforested area (ha)
Bangladesh	8,000
Bhutan	2,000
Brunei	7,000
India	147,000
Indonesia	550,000
Kampuchea	15,000
Laos	125,000
Malaysia	230,000
Myanmar	95,000
Nepal	84,000
Pakistan	7,000
Papua New Guinea	21,000]
Philippines	101,000
Sri Lanka	25,000
Thailand	333,000
Vietnam	65,000
Total (16 countries)	1,815,000

Ref: www.agner.org/library



Future trends > Past trends

Deforestation

- Forests cleared for agriculture

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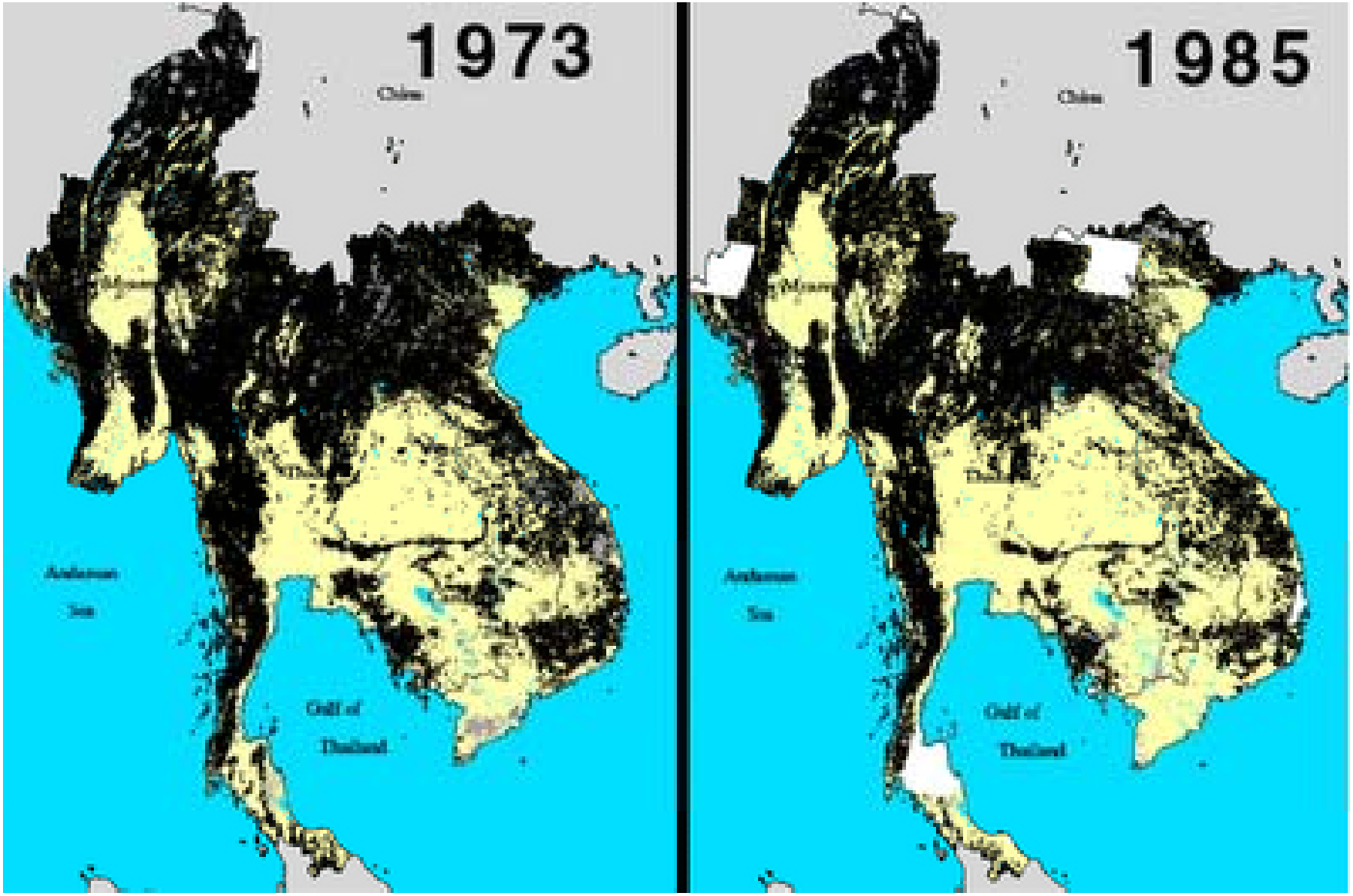

Dark areas represent forests. 81 % of deforestation in SE Asia is for Agriculture.

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Forests cleared for Agriculture ….

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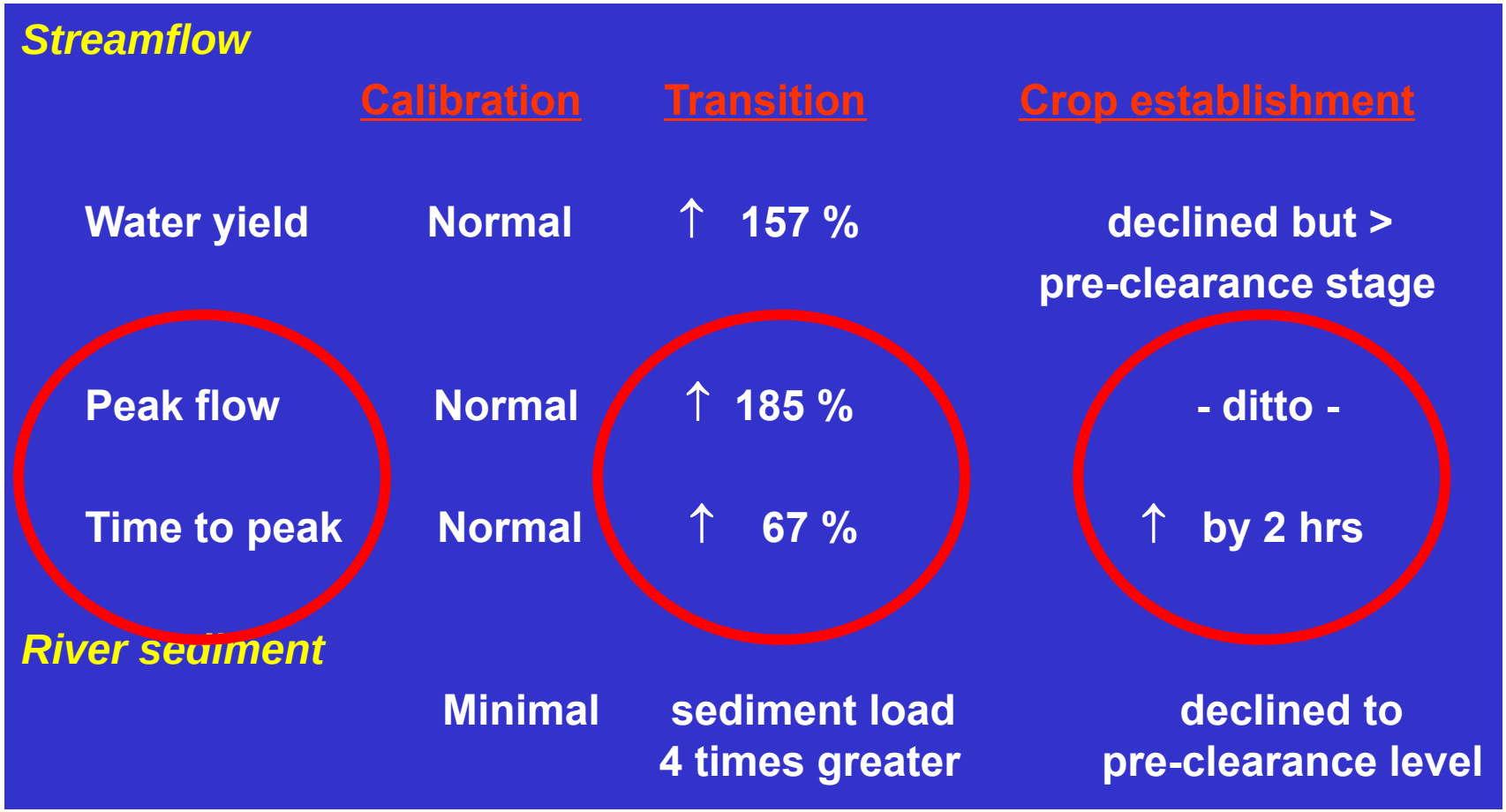
……. and rice cultivation

Deforestation

- Forests cleared for agriculture
- Impacts → Study done on Tekam River, Pahang, Malaysia
- Study : Forest → Clearing → Crops planted

Tekam River Study



Transition period - between land clearing and crop establishment

Ecaluation period - after crop establishment

Tekam River Study

	Calibration	Transition	Crop establishment
Streamflow			
Water yield	Normal	↑ 157 %	declined but > pre-clearance stage
Peak flow	Normal	↑ 185 %	- ditto -
Time to peak	Normal	↑ 67 %	↑ by 2 hrs
River sediment	Minimal	sediment load 4 times greater	declined to pre-clearance level

Transition period - between land clearing and crop establishment

Ecaluation period - after crop establishment

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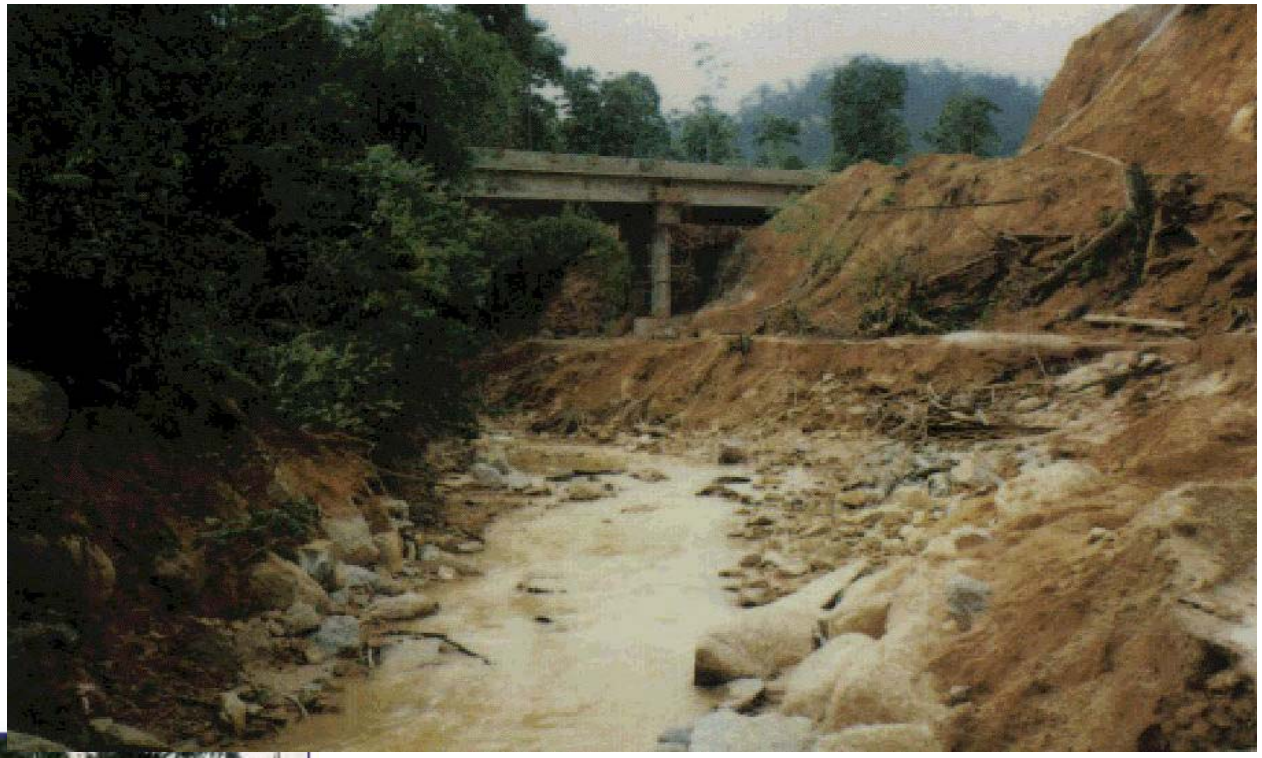

Erosion rates increase from 10 to 400 t/km²/year

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Changing Conditions

Some of the major changes in Natural and Social Conditions over last few decades :

- Population Growth
- Deforestation
- Urbanisation
- Climate Change

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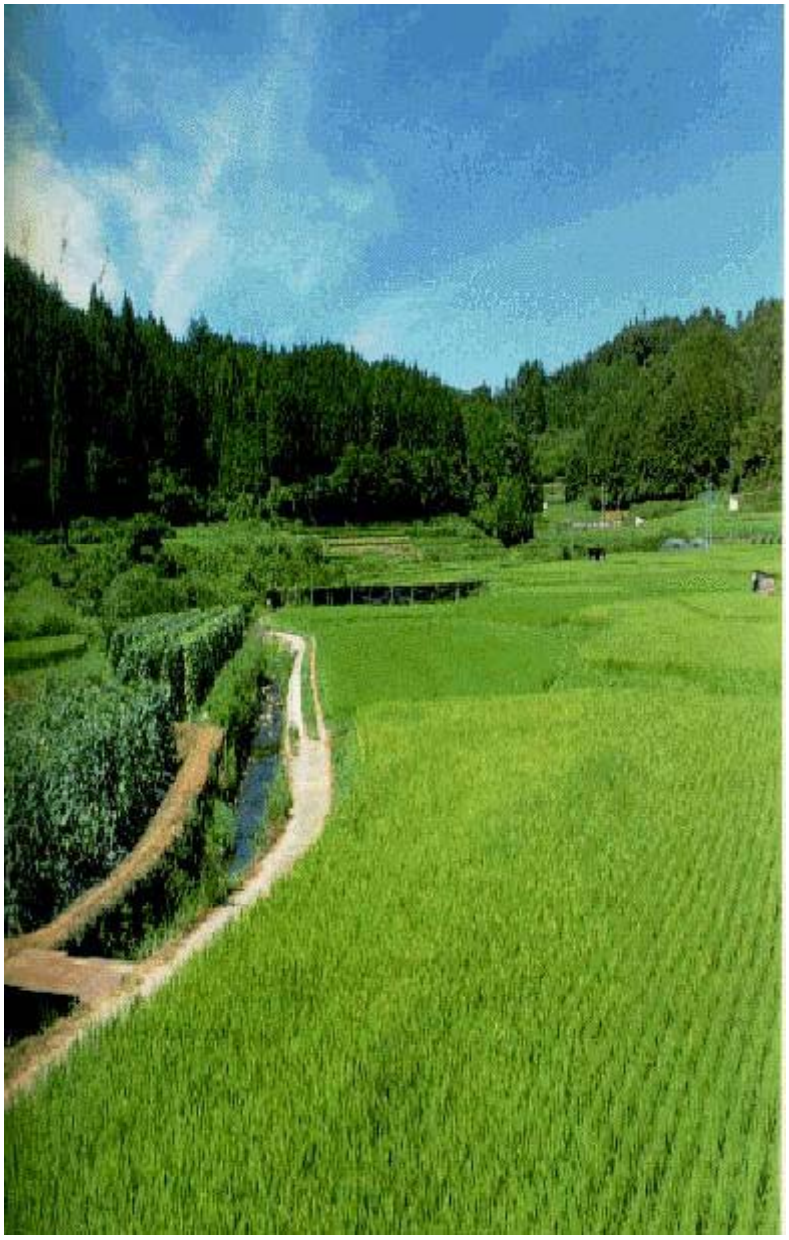

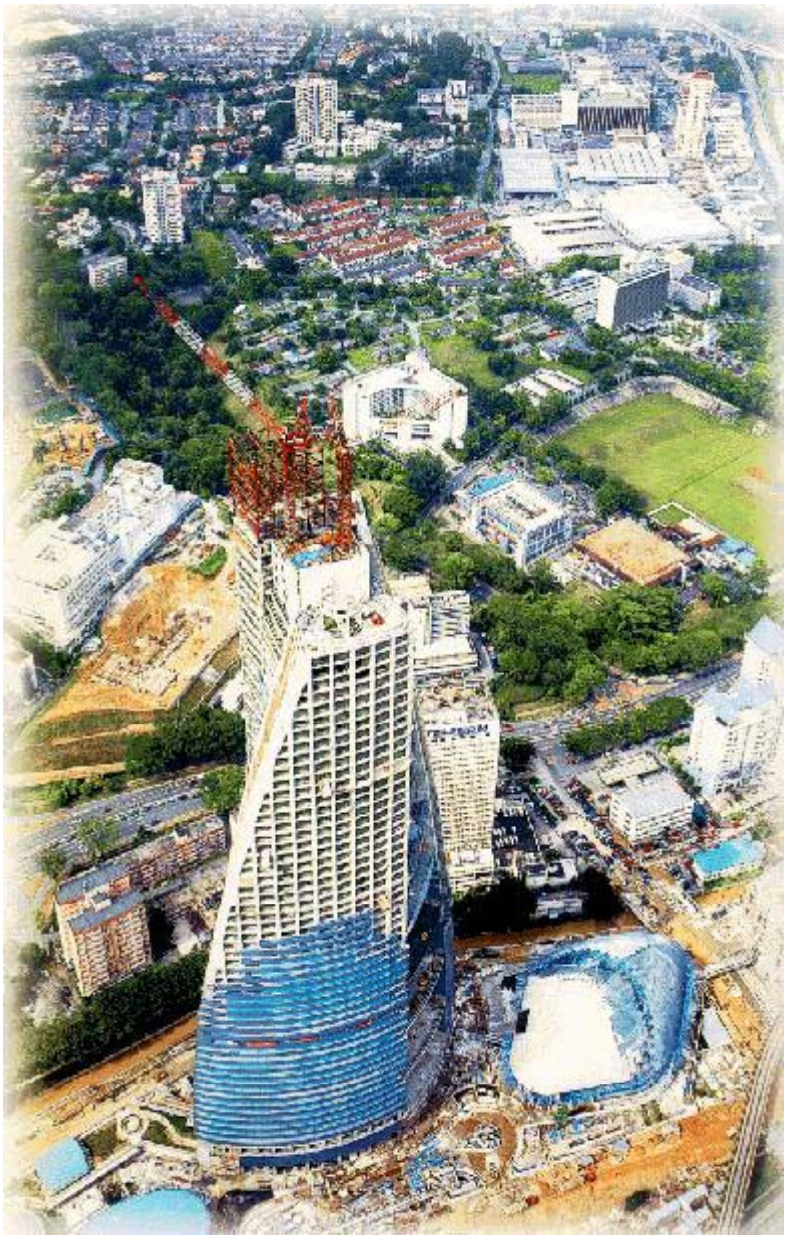

Agricultural Area

Urbanisation

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Land Clearing → New Township

NEW STRAITS TIMES NATIONAL TUESDAY, MARCH 8, 2005 5

Green areas reduced by 21pc

Forest clearing and lack of co-ordination in Klang Valley among causes

By Chow Kum Hor

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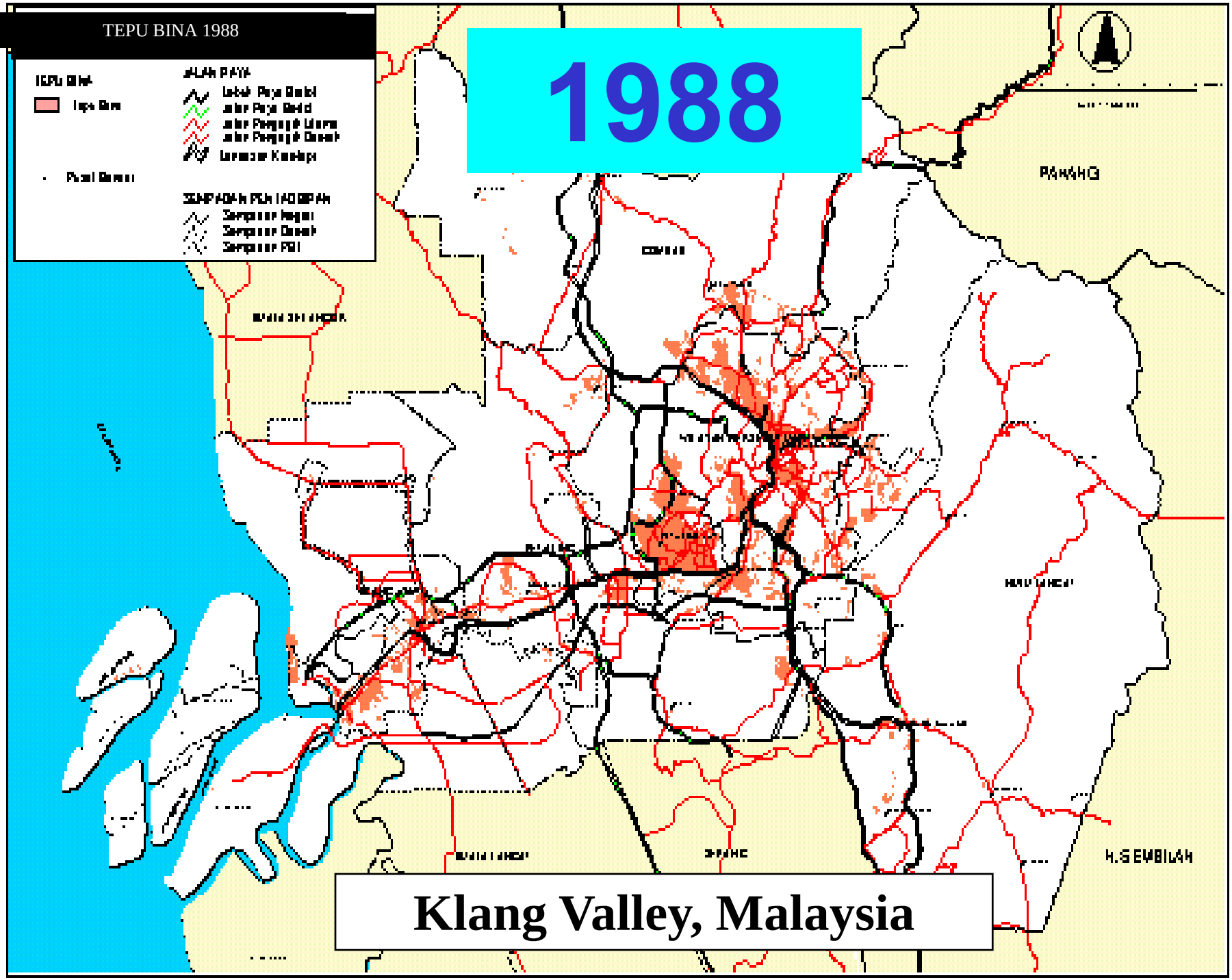
Asian Monsoon Region



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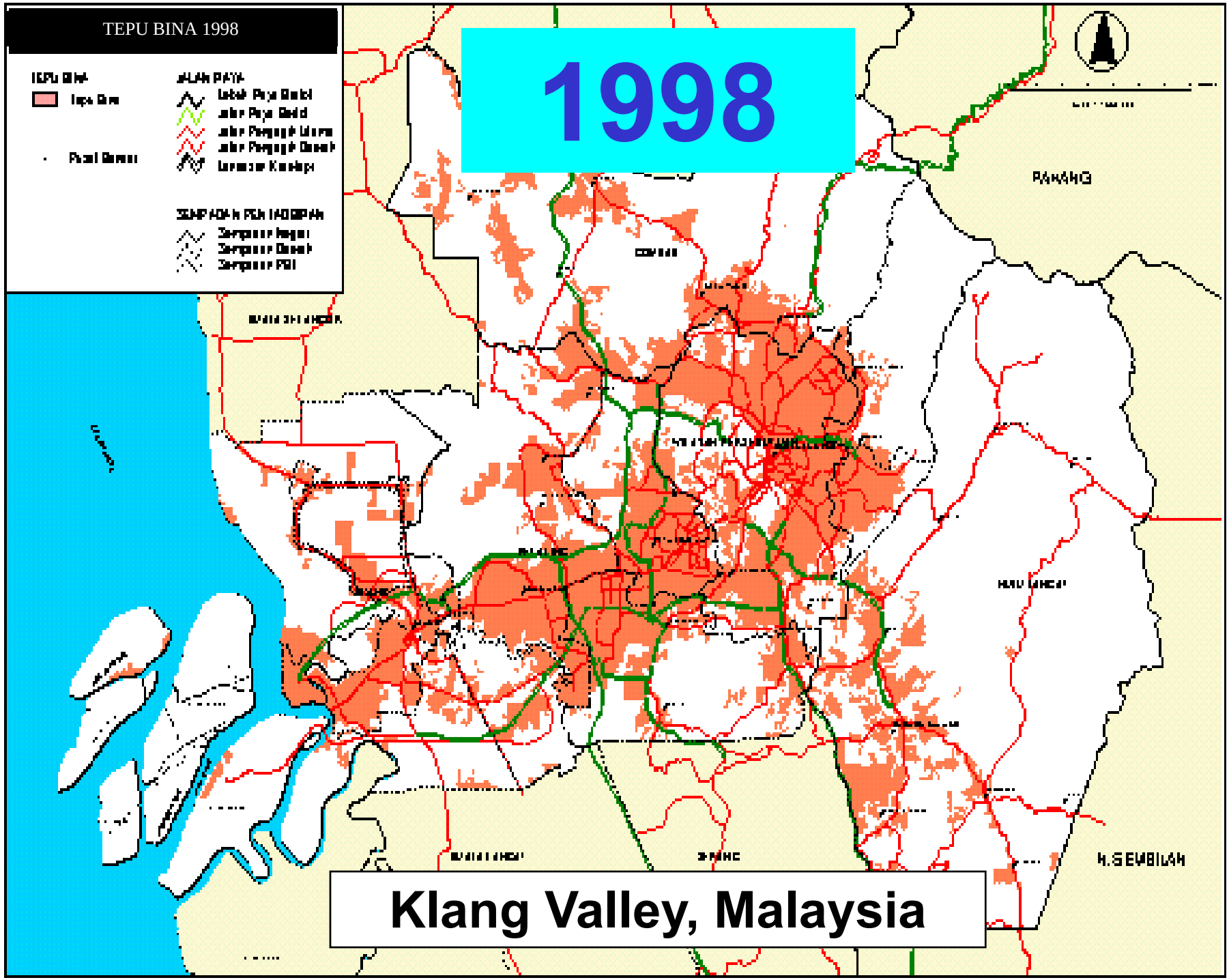

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Urbanisation

- Urbanisation increases as country income increase
- Developed countries → 70 - 80 %

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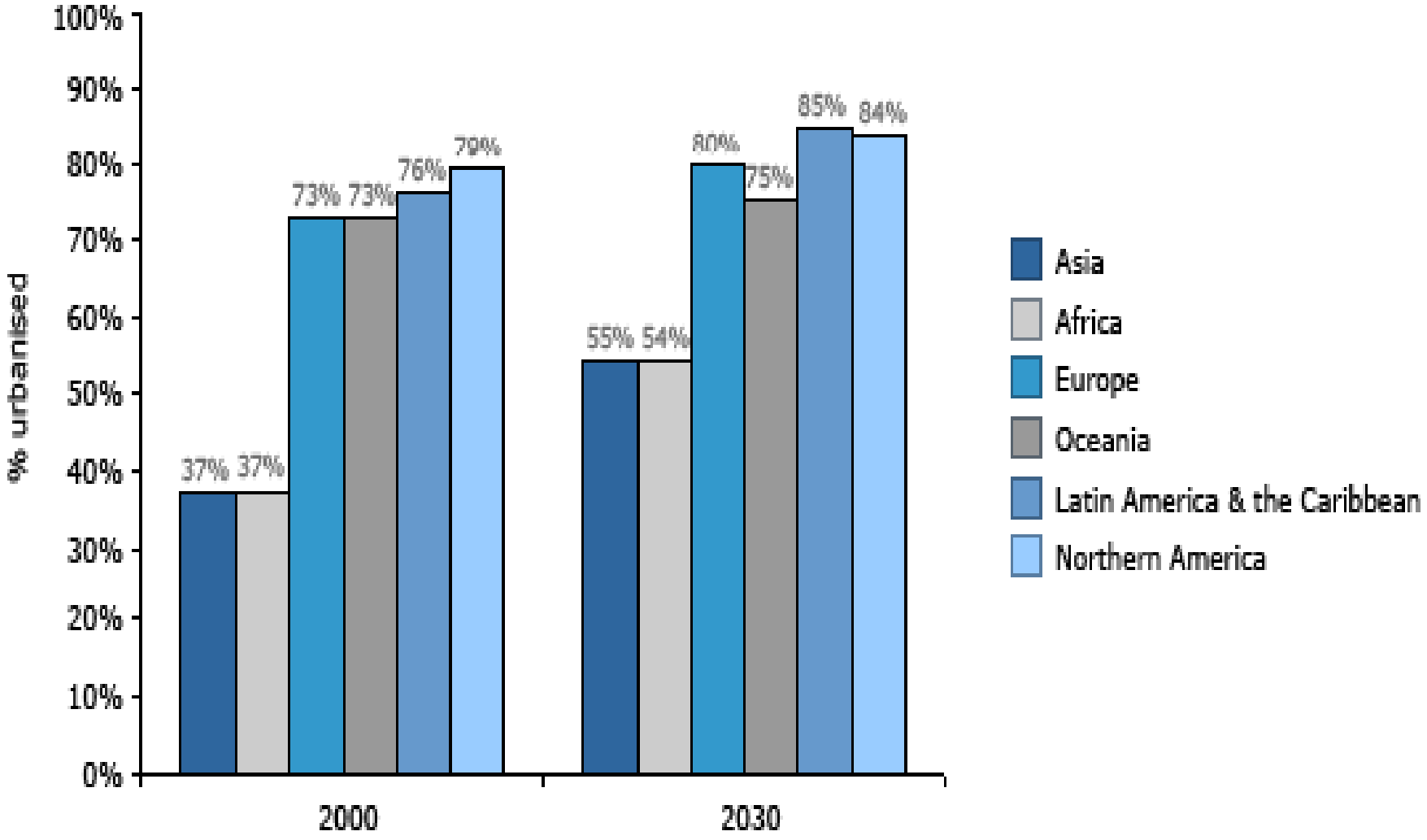

Ref: www.igd.com

Urbanisation

- Urbanisation increases as country income increase
- Developed countries → 70 - 80 %
- Developing countries → fastest rate of urban growth

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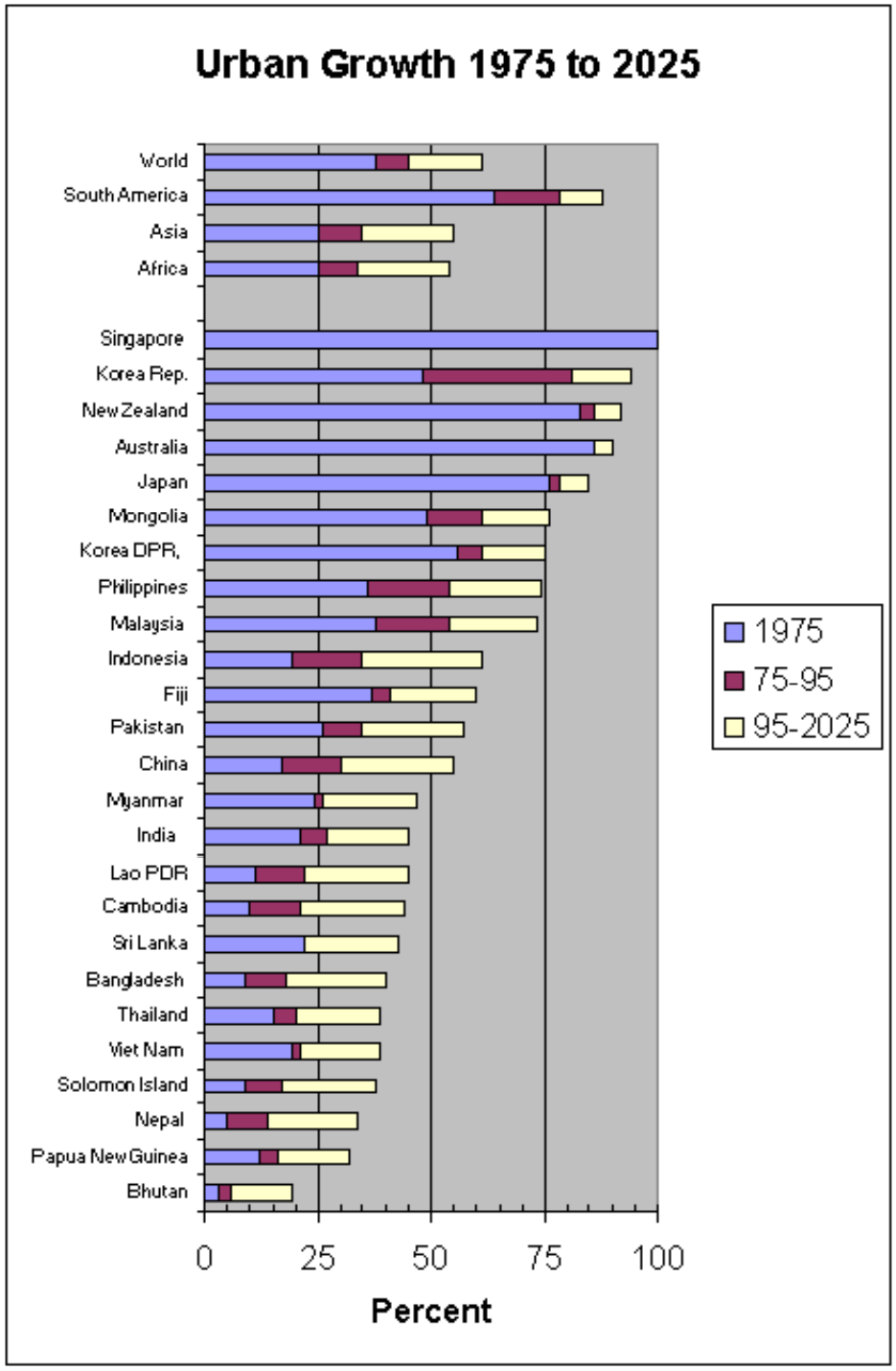

Ref: FAO

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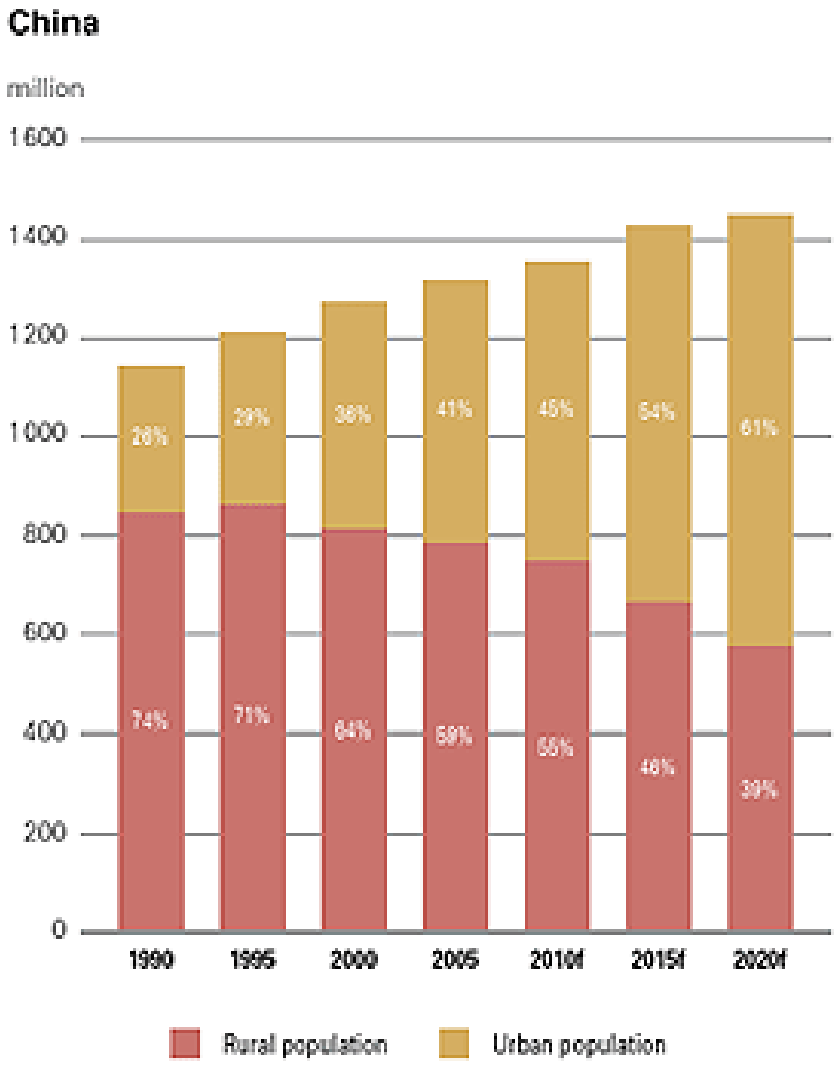

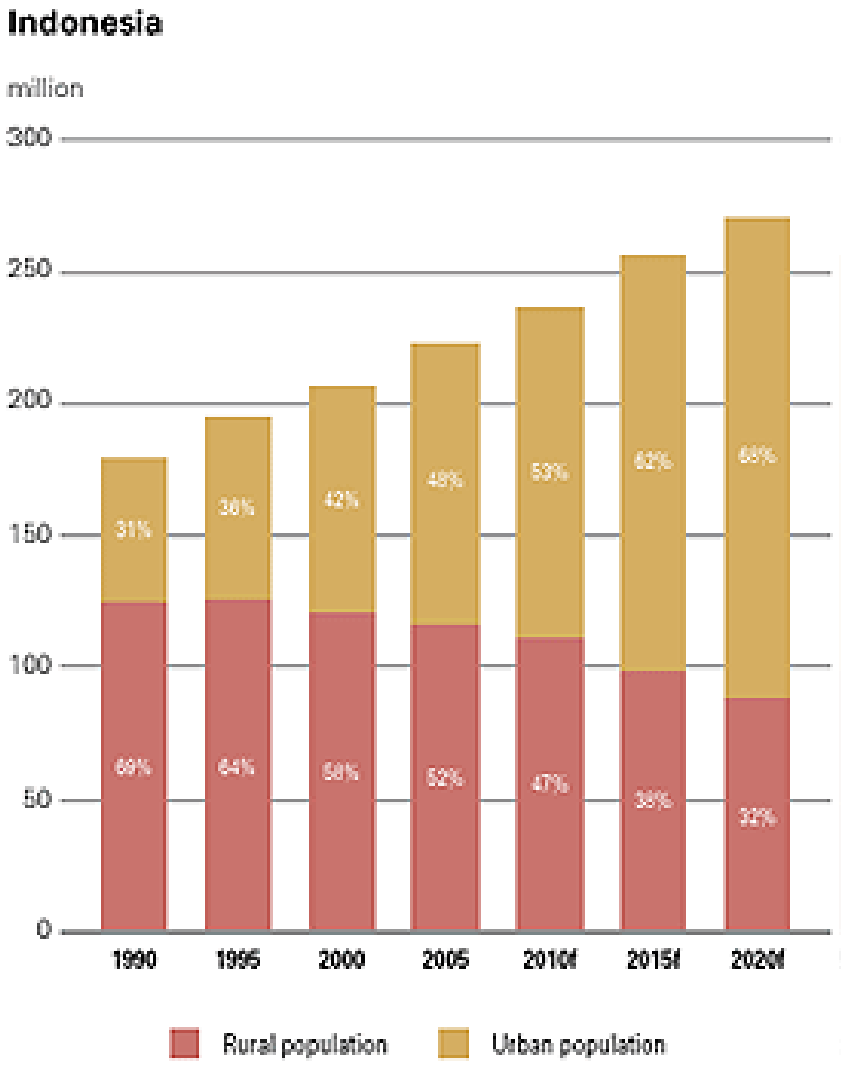

Ref: www.kepcorp.com

Urbanisation

- Urbanisation increases as country income increase
- Developed countries → 70 - 80 %
- Developing countries → fastest rate of urban growth
- Impact of urbanisation on flood runoff

Effect of Urbanisation

Increase In Urbanised Area

0 ➡ 40 %

➡

Runoff Quantity

Q ➡ Increase 190 %

Velocity

V ➡ Increase 2x

Tc ➡ 50 % decrease

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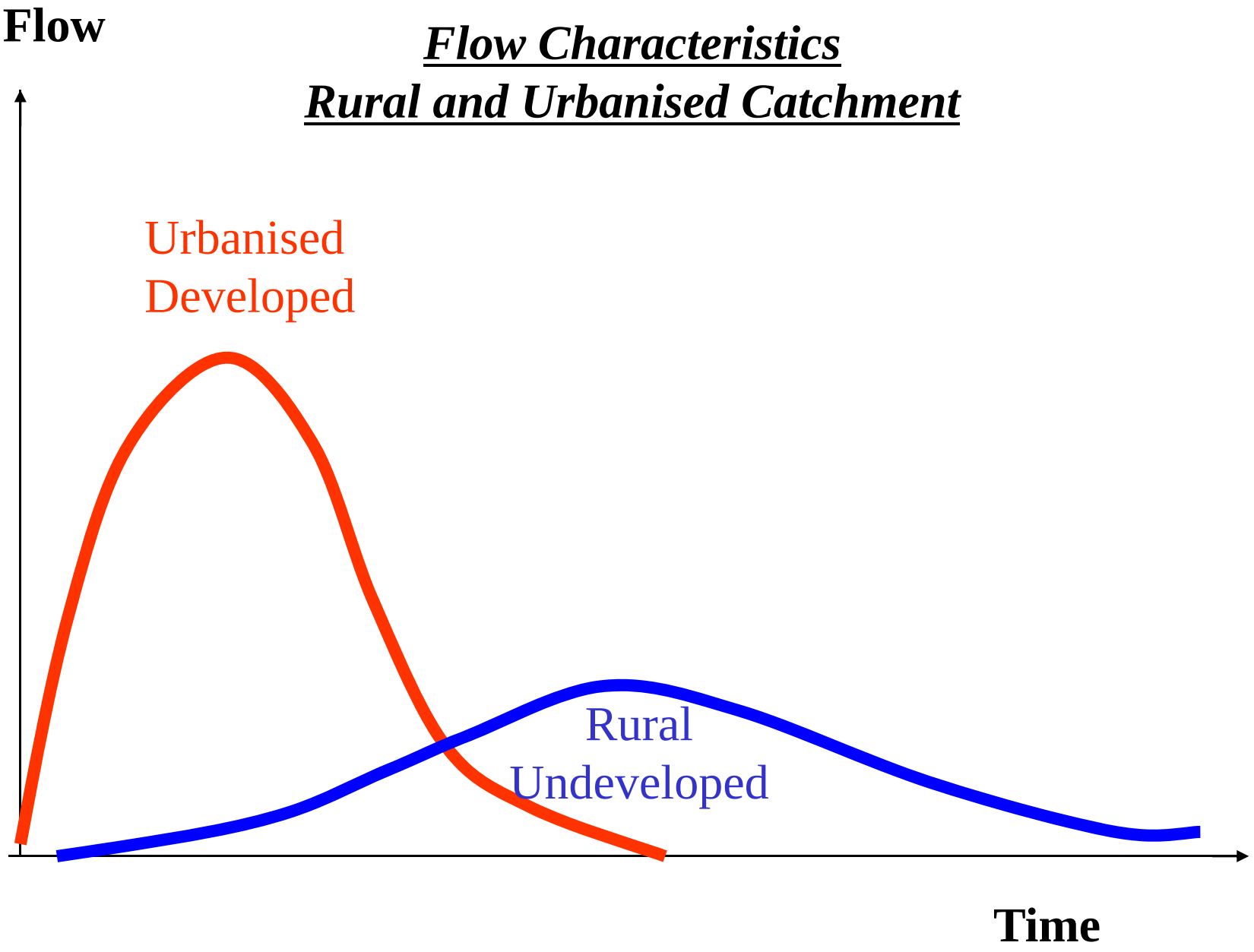
Before

After

Flow Characteristics
Rural and Urbanised Catchment



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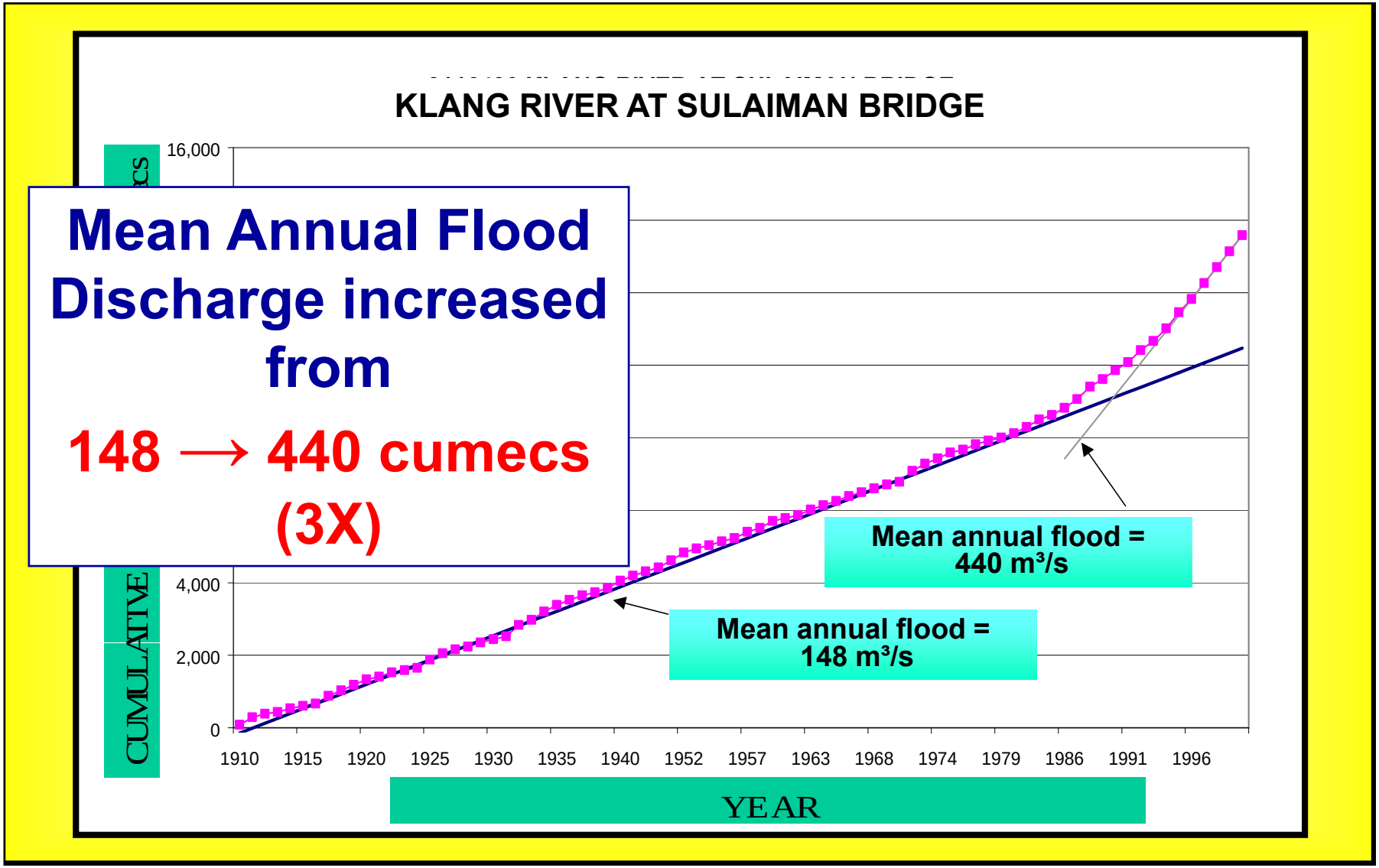

Increasing Trend of Annual Flood Discharge in Kuala Lumpur

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Befrienders > Track suicide bids Nation 4

WEDNESDAY

Star

The people's paper

World

Israel tries to kill Hamas leader

Sport

Hafiz st[illegible]

11 June 2003

No.16049 (PP1641/3/2004)

Peninsula RM1.20

Sabah RM1.80

Sarawak RM1.80

thestar.com.my

Abdul Kudus sacked with immediate effect

Nation 3

VCD ops to go on until Aug 31

Nation 6

StarBiz >

Maruichi to list unit, sell Sumiputeh stake

KL hit by floods

Three-hour downpour causes havoc in city

KUALA LUMPUR: Hundreds of thousands of people were caught in chaos caused by flash floods that saw one person drowned in what has been described as the worst deluge yet to hit the city for the past year.

Hundreds of cars were damaged when underground car parks were turned into giant pools as police reported that several people were also injured in various accidents due to the havoc.

The three-hour rain that brought much relief from the heat started at 4pm and within 30 minutes became a heavy downpour trapping the hundreds of thousands as they tried to make their way home from work.

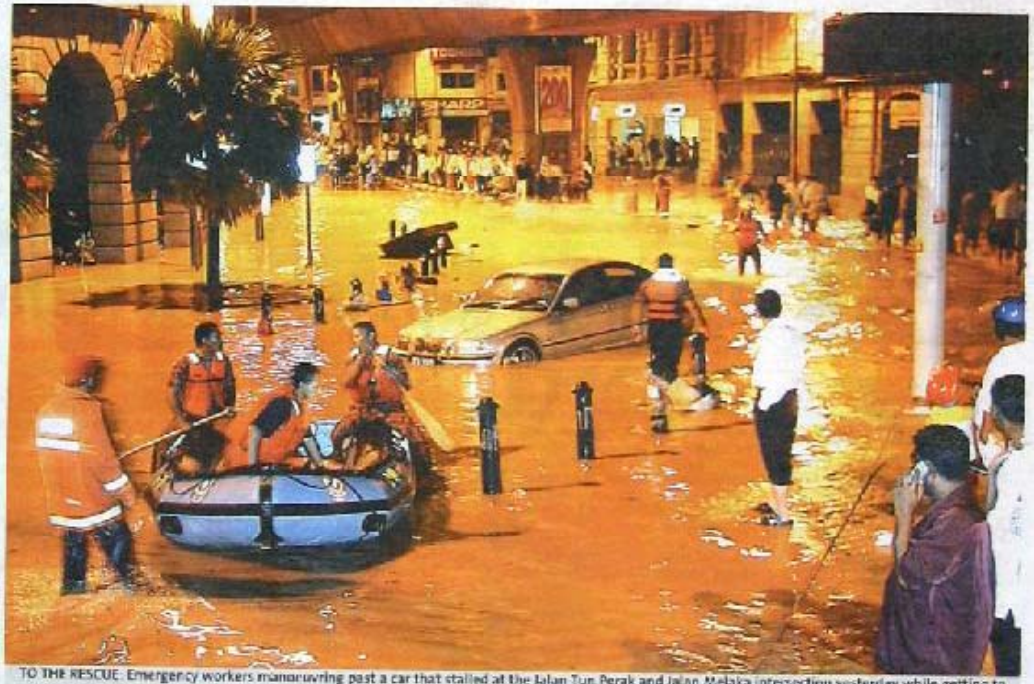
Even the Sentul Fire Station fell victim to flood waters and all the engines had to be parked outside as the water level in the building was chest-high at the peak.

City Mayor Datuk Shaid Mohd Taufik had to take to a motor-cycle to get to visit the various affected places.

City Hall's 24-hour monitoring centre also reported flooding at the nearby areas of Bataran Merdeka, Masjid Jamek, St. Mary's Cathedral and parts of Jalan Sultan Ismail.

The low-lying areas of Kampung Baru,

● TURN TO PAGE 3



TO THE RESCUE: Emergency workers manoeuvring past a car that stalled at the Jalan Tun Perak and Jalan Melaka intersection yesterday while getting to those stranded following a three-hour downpour.

Changing Conditions

Some of the major changes in Natural and Social Conditions over last few decades :

- Population Growth
- Deforestation
- Urbanisation
- Climate Change

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Climate Change

- **Micro-scale → Urban Heat Island**

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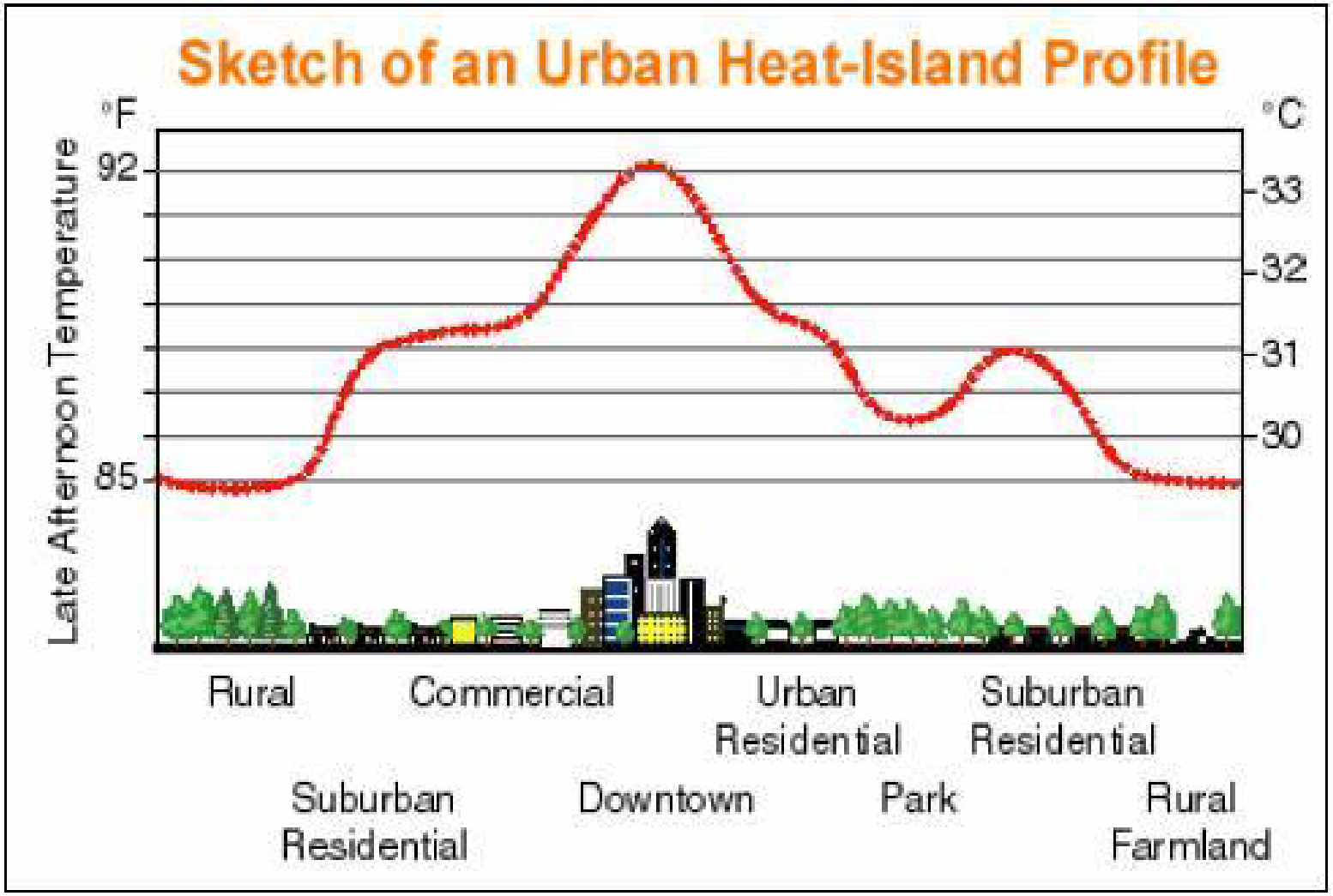

Urban Heat Island (UHI)

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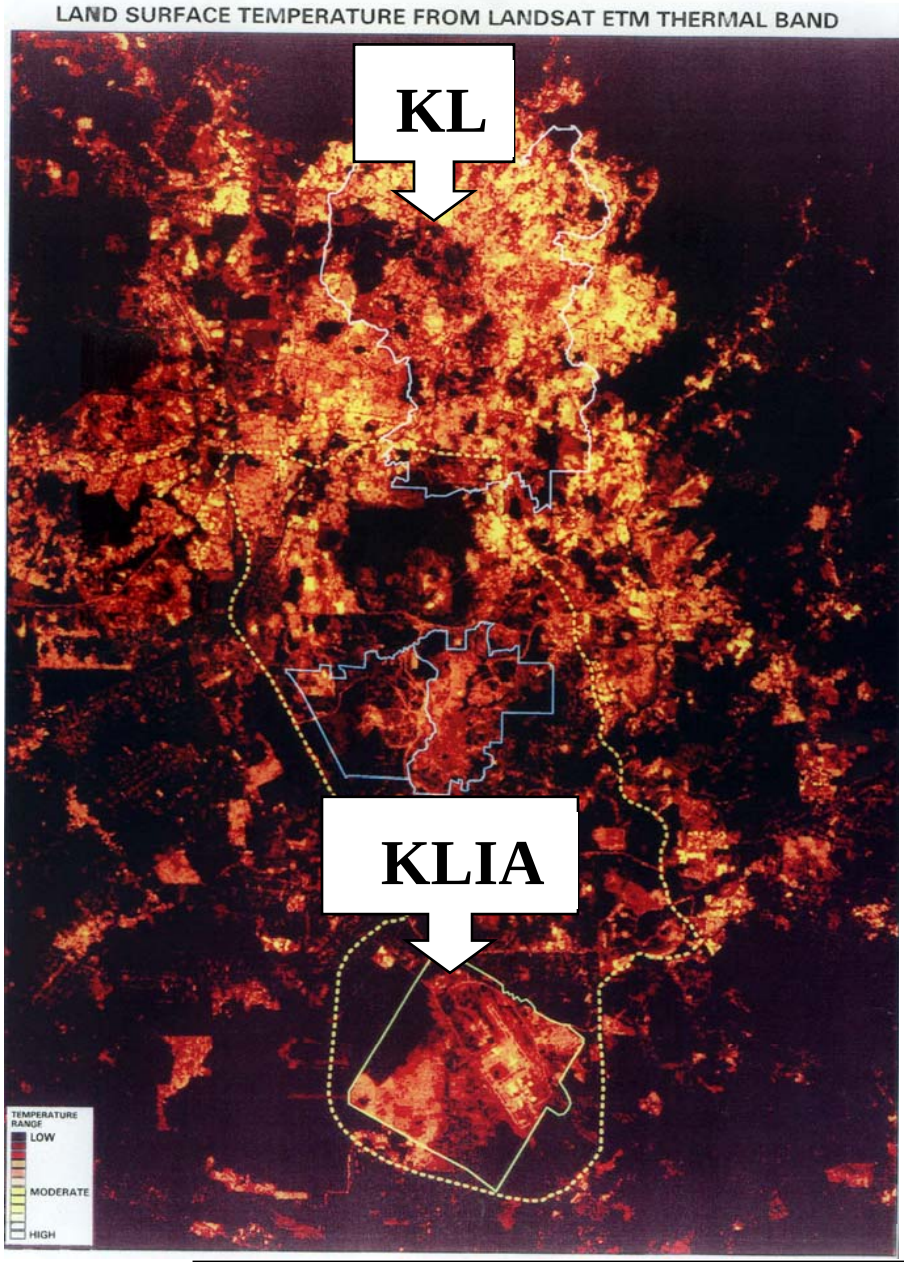
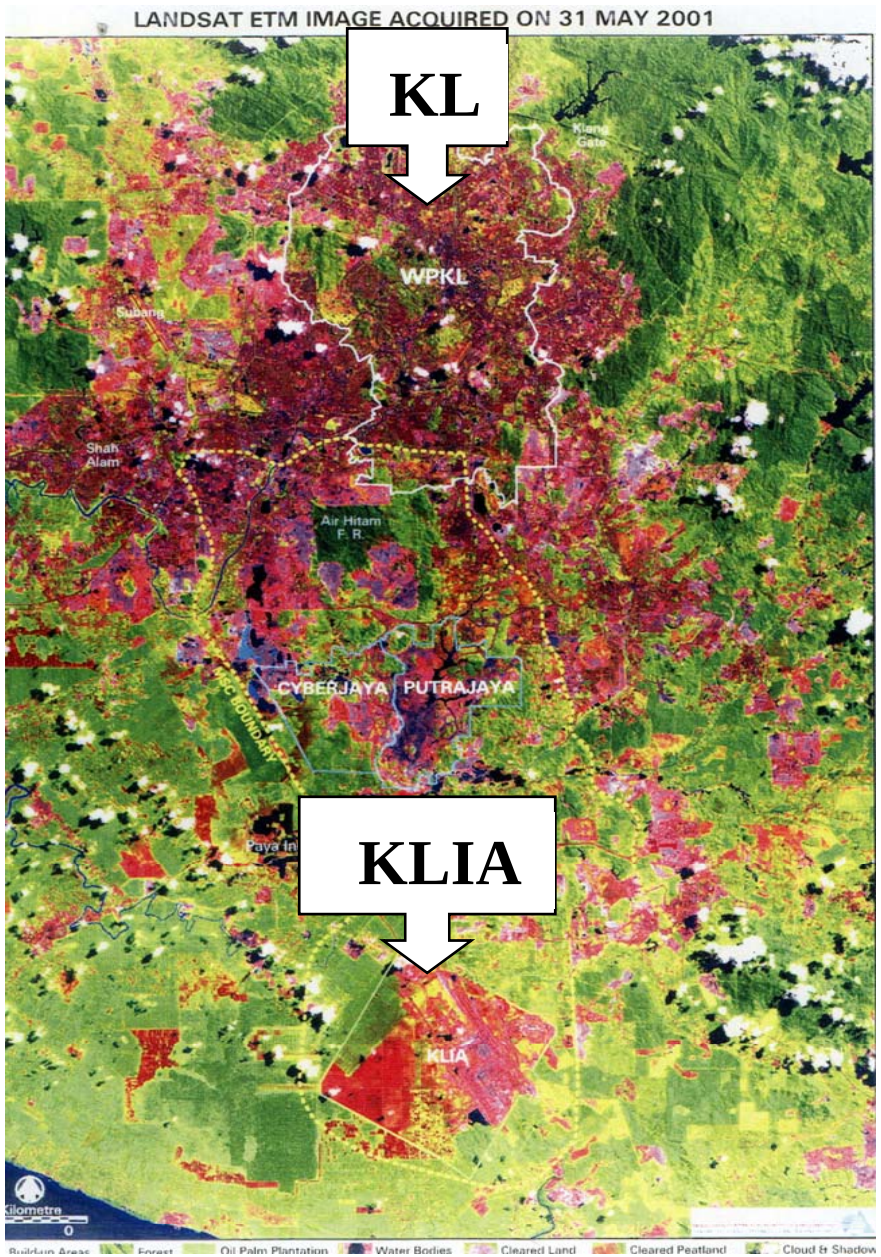




Satellite Image of UHI in Kuala Lumpur

Warm Air Rising and Forming Storm Clouds

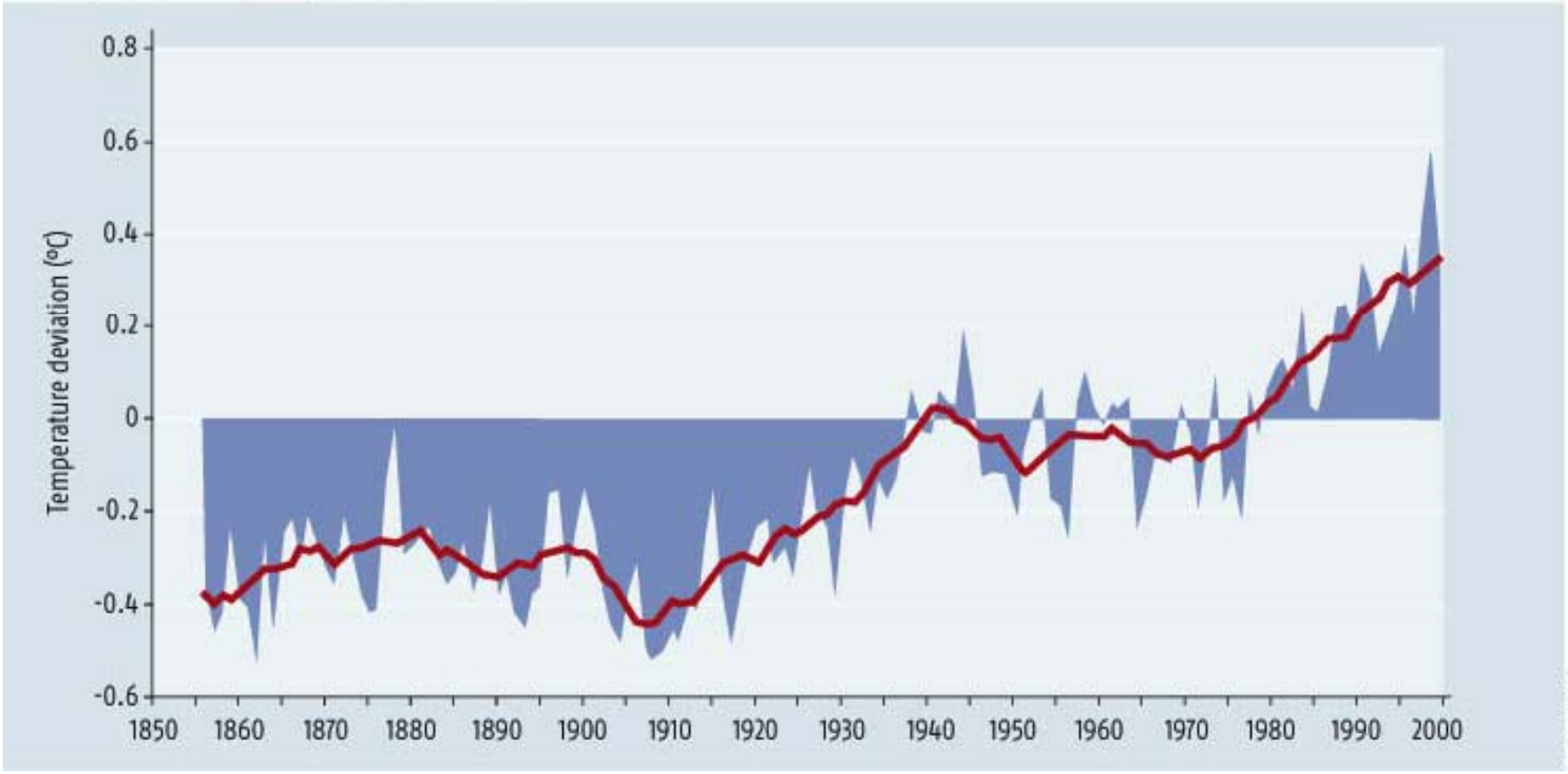
Climate Change

- Micro-scale → Urban Heat Island
- Global scale → Global Warming

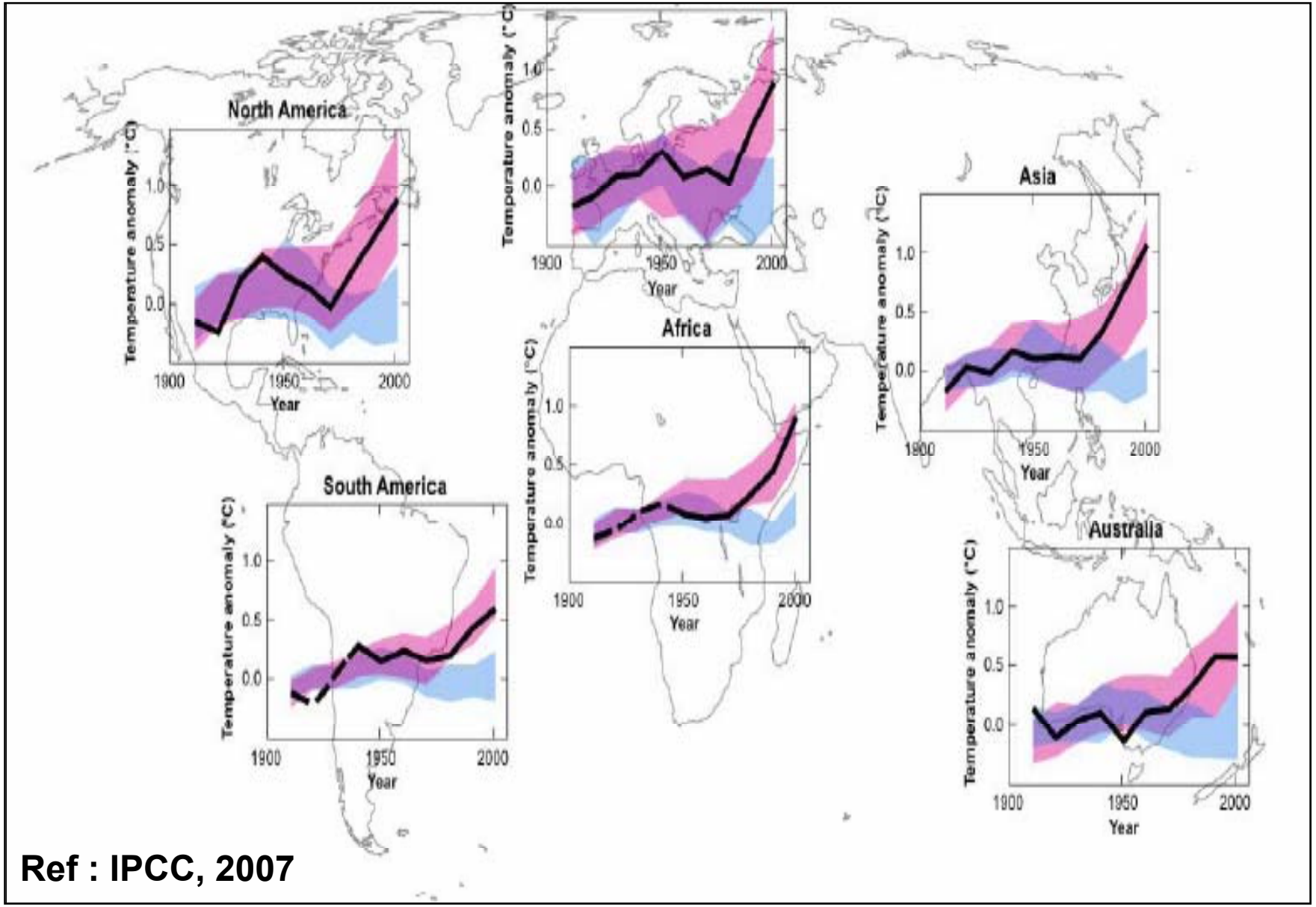
THE WORLD IS GETTING WARMER

Temperature plotted as the deviation from the 1960 to 1990 average

Yearly deviation 10-year smoothed trend



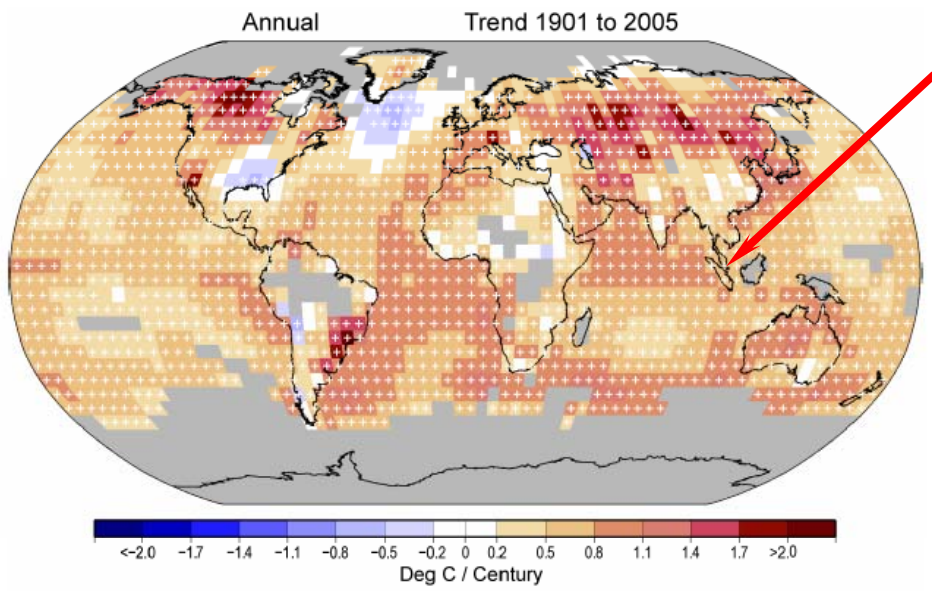
Comparison of Observed Continental Changes in Surface Temperature for 1906 – 2005 Relative to Average 1901 – 1950



Ref : IPCC, 2007

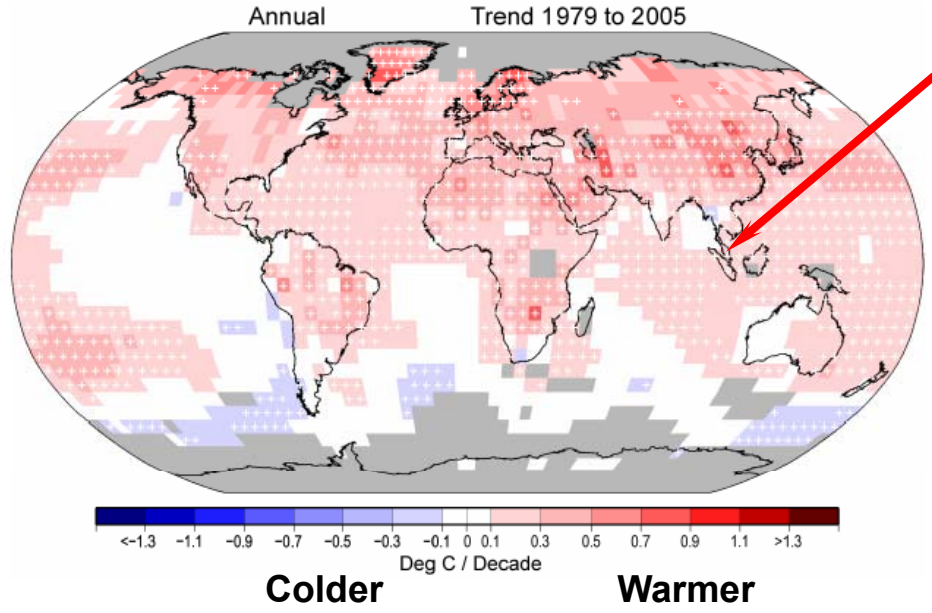
Annual Temperature Trend for 1901 to 2005 (above) and 1979 to 2005 (below)

Asian Monsoon Region



Malaysia

~ 0.5°C per Century



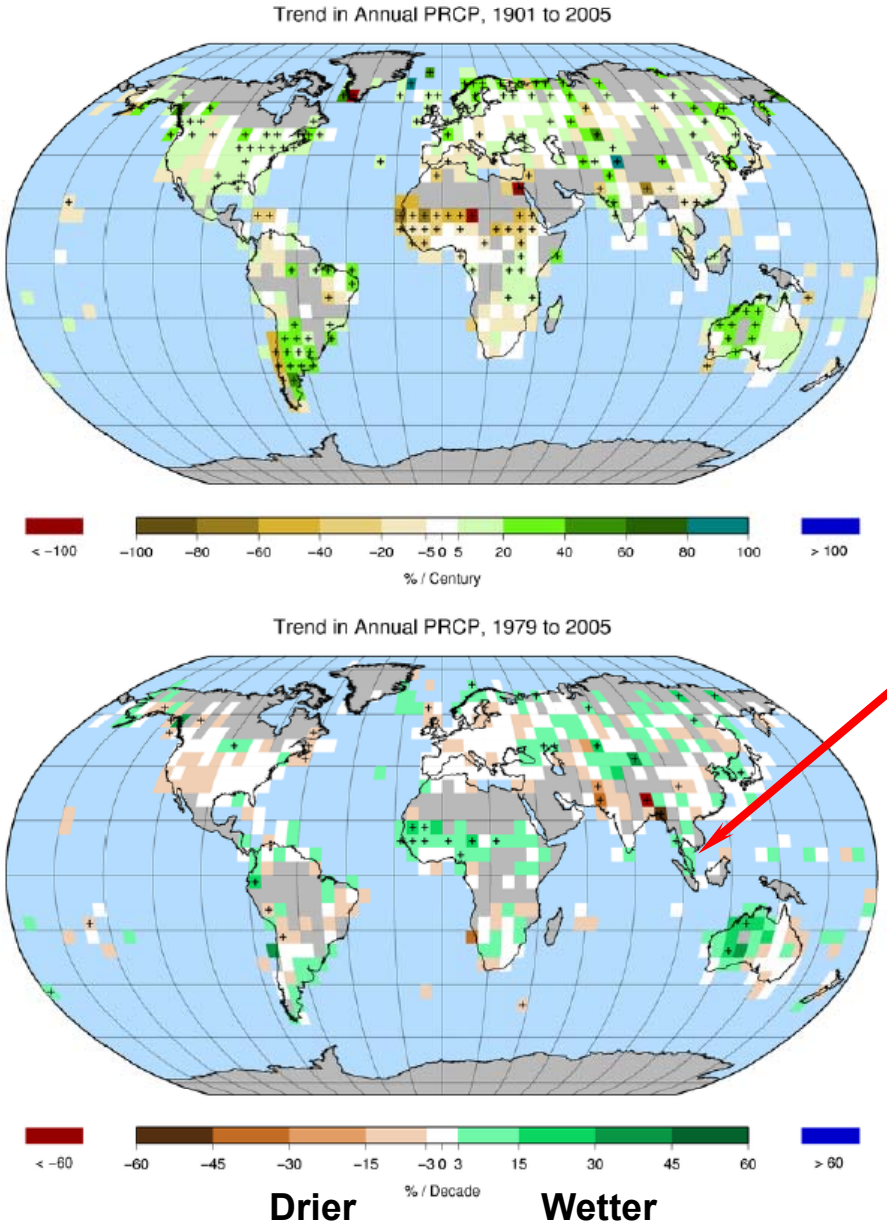
Malaysia

~ 0.1°C per Decade

Ref : IPCC, 2007

Sept 2008

Annual Rainfall Trend for 1901-2005 (above) and 1979-2005 (below)



Malaysia

~ 3% per Decade

Ref : IPCC, 2007

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Recent Trends of Extreme Weather Events and Assessment of Human Influence on the Trend (IPCC, 2007)

Phenomenon and direction of trend	Likelihood that trend occurred in late 20th century (typically post 1960)	Likelihood of a human contribution to observed trend
Warmer and fewer cold days and nights over most land areas	***Very likely***	***Likely***
Warmer and more frequent hot days and nights over most land areas	***Very likely***	***Likely (nights)***
Warmer spells / heat waves. Frequency increases over most land areas	***Likely***	***More likely than not***
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	***Likely***	***More likely than not***
Area affected by droughts increases	***Likely in many regions since 1970s***	***More likely than not***
Intense tropical cyclone activity increases	***Likely in many regions since 1970***	***More likely than not***
Increased incidence of extreme high sea level (excludes tsunamis)	***Likely***	***More likely than not***

Virtually certain:
> 99% probability of occurrence

Extremely likely:
> 95%

Very likely:
> 90%

Likely:
> 66%

More likely than not:
> 50%

Unlikely:
< 33%

Very unlikely:
< 10%

Extremely unlikely:
< 5%

Recent Trends of Extreme Weather Events and Assessment of Human Influence on the Trend (IPCC, 2007)

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Very likely:
> 90%

Likely:
> 66%

More likely than not:
> 50%

Unlikely:
< 33%

Very unlikely:
< 10%

Extremely unlikely:
< 5%

Climate Change

- Micro-scale → Urban Heat Island
- Global scale → Global Warming
- Impact on hydrological system
- IPCC Assessment (2007) → by 2100 :
  - Possible intensification of hydrological cycle on global basis
  - Increased frequencies and intensities of extreme weather events e.g. floods and droughts

Outline of Presentation

I. Floods in Asian Monsoon Region

II. Changing Conditions

III. Need for Sustainable Approach

IV. New Approaches to Manage Floods

V. Conclusion

Sustainable Approach

- Changes in Natural and Social Conditions → exacerbated flood problem

Asian Monsoon Region

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Wednesday 20 December 2006

N14 Nation

THE STAR

Worst flood experience yet

JOHOR BARU: Mohammad Abdul Hamid, 63, was feeling edgy as he watched the rain pouring down non-stop since Sunday.

He had seen many floods in the 26 years he had lived in Kampung Laut but he sensed that the incessant rain the last few days was a bad omen.

"I was watching television in the hall in the morning and suddenly water started rushing into the house from the kitchen," he said, adding that in 10 minutes the waters had reached almost to his waist.

Mohammad, a retiree, said he grabbed his personal documents, carried his youngest child and called out to his other three children and wife to get out of the house.

With the help of neighbours, he managed to move a television set and washing machine to higher ground.

From there they watched the water around their double-storey house rapidly rise. Within three hours, the waters had reached the roof.

Rescuers from the Fire and Rescue Department later arrived to take them to the relief centre at SRJK Pu Sze.

"There have been some severe floods in the past but never one as bad as this," Mohammad said.

"My loss is about RM8,000. I have thought of shifting house, but I'm retired and have financial constraints."

N. Appanaitu, 54, said the flood this time was more severe.

"My family and I went outstation the day before and when we got back we saw our house in flood waters.

"I lost about RM20,000 worth of items, including our computer and electrical appliances," said Appanaitu.

At Kampung Mahmoodiah, restaurateur Ahmad Ismail, 25, struggled to keep the water from entering his house but to no avail.

"We were all prepared for this rainy season but we never expected the rain to fall continuously for days," he said, adding that his house started flooding at 2.30am yesterday.

Odd job worker Masri Safwan, 34, said he was shocked when he saw a car floating away in the floodwaters while the vehicle owner was having a meal at a nearby stall.

His friend, Abdul Rahman Abu Bakar, 43, blamed the poorly kept drainage for the floods.

"I cannot understand why because we have complained many times and the media have highlighted it countless times," he said.

At the height of the floods, the residents broke the concrete embankment to allow the waters to flow into a monsoon drain.

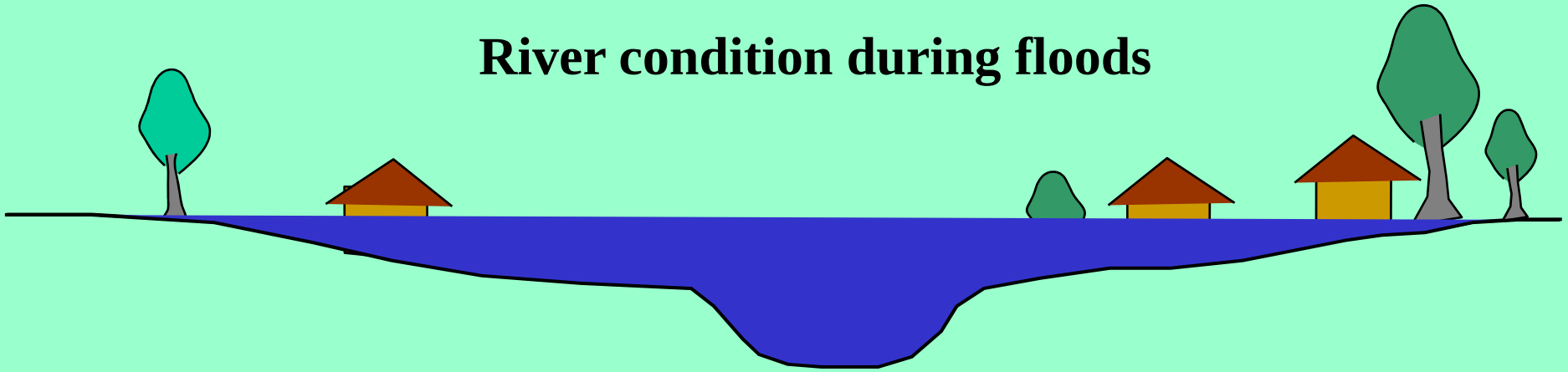
TO HIGHER GROUND: A Kampung Laut resident trying to salvage a refrigerator while another seeks refuge

Floods getting more intense and frequent

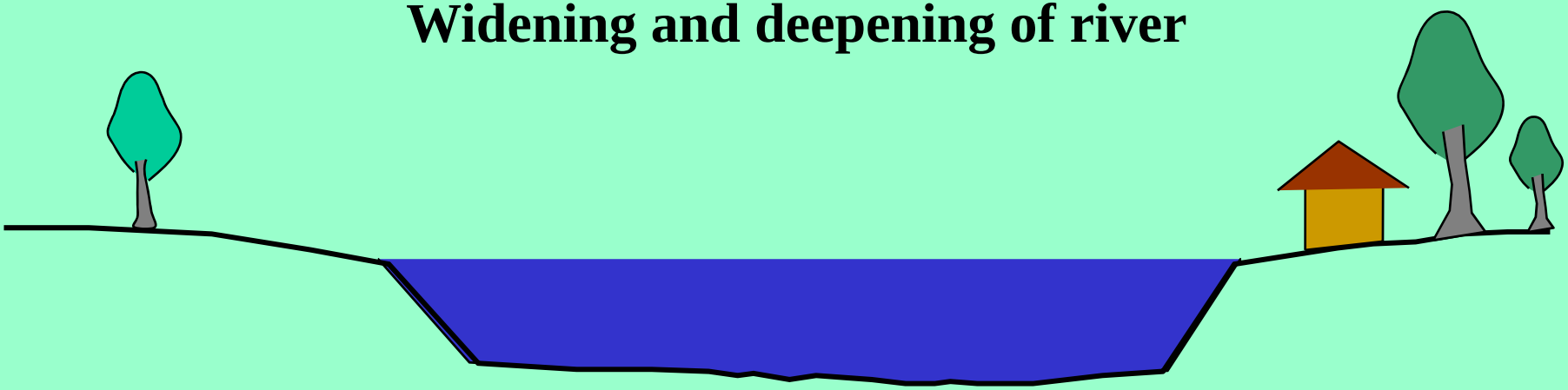
Sustainable Approach

- Changes in Natural and Social Conditions → exacerbated flood problem
- Traditional solution → structural (engineering measures)
  - Removing the excess water through river improvement works
  - Widening and deepening of rivers

River condition during floods



Widening and deepening of river



Asian Monsoon Region

River Widening and Deepening

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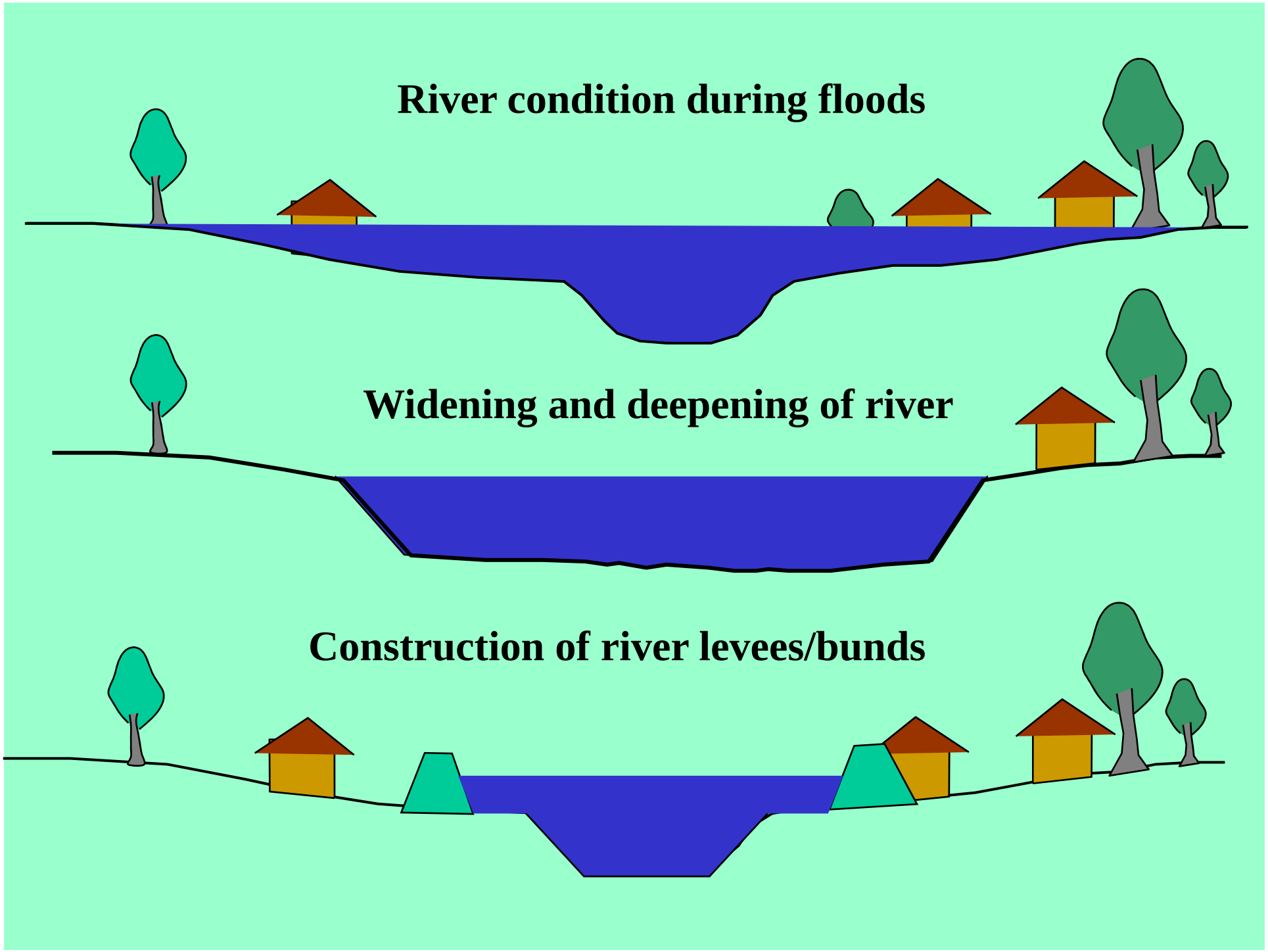
Sustainable Approach

- Changes in Natural and Social Conditions → exacerbated flood problem
- Traditional solution → structural (engineering measures)
  - Removing the excess water through river improvement works
  - Widening and deepening of rivers
  - Construction of river levees


River condition during floods
Widening and deepening of river
Construction of river levees/bunds

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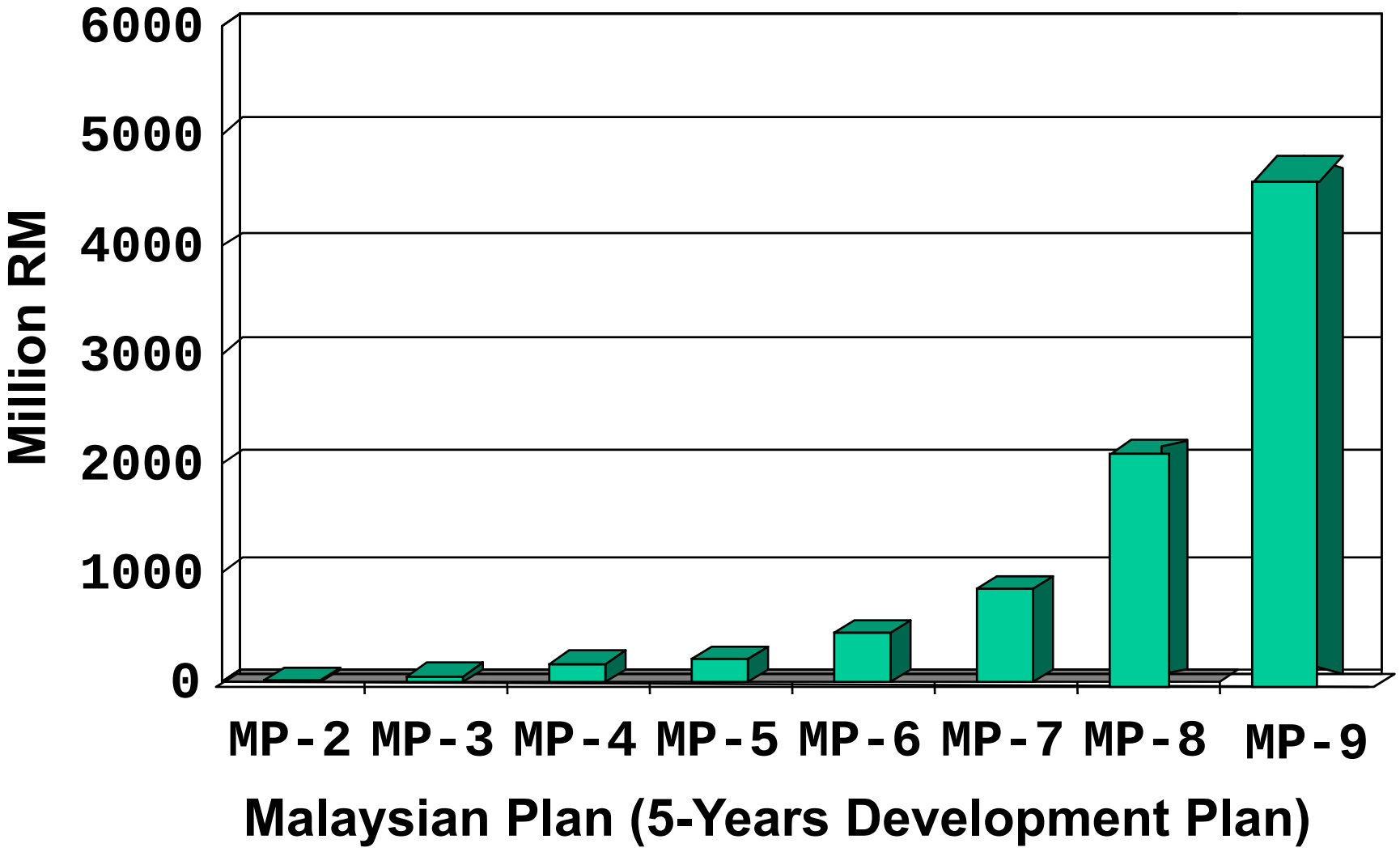
River Levees (Walls) in City Centre

Sustainable Approach

- Changes in Natural and Social Conditions → exacerbated flood problem
- Traditional solution → structural (engineering measures)
- Structural solutions are costly

Development Allocation for Flood Projects per Malaysian Plan

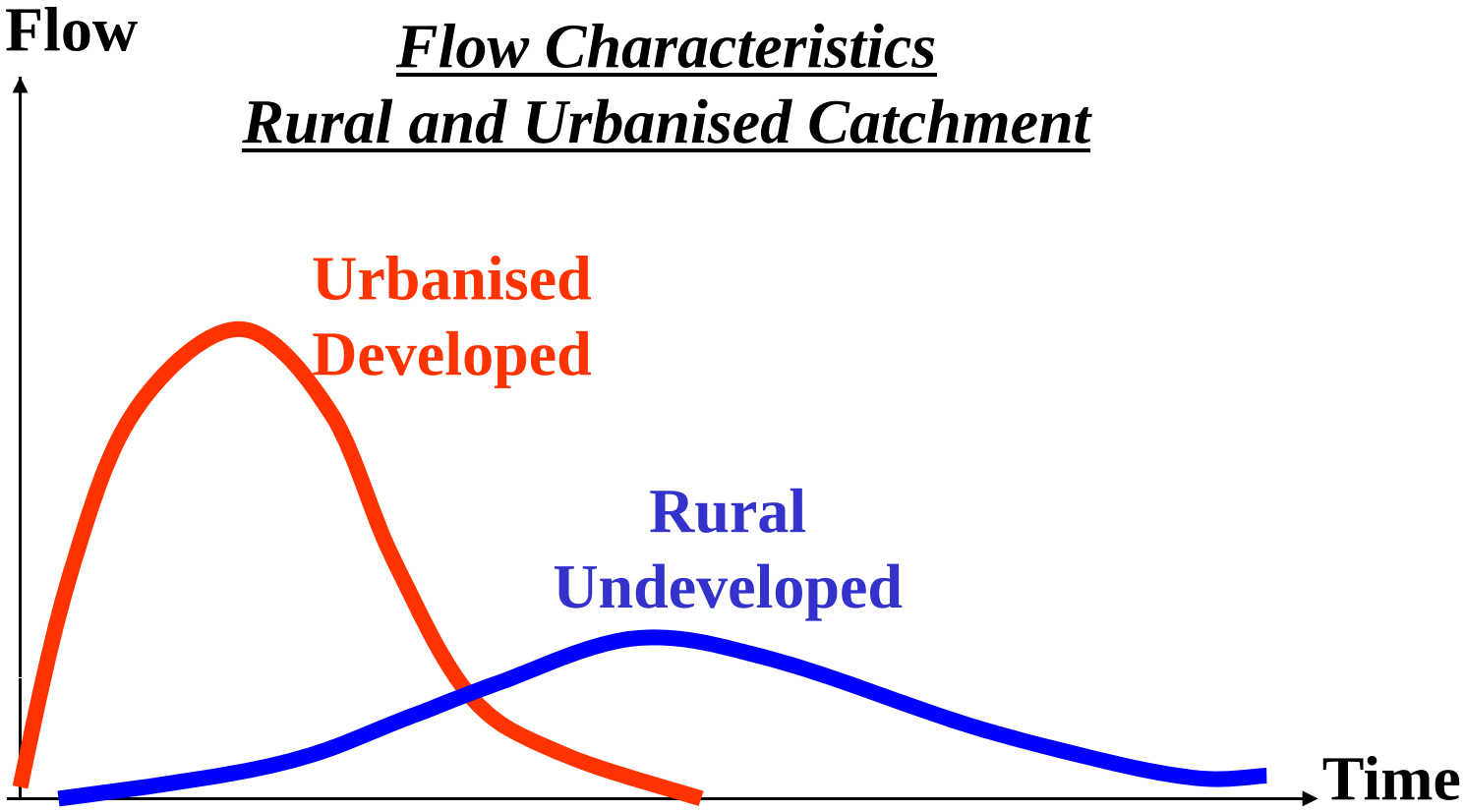


Sustainable Approach

- Changes in Natural and Social Conditions → exacerbated flood problem
- Traditional solution → structural (engineering measures)
- Structural solutions are costly
- Creates dilemma

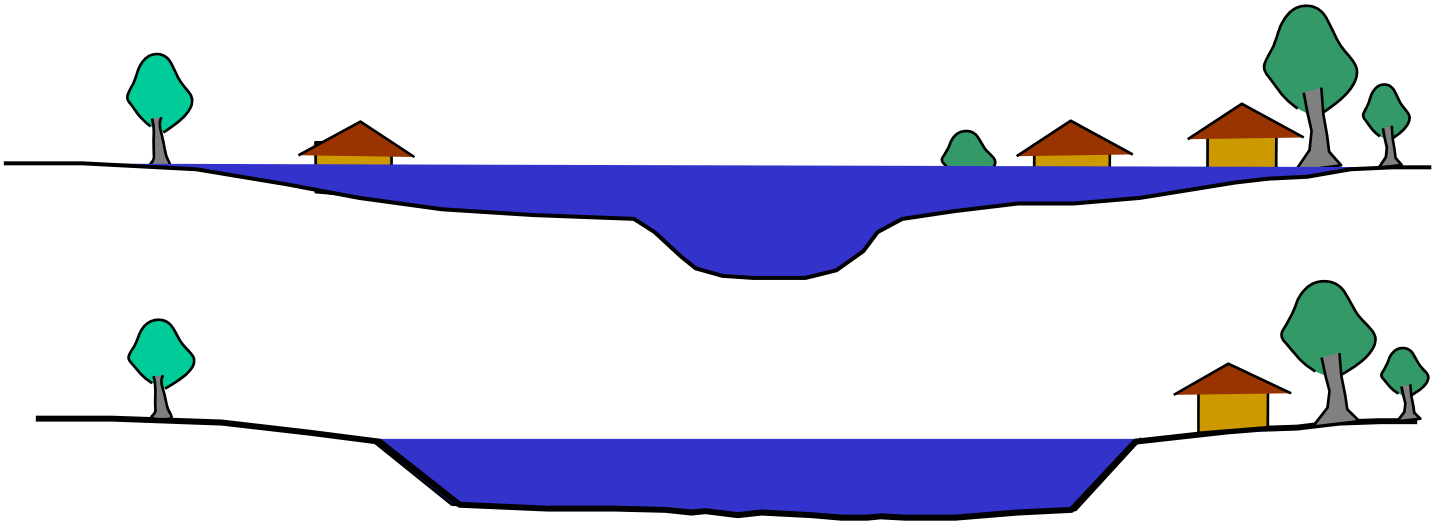
Dilemma

- ⇧ *condition changes increase*
- ⇧ *runoff generated*



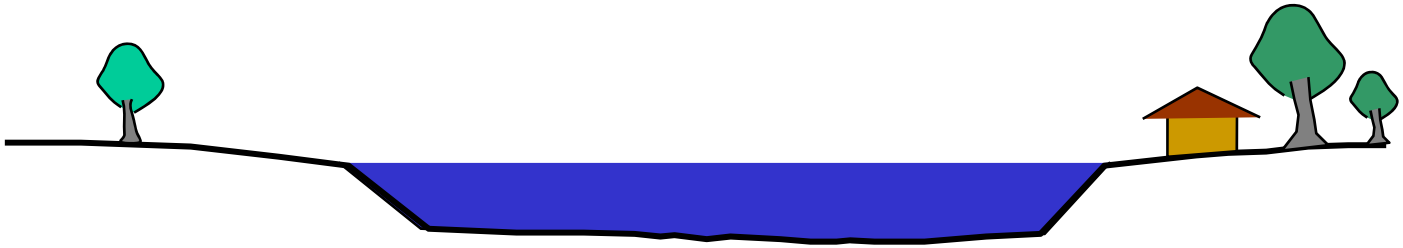
Dilemma

- ⇧ *condition changes increase*
- ⇧ *runoff generated*
- *Leads to more floods*
- *Solve through engineering works*

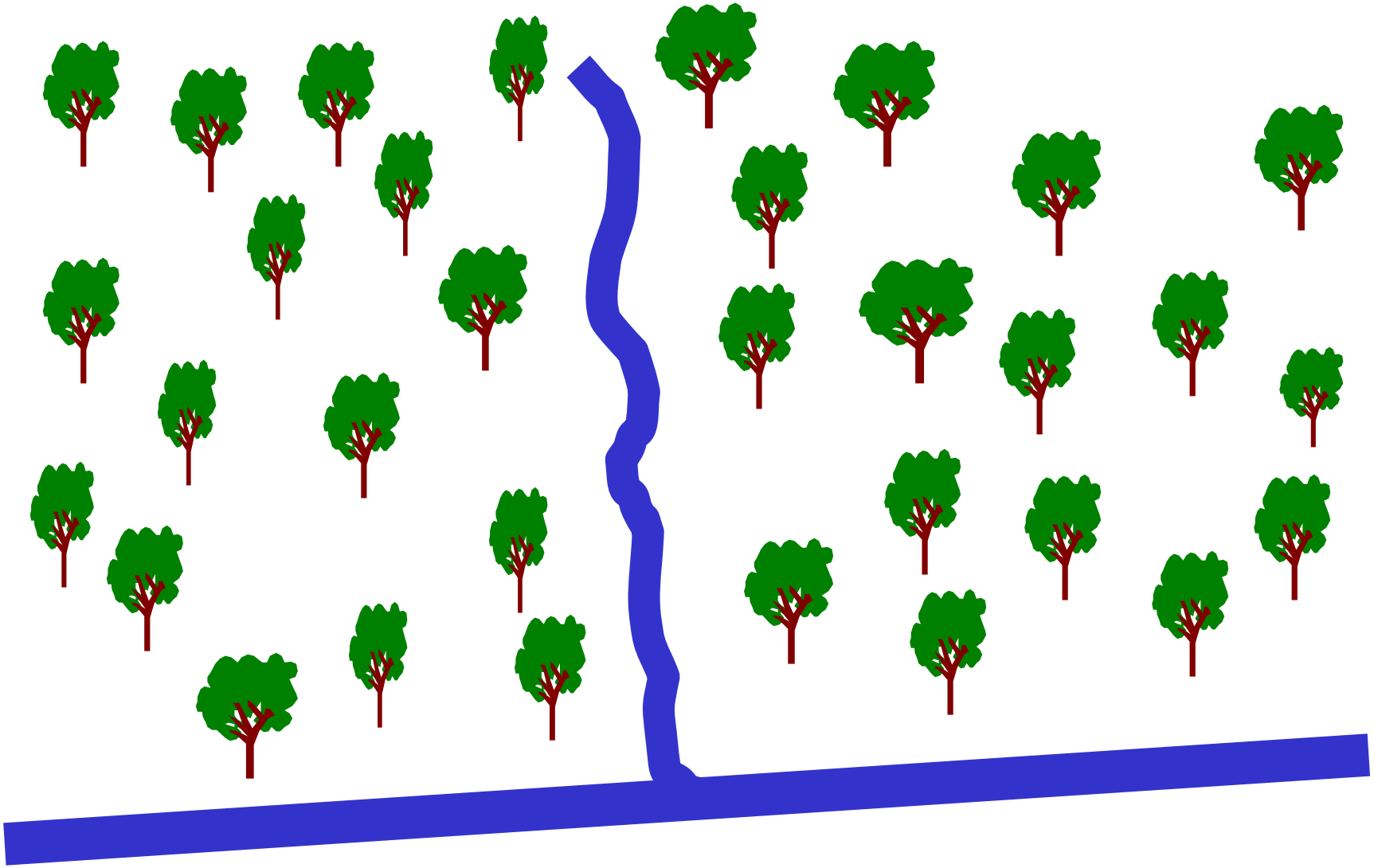


Dilemma

- ⇧ *condition changes increase*
- ⇧ *runoff generated*
- *Leads to more floods*
- *Solve through engineering works*
- *Cycle repeated with more changes*
- *Not Sustainable*



Asian Monsoon Region



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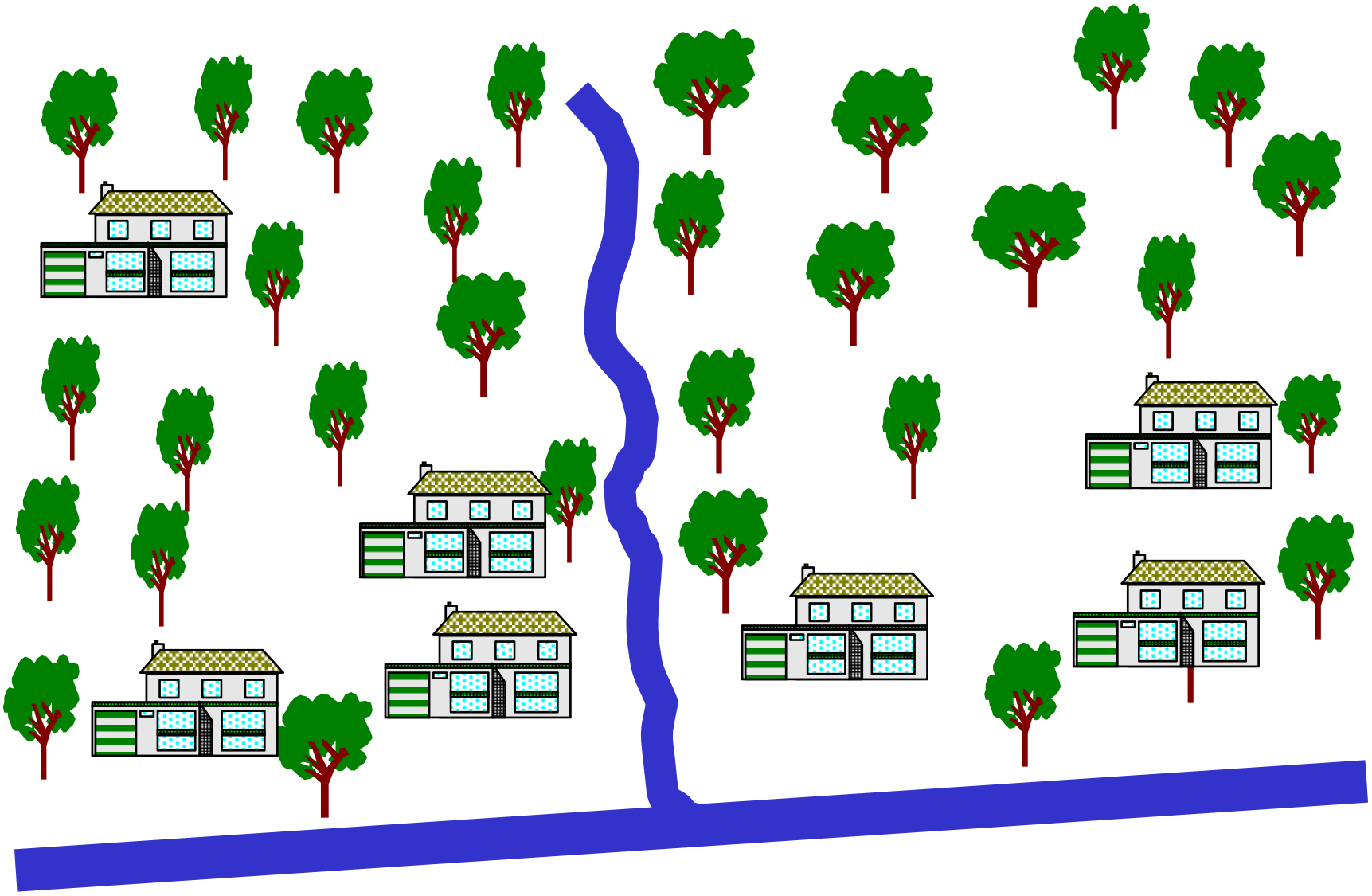

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Outline of Presentation

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Flood Management

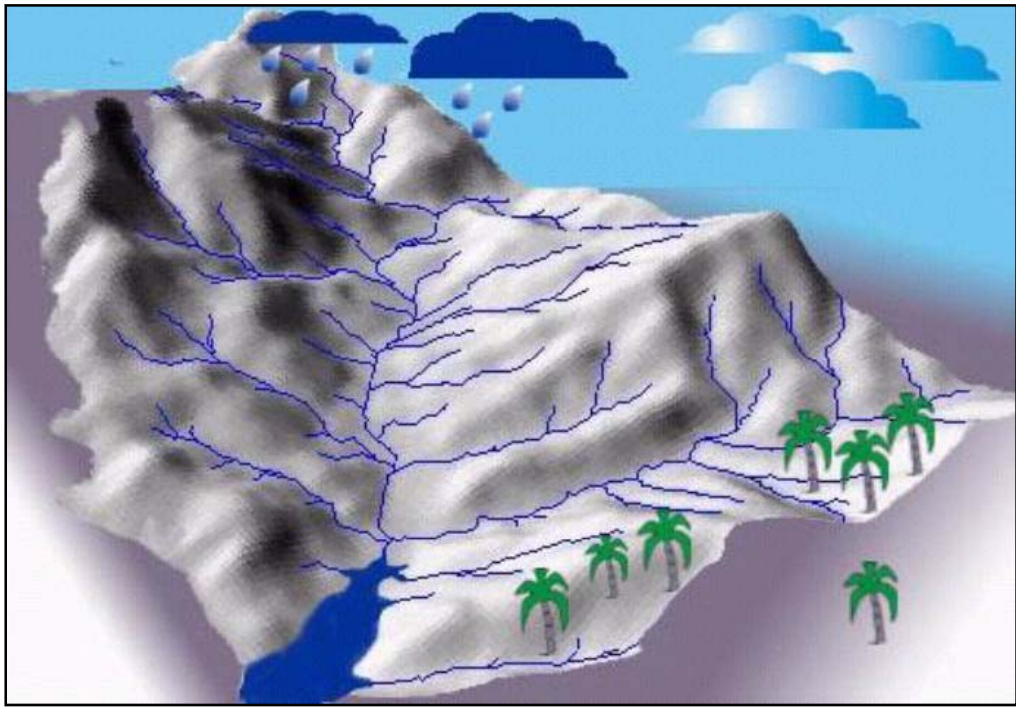
- New approaches needed for Flood Management because :
  - Funds for structural measures becoming more limited
  - Change from structural to non structural
  - Need for a more comprehensive and sustainable approach
  - Change from supply-led approach (projects focused) → demand-led approach (control problem at source)

Flood Management

- New approaches needed for Flood Management
- More holistic approach in planning :
  - Concept of river basin

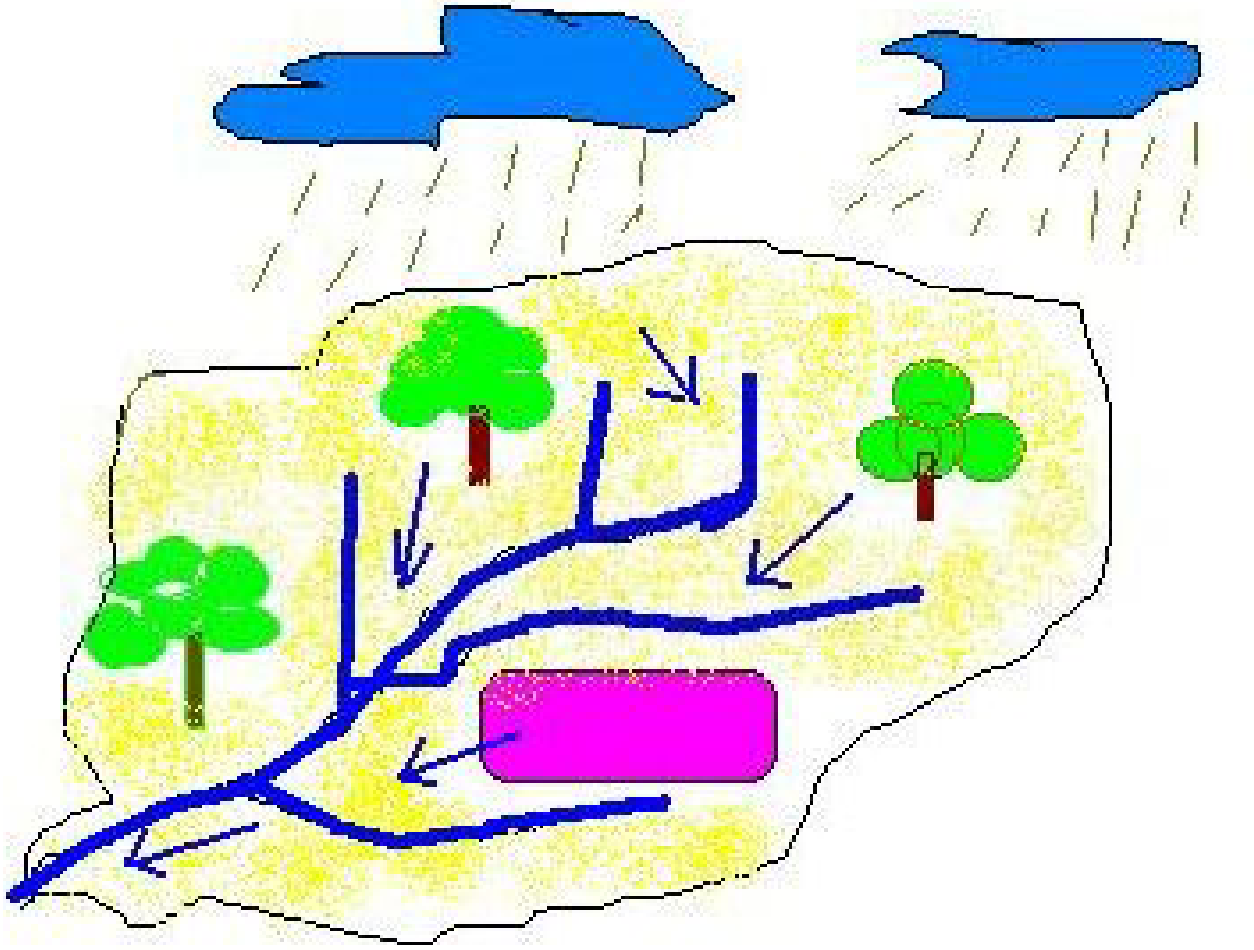
River Basin

- Geographical area determined by the watershed limits of the system of waters, including surface and underground waters, flowing into a common terminus



Asian Monsoon Region

A River Basin



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Planner's Role

- Need for more holistic approach
  - Concept of river basin
  - Watershed boundary vs political boundary
  - Planning needs to be done on basis of physical rather than political boundaries

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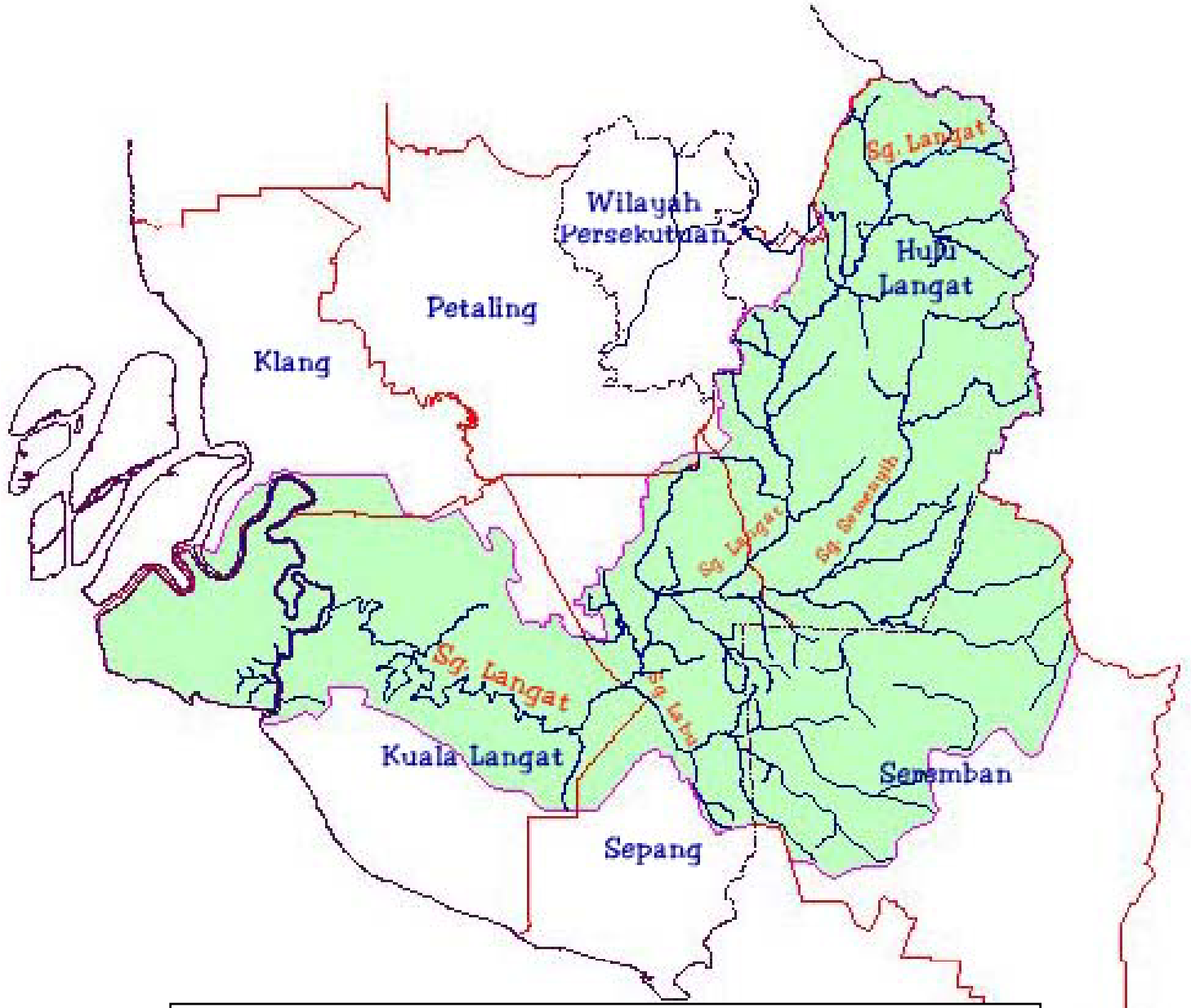
Mekong River Basin

Asian Monsoon Region



Langat River Basin, Malaysia

Sept 2008

Asian Monsoon Region

Yodo River Basin

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Planner's Role

- Need for more holistic approach
  - Concept of river basin
  - Watershed boundary vs political boundary
  - Planning needs to be done on basis of physical rather than political boundaries
  - River basin master plan

NEW STRAITS TIMES

Master plan for river basins

Monitoring land use for development

By Jaswinder Kaur
news@nstp.com.my

KINABATANGAN, Mon. — The Drainage and Irrigation Department will formulate a master plan on land use at 150 river basins in the country, its director-general Datuk Keizrul Abdullah said.

The master plan would become a basis for all local authorities to use as it was impossible for the department's enforcement officers to monitor the almost 12,000 rivers in the country.

He said a master plan was necessary as "every inch" of the country was part of a river basin and all activities have an impact on rivers.

Keizrul was speaking after witnessing Agriculture and Food Industry Assistant Minister Datuk Mannan Jakasa close the two-day Sungai Kinabatangan Expedition in Sukau on Saturday.

About 40 people representing government agencies, non-governmental organisations, students and members of the media participated in the expedition which was organised by DID under the "Love Our River" campaign.

Keizrul said integrated plans would be made for major rivers like Sungai Klang and Sungai Langat in Selangor first, while in Sabah, the plan would be for Sungai Kinabatangan which, at 560km, is the longest river in the State.

He said the department aimed to rehabilitate rivers back to Class Three and then down to Class Two.

(Class One refers to pristine rivers; Class Two for rivers which can be used as a drinking source with treatment; Class Three allows for contact sports; Class Four refers to rivers which do not allow body contact; while Class Five is for rivers with poor water quality.)

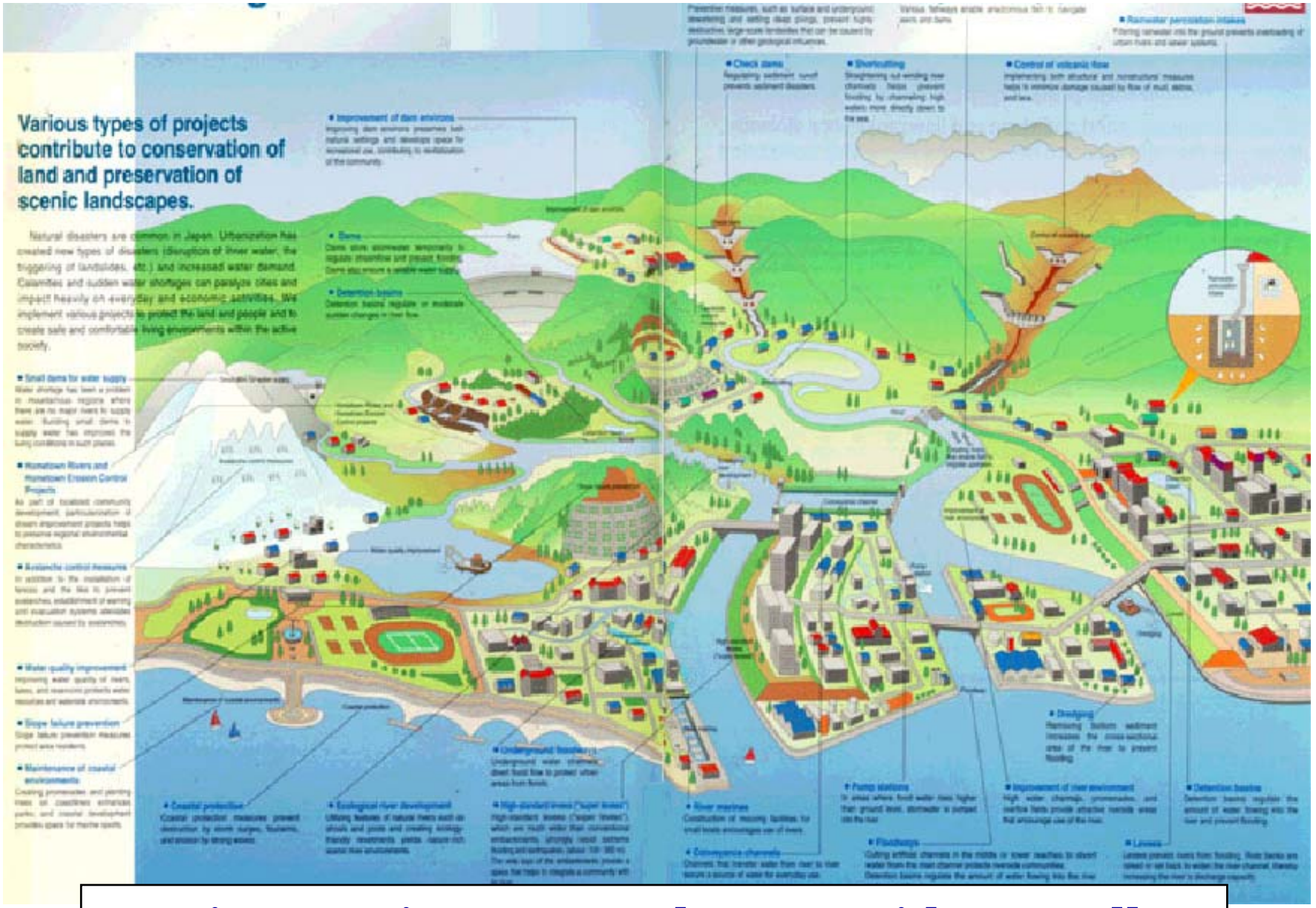
"DID sees rivers as a heritage we should care for. Rivers provide 98 per cent of our drinking water while the remaining two per cent is from underground water," Keizrul said.

"Rivers are also a source of protein in terms of fish, and provides recreation, economic income, ecotourism and transportation," he added.

Mannan, who represented Deputy Chief Minister Datuk Lajim Ukin, said the Government was committed in its efforts to keep rivers clean.

"In 1998, the State Government passed the Water Resources Enactment to ensure sustainable management of water and to maximise the benefits of rivers.

"We want to make it possible for future generations to continue using rivers as a source of income and for transportation," he said.



River Basin Master Plans provide overall framework for development in a river basin

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Flood Management

- New approaches needed for Flood Management
- More holistic approach in planning
- Remedial measures :
  - Ban logging in forest areas : eg. Thailand 1989
  - Limit activities in forest/catchment areas

TheStar FRIDAY 5 November 2004

'Gazette water catchments'

Do it as soon as possible, states ordered

BY MERGAWATI ZULFAKAR

PUTRAJAYA: The order is out to all state governments to gazette all water catchment areas as soon as possible.

And once done, a total of 880,000ha would be gazetted as water catchment areas to meet the future water needs of Malaysians.

Deputy Prime Minister Datuk Seri Najib Tun Razak said the authorities must use satellite photos and aerial surveillance to curb illegal logging in all forest reserves.

He said the country's water resources must be protected as demand for water was on the rise.

"Some state governments

Najib: Says water resources must be protected because demand for water is rising

Malaysia had been recognised as one among the 12 countries in the world with rich biodiversity where there were 12,500 species of flower plants, 300 species of mammals, 750 species of birds, 350 species of reptiles, 165 species of amphibians, 300 species of freshwater fish and millions of invertebrates.

Najib also said the council was getting the cooperation of the Malaysian Centre for Remote Sensing to supply satellite and aerial photographs to state governments to check on illegal logging activities.

"This will make it easier to detect illegal logging activities and enforcement could be

Flood Management

- New approaches needed for Flood Management
- More holistic approach in planning
- Remedial measures :
  - Ban logging in forest areas : eg. Thailand 1989
  - Limit activities in forest/catchment areas
  - Reforestation

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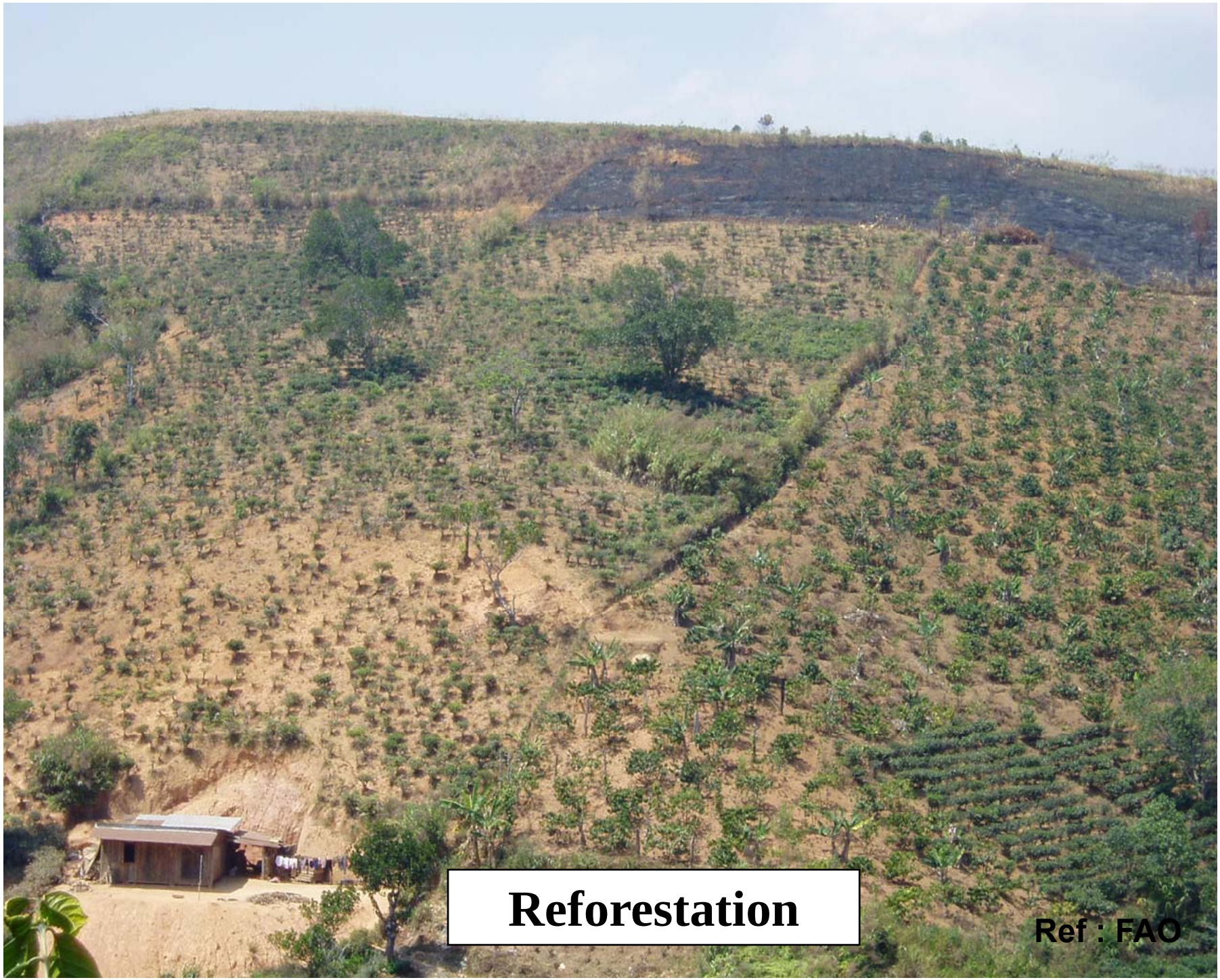

Reforestation

Ref : FAO

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Flood Management

- New approaches needed for Flood Management
- More holistic approach in planning
- Remedial measures
- Change from rapid disposal to control at source
  - Rapid disposal → removing the excess water quickly through river improvement works

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River Improvement Works

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Control at Source

- *Rapid Disposal of floodwaters*

- *Control at Source, attenuated flow*

Control at Source

Reduce run-off through

- Storage
- Increasing Infiltration
- Decreasing Velocities

Control at Source

- **Storage**
  - **Detention Pond**

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Control at Source

- **Storage**
  - **Detention Pond**
  - **Rainfall harvesting**

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Control at Source

- **Storage**
  - **Detention Pond**
  - **Rainfall Harvesting**
  - **Modular tanks underground**

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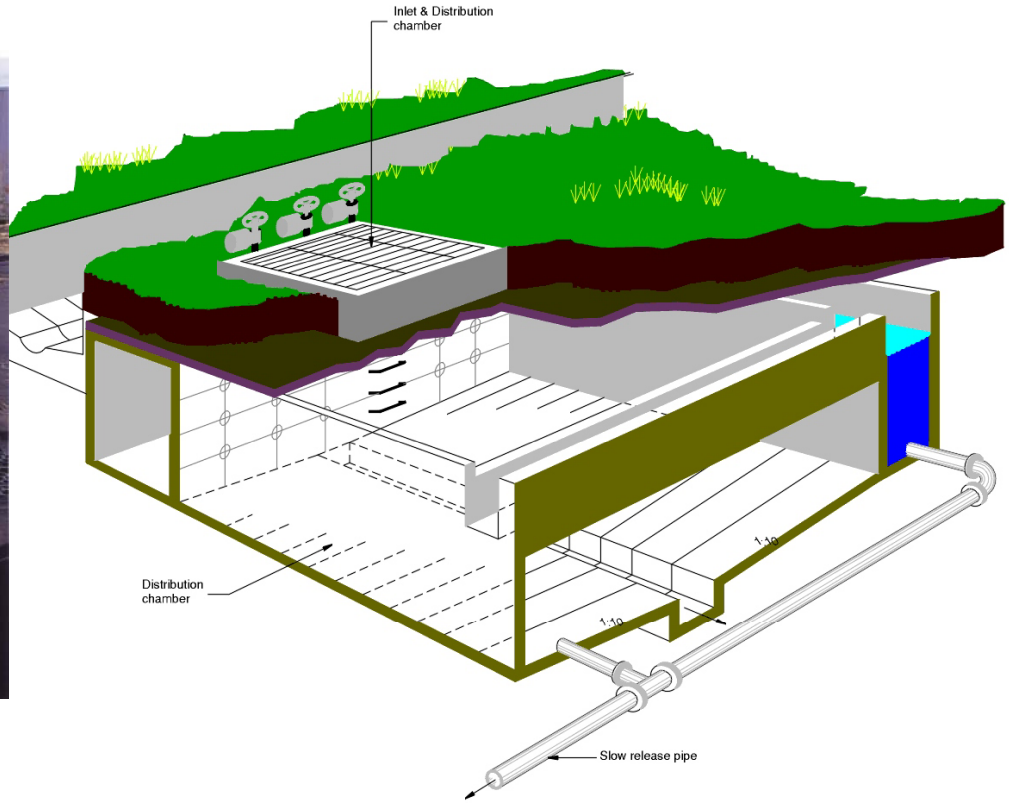
Underground Tanks



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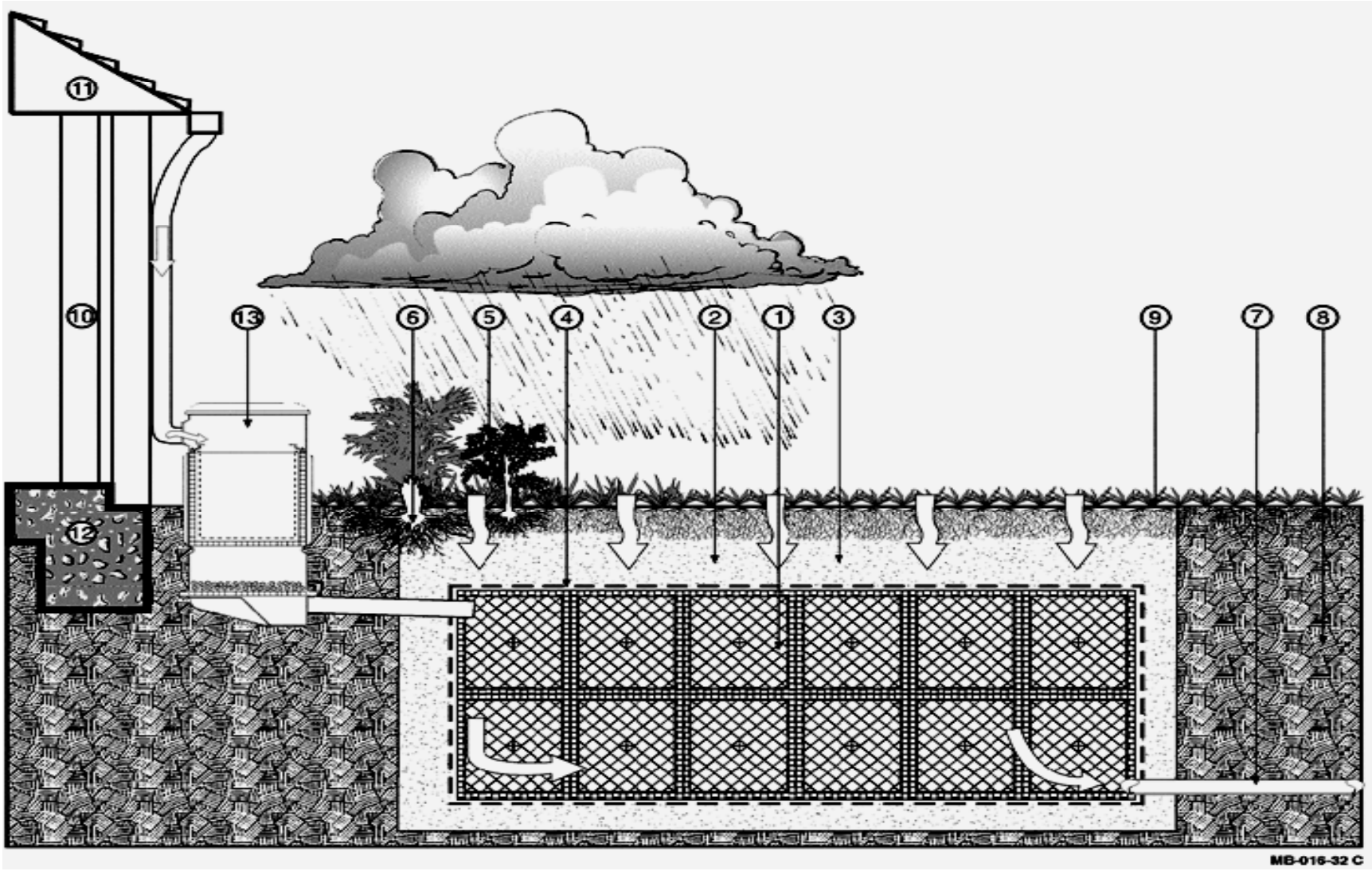
Modular Tank



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Control at Source

- **Storage**
- **Increase Infiltration**
  - **Infiltration/gravel Drains**

Infiltration Trench

Infiltration System at housing perimeter

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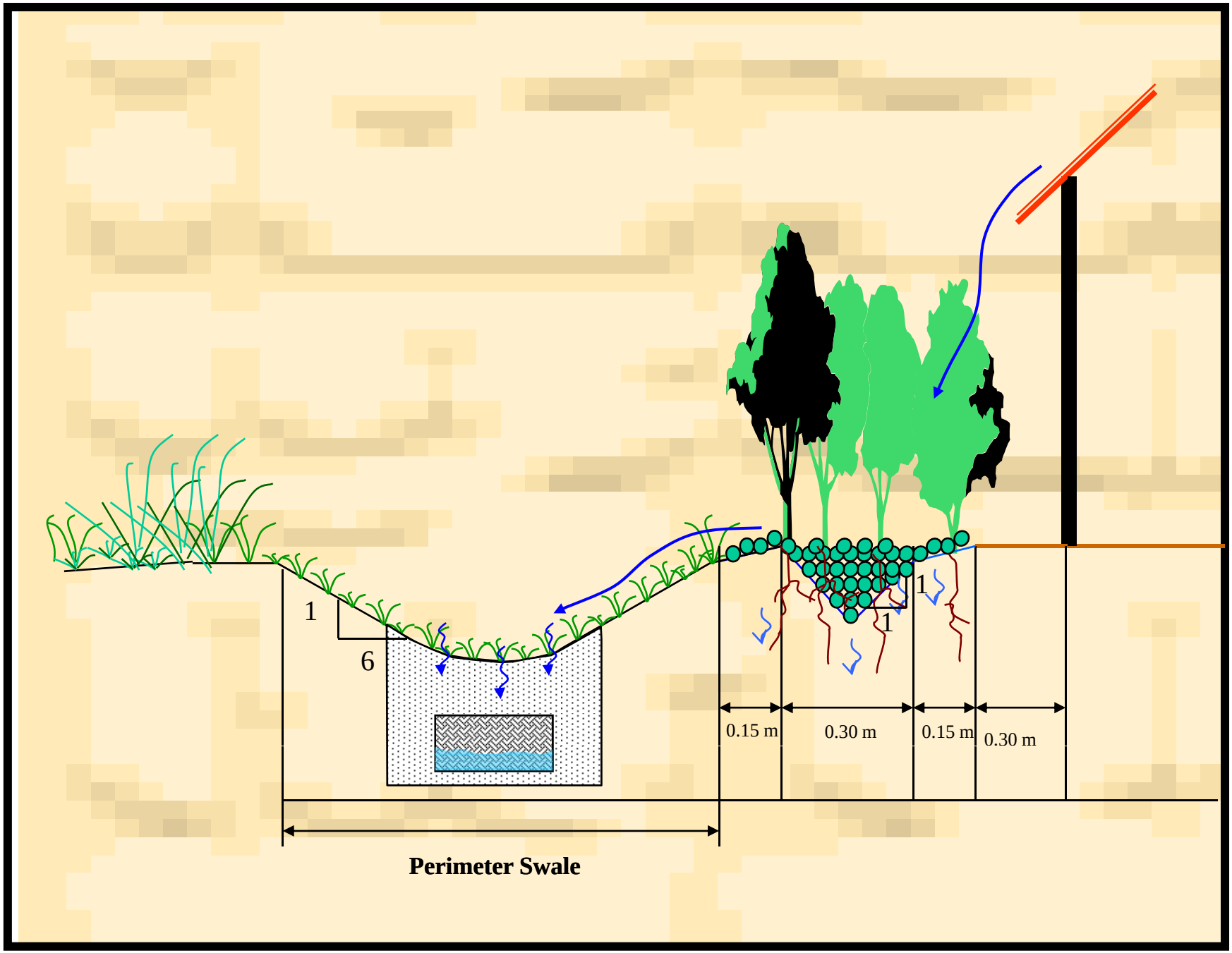

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Control at Source

- **Storage**
- **Increase the infiltration rate**
  - **Infiltration gravel drain**
  - **Pervious Road (pervious pavement)**

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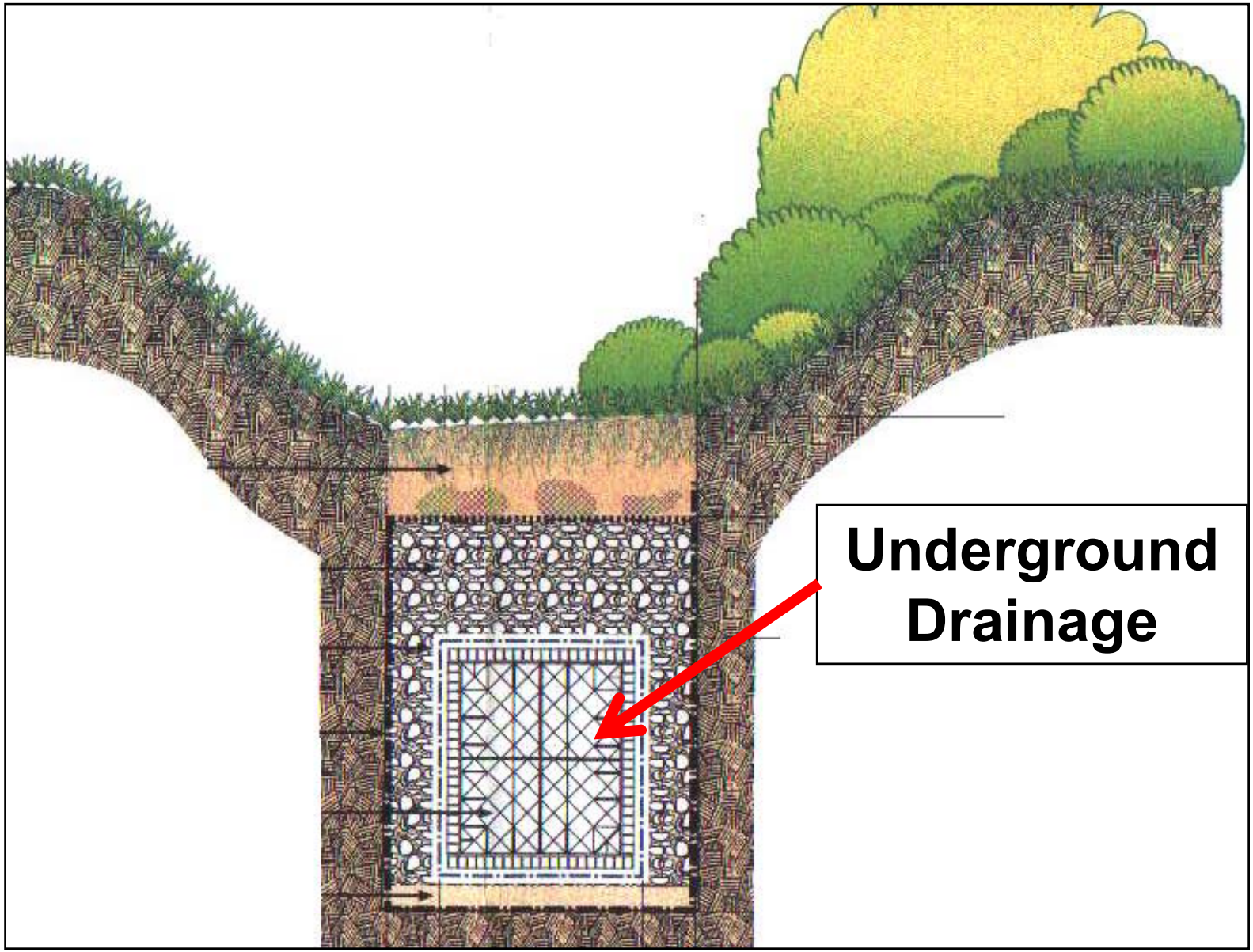
Control at Source

- **Storage**
- **Increase the Infiltration rate**
  - **Infiltration gravel drain**
  - **Pervious Road air (pervious pavement)**
  - **Underground Drainage (buried drains)**


Underground
Drainage

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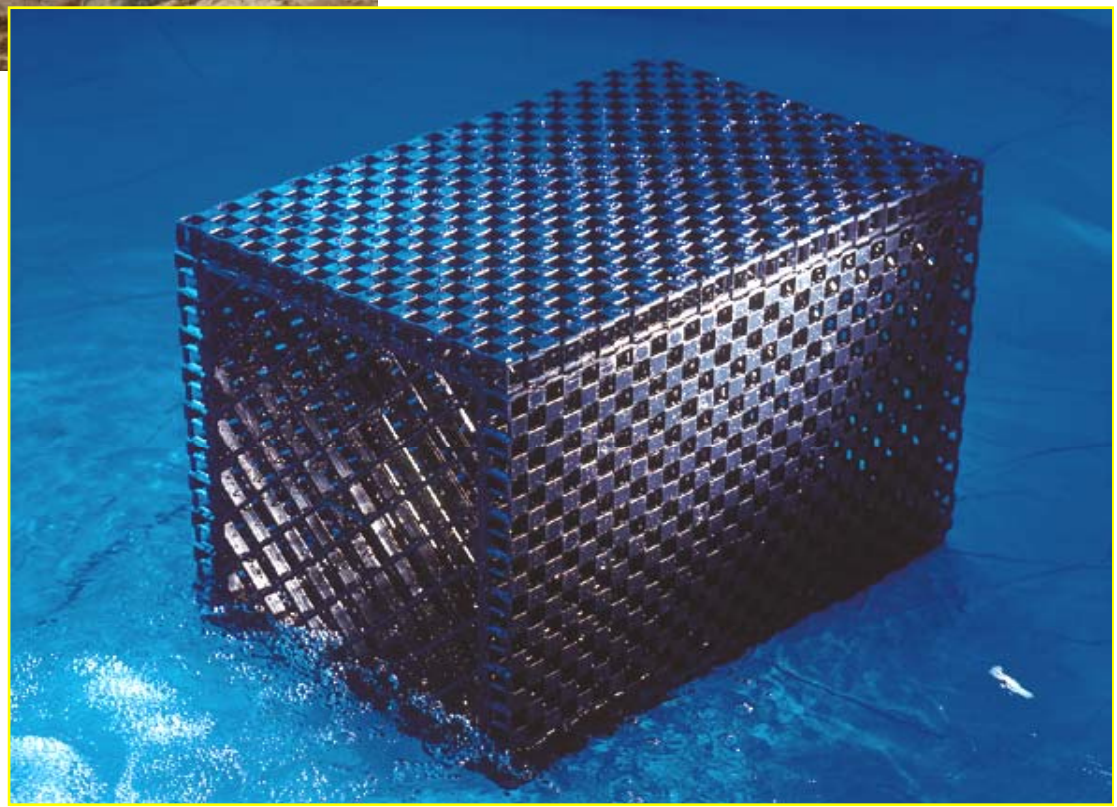
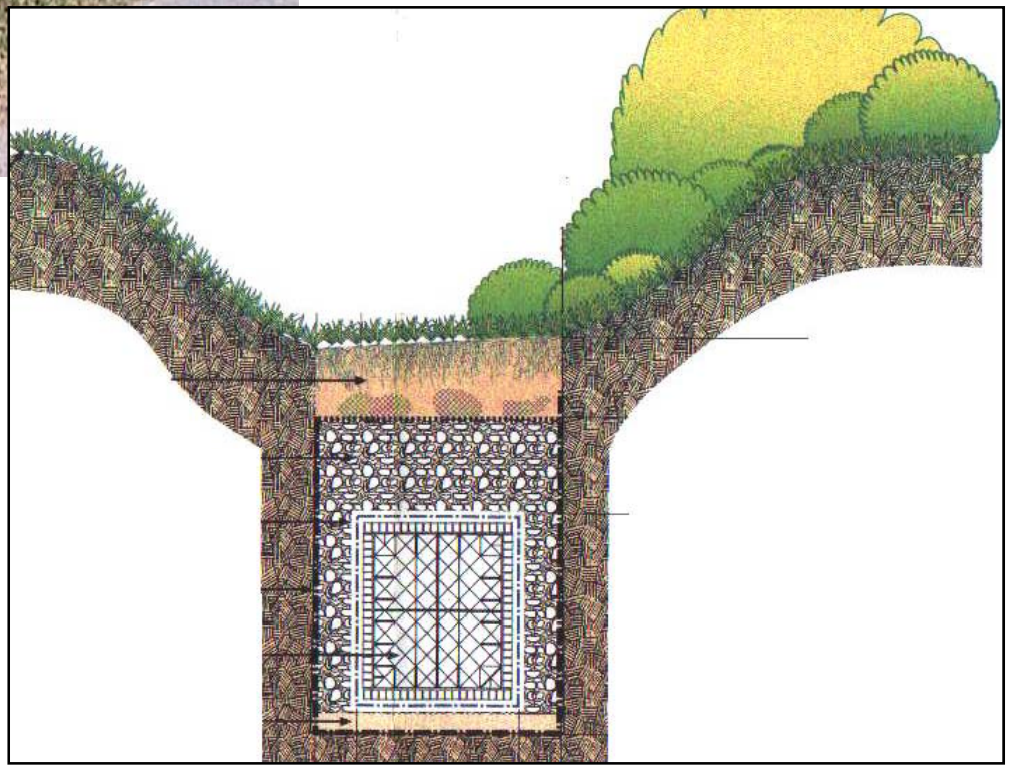


Control at Source

- **Storage**
- **Increase the Infiltration rate**
- **Reduce the Flow Velocity**
  - **(swale)**

Swale



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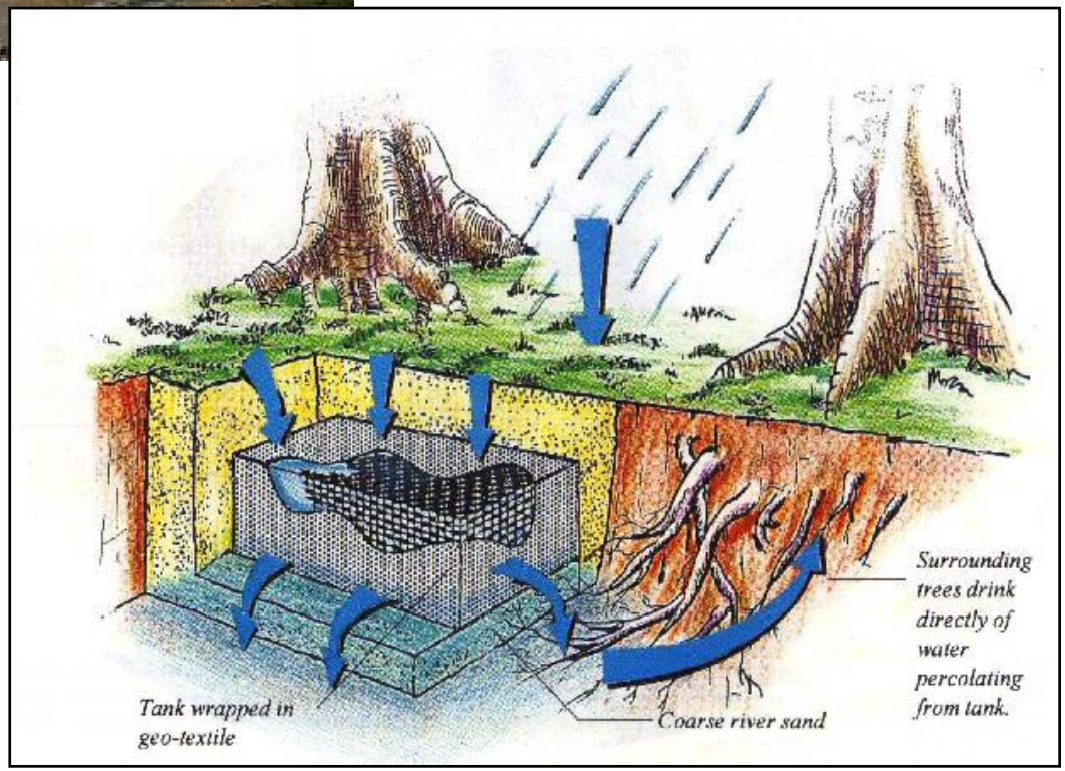

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STORMWATER MANAGEMENT MANUAL

Malaysia's local solution for a global problem

- Ex… …ol …d

…s Examples of World-wide best practices

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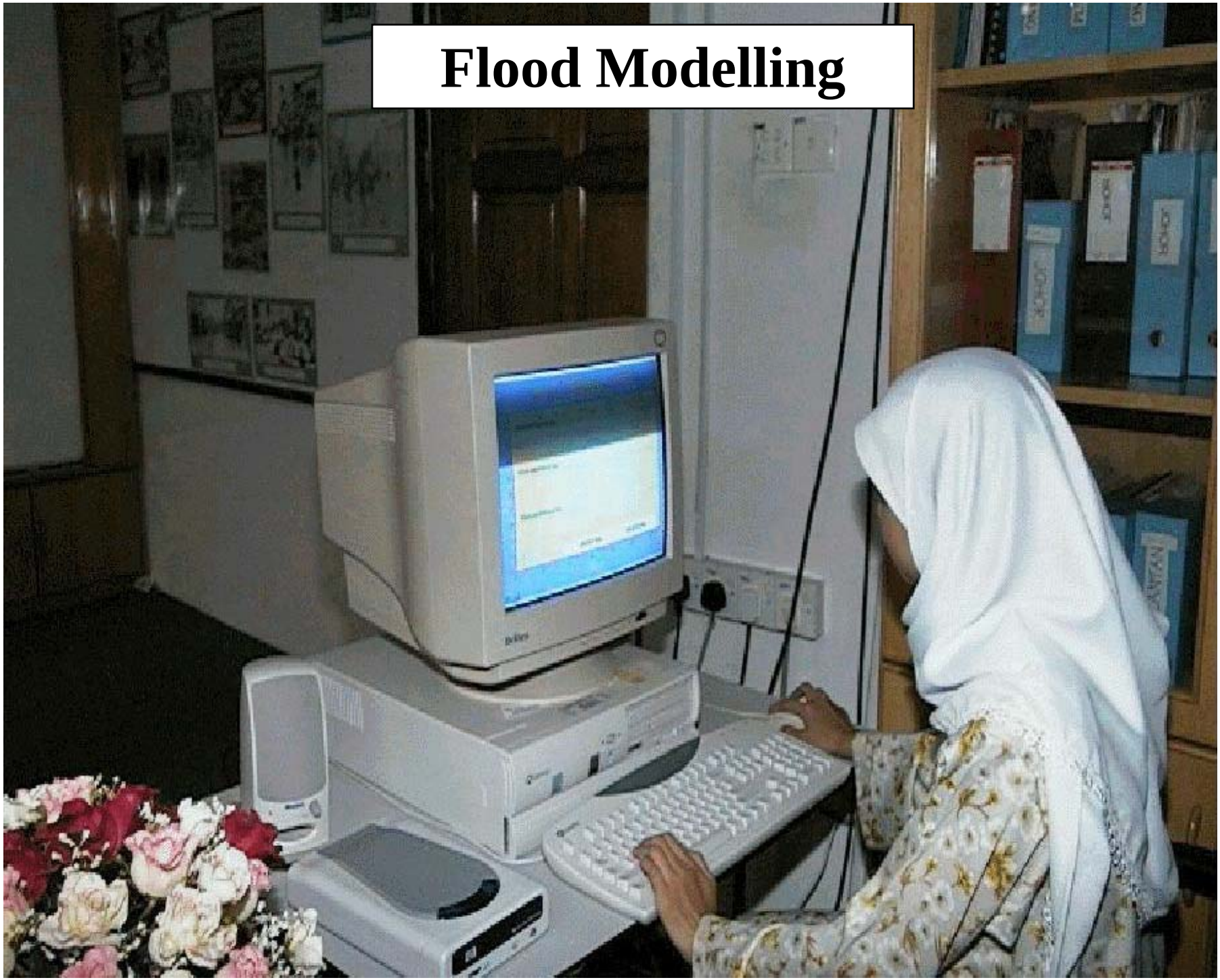
Flood Management

- New approaches needed for Flood Management
- More holistic approach in planning
- Remedial measures
- Change from rapid disposal to control at source
- Flood modelling and flood mapping

Flood Modelling



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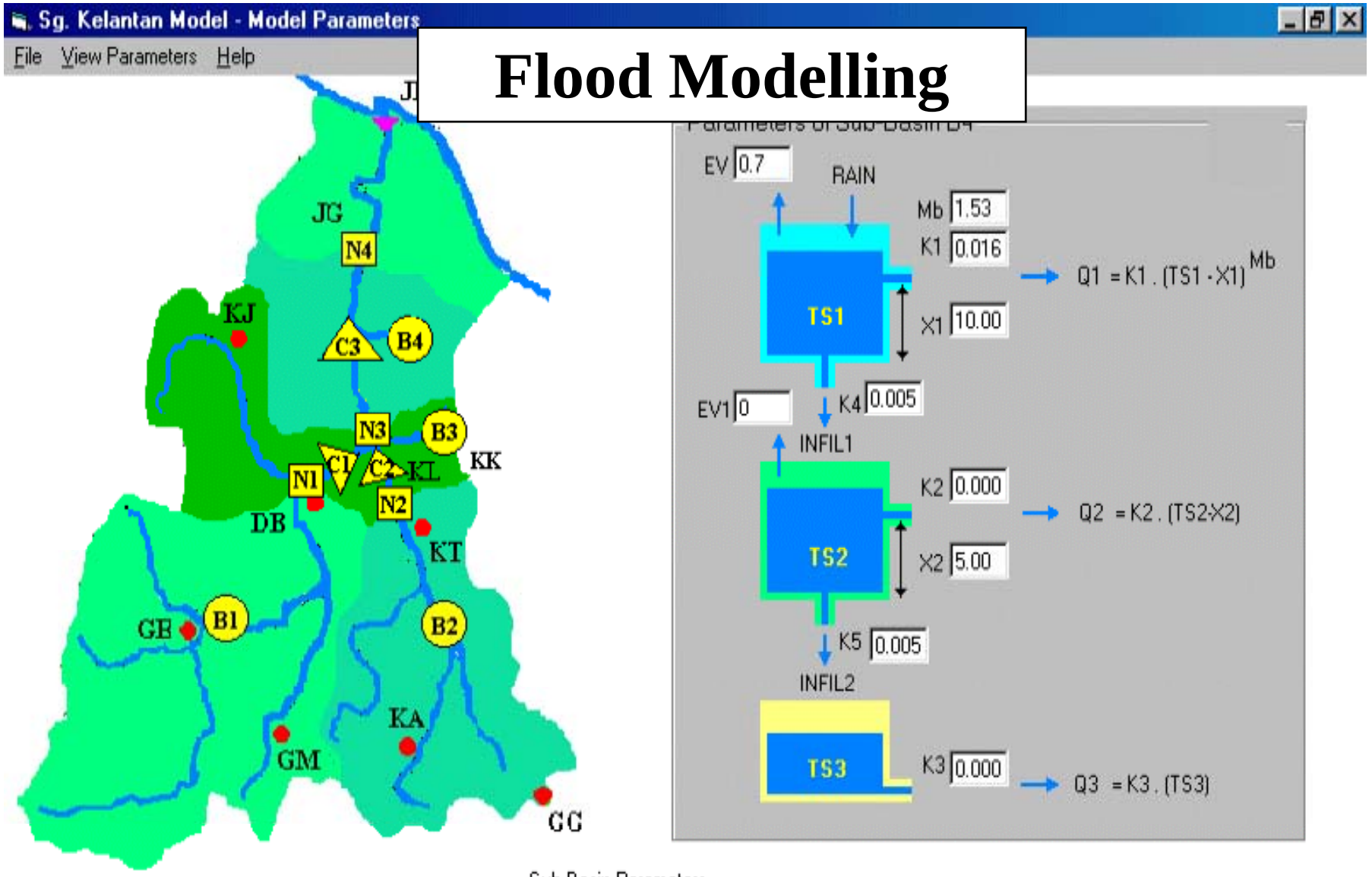
Flood Modelling



Sub-Basin Parameters

	A(km2)	L(km)	Lc(km)	S(%)	U(%)	Lg(h)
B1	6120	268.5	126	0.693	2	54.18
B2	2460	118.6	58	0.569	1	33.44
B3	2138	147.6	66	0.773	2	34.38
B4	1338	41	18	0.532	4	13.74

K1	Mb	K2	K3	K4	X1	X2	K5
0.20000	1.67	0.00800	0.00800	0.20000	10.00	5.00	0.03000
0.01500	1.20	0.00500	0.00500	0.05000	10.00	5.00	0.01000
0.01600	1.53	0.00060	0.00060	0.00500	10.00	5.00	0.00500
0.01600	1.53	0.00060	0.00060	0.00500	10.00	5.00	0.00500

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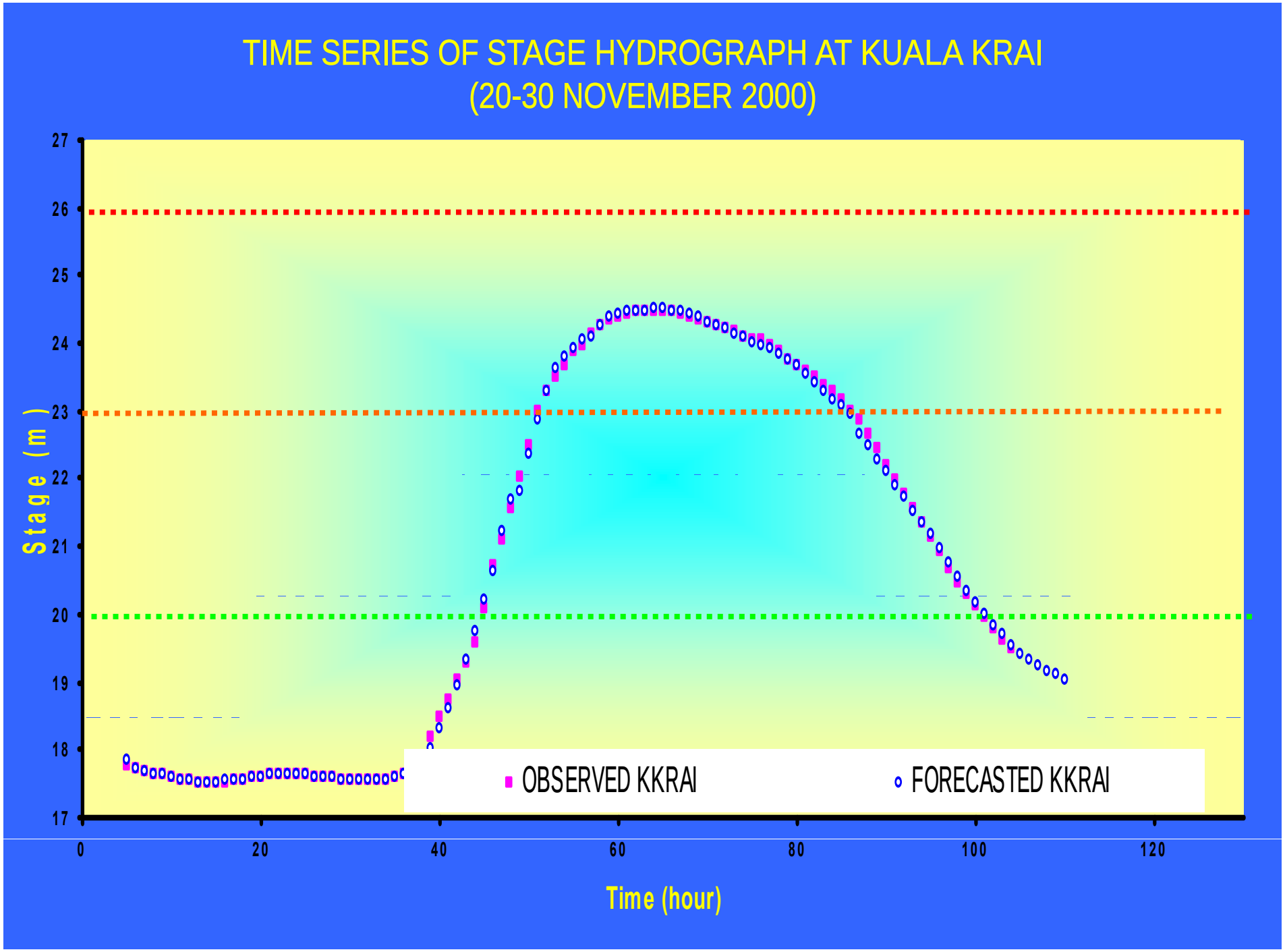
TIME SERIES OF STAGE HYDROGRAPH AT KUALA KRAI
(20-30 NOVEMBER 2000)
Stage (m)
27
26
25
24
23
22
21
20
19
18
17
0
20
40
60
80
100
120
Time (hour)
OBSERVED KKRAI
FORECASTED KKRAI

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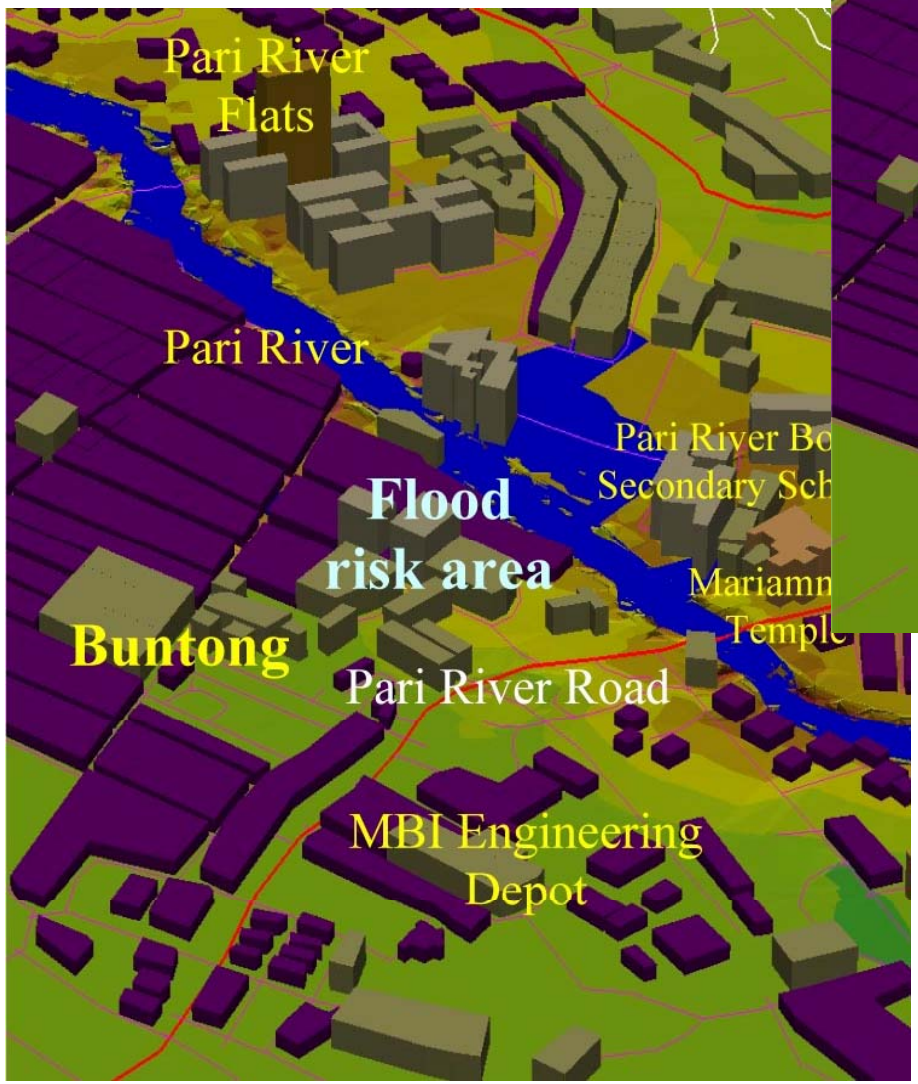
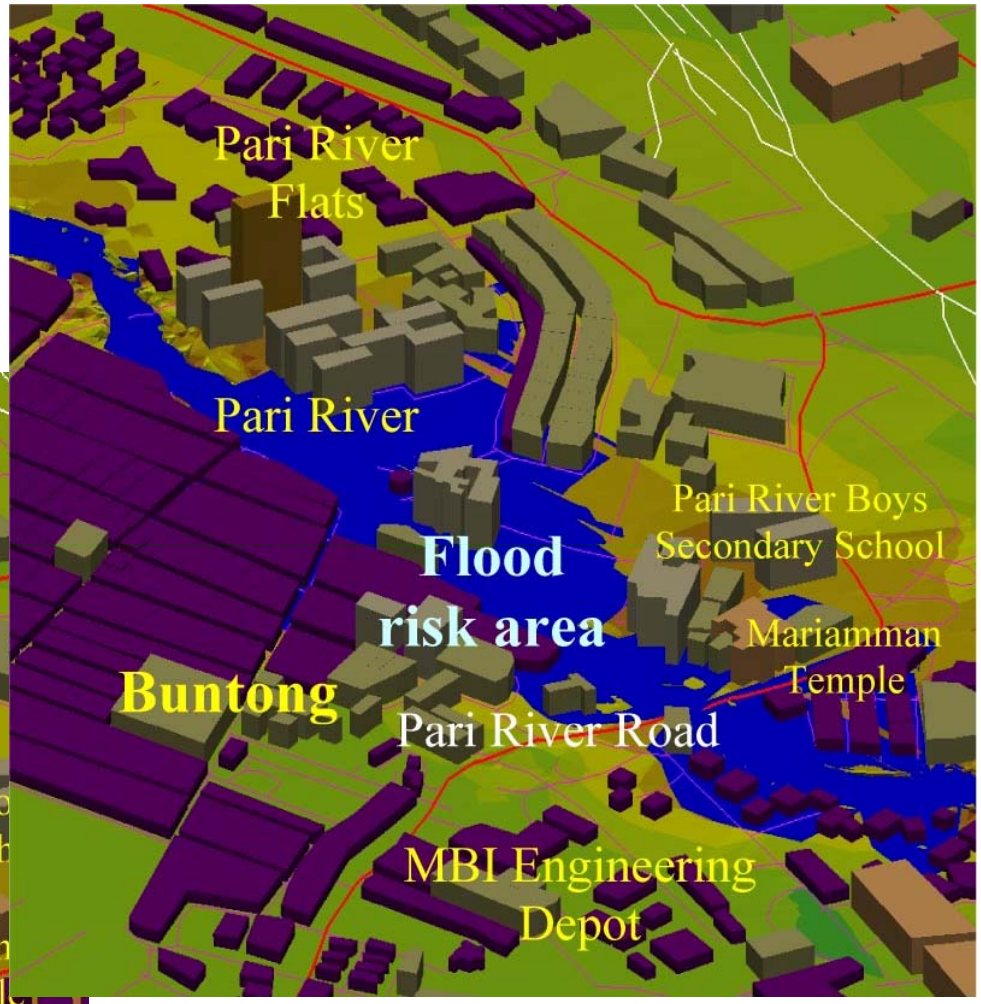
Present Condition





2020 Condition

Flood Management

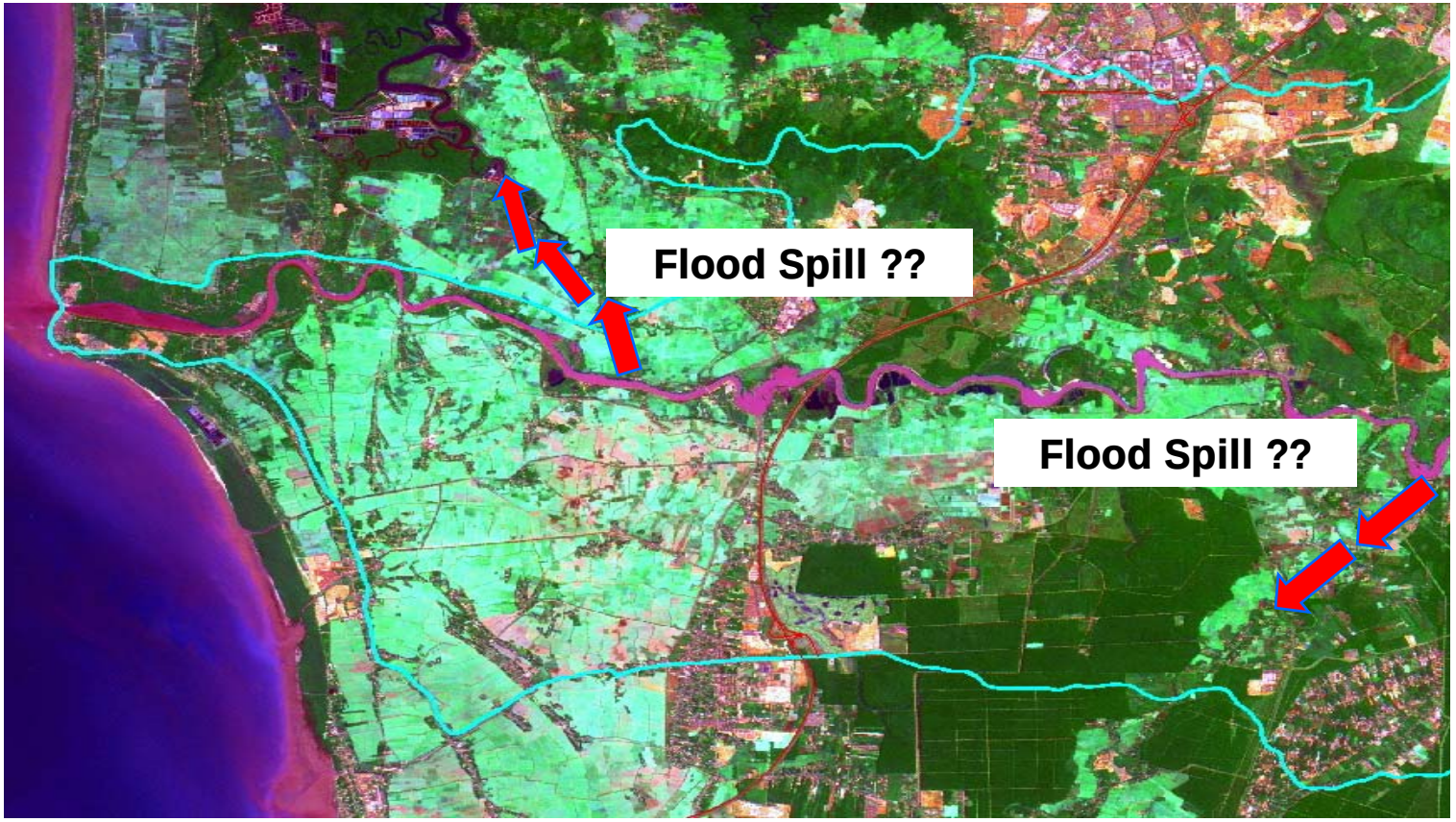
- New approaches needed for Flood Management
- More holistic approach in planning
- Remedial measures
- Change from rapid disposal to control at source
- Flood modelling and flood mapping
- Managing flood risk

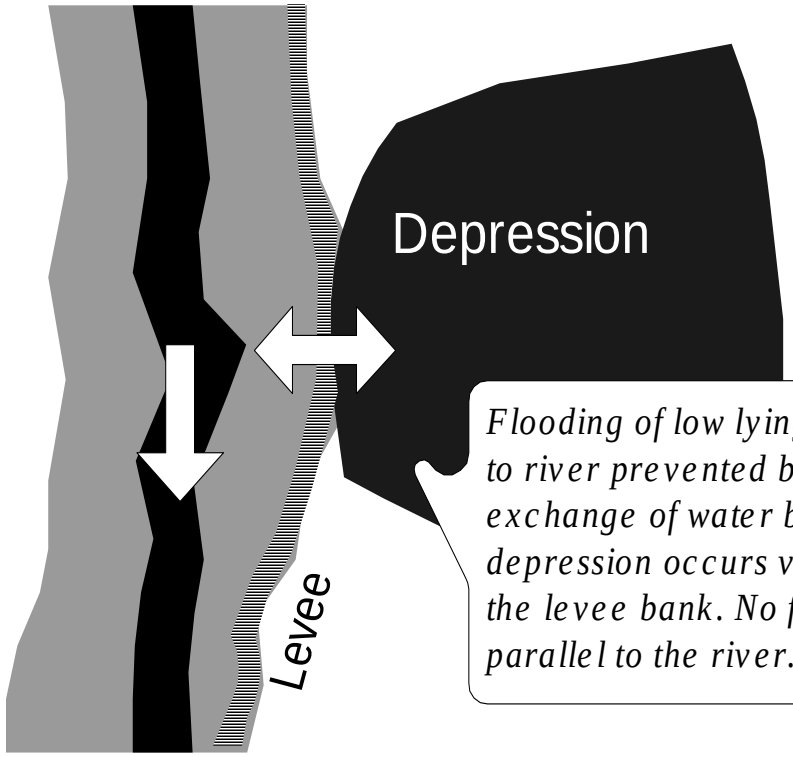
Managing Flood Risk

- **What is appropriate level of protection?**
  - **in**
  - **ies**

Managing Flood Risk

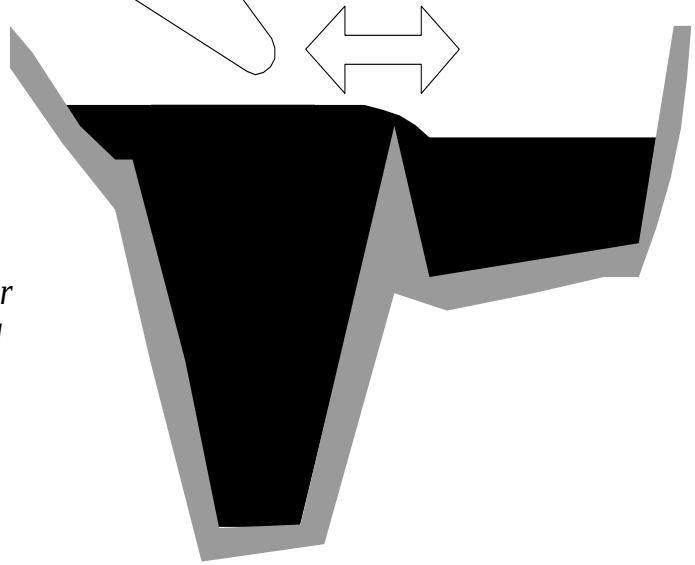
- **What is appropriate level of protection?**
- **Sharing the risk → deliberate failure section**





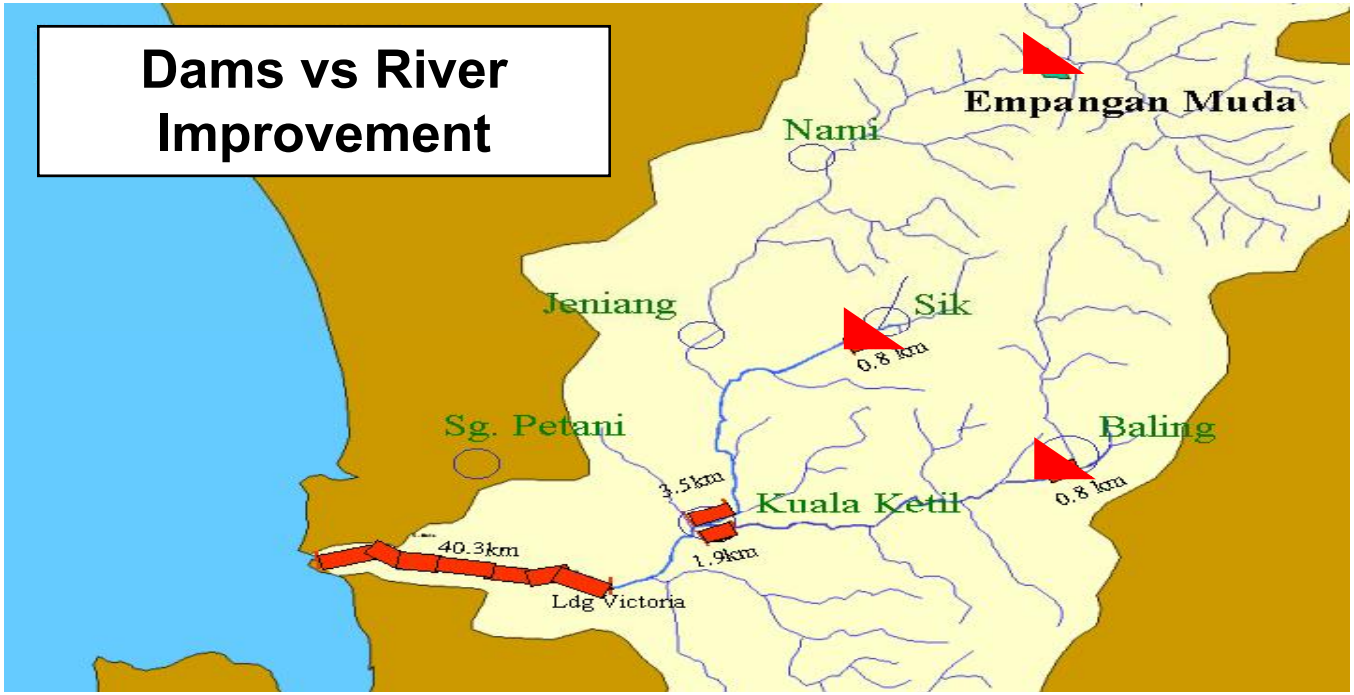
Flooding of low lying area adjacent to river prevented by levee. However exchange of water between river and depression occurs via spilling over the levee bank. No flow takes place parallel to the river.

Water surface is not horizontal across the river and depression



Managing Flood Risk

- **What is appropriate level of protection?**
- **Sharing the risk → deliberate failure section**
- **Sharing the burden → upstream vs downstream**



Flood Management

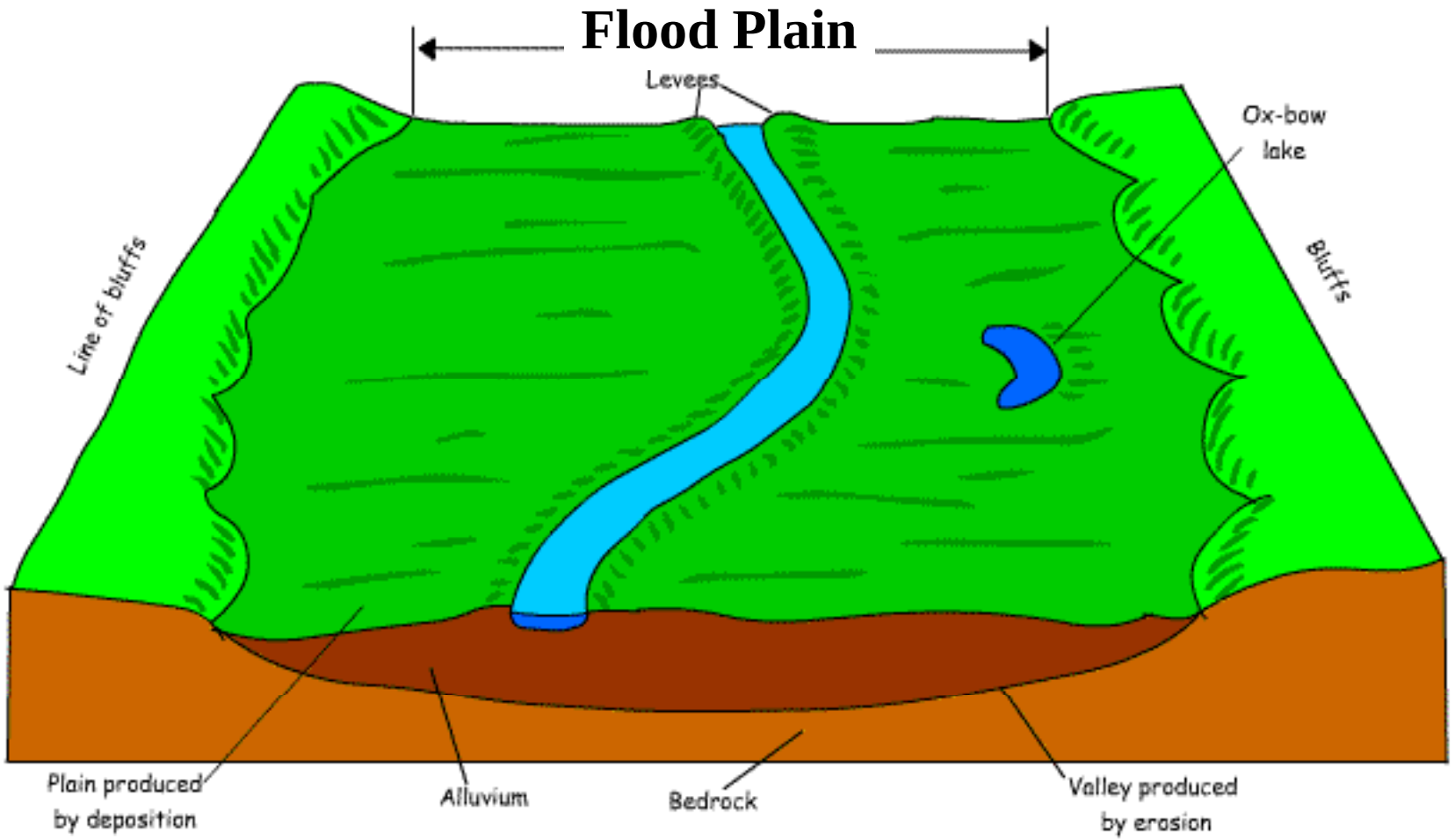
- Living in harmony with floods
  - ICID Congress 2005, Beijing

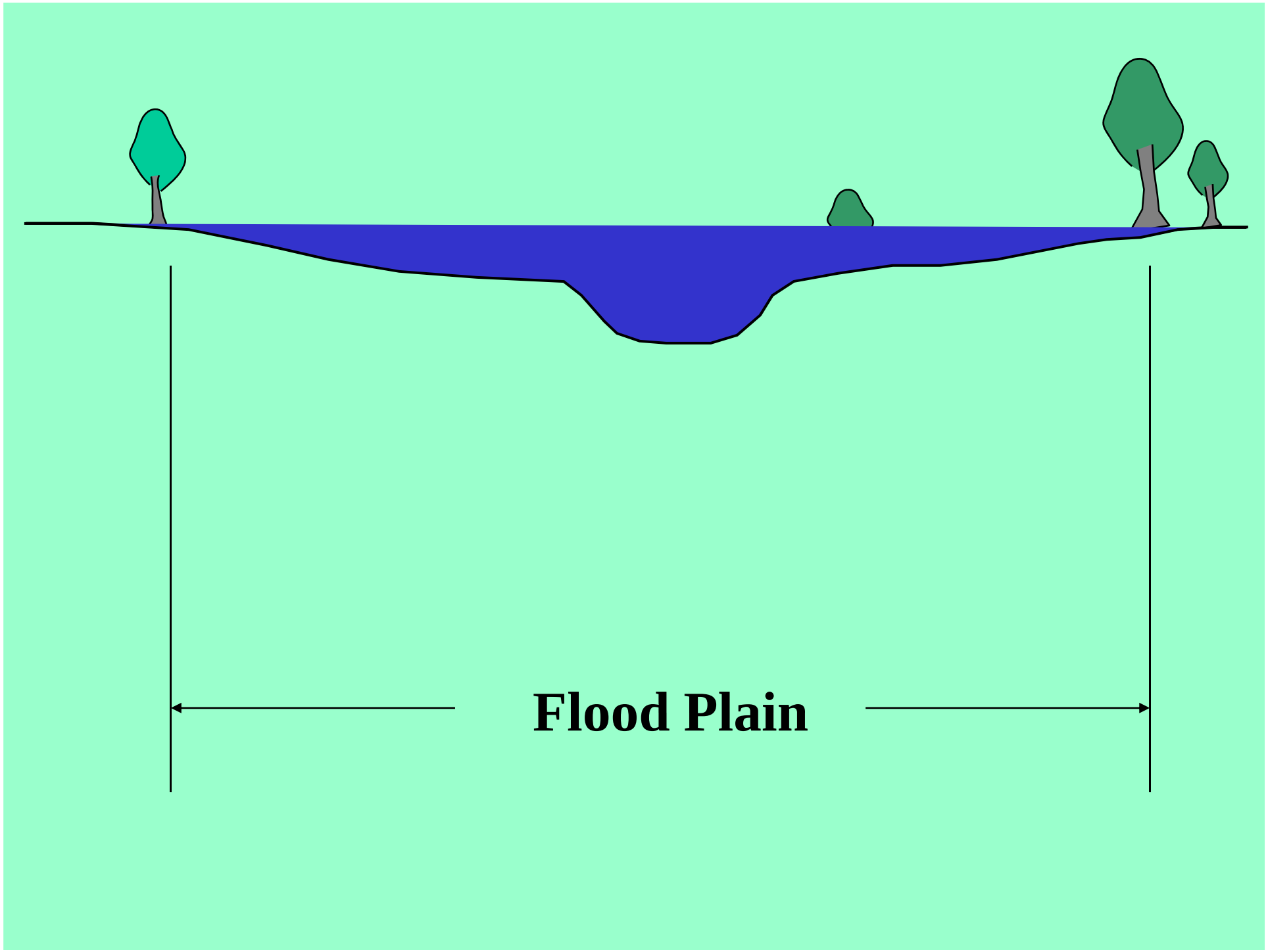
Harmonious Coexistence with Flood Water

- Impacts of changes in land use planning and climate on flood and drought regime
- Integrated planning and management of flood diversion, storage, retention and discharge areas
- Adjusting urban and rural development to reduce flood risks
- Mechanisms for protection, relief and rehabilitation
- Information technical system and professional contingent for flood fighting

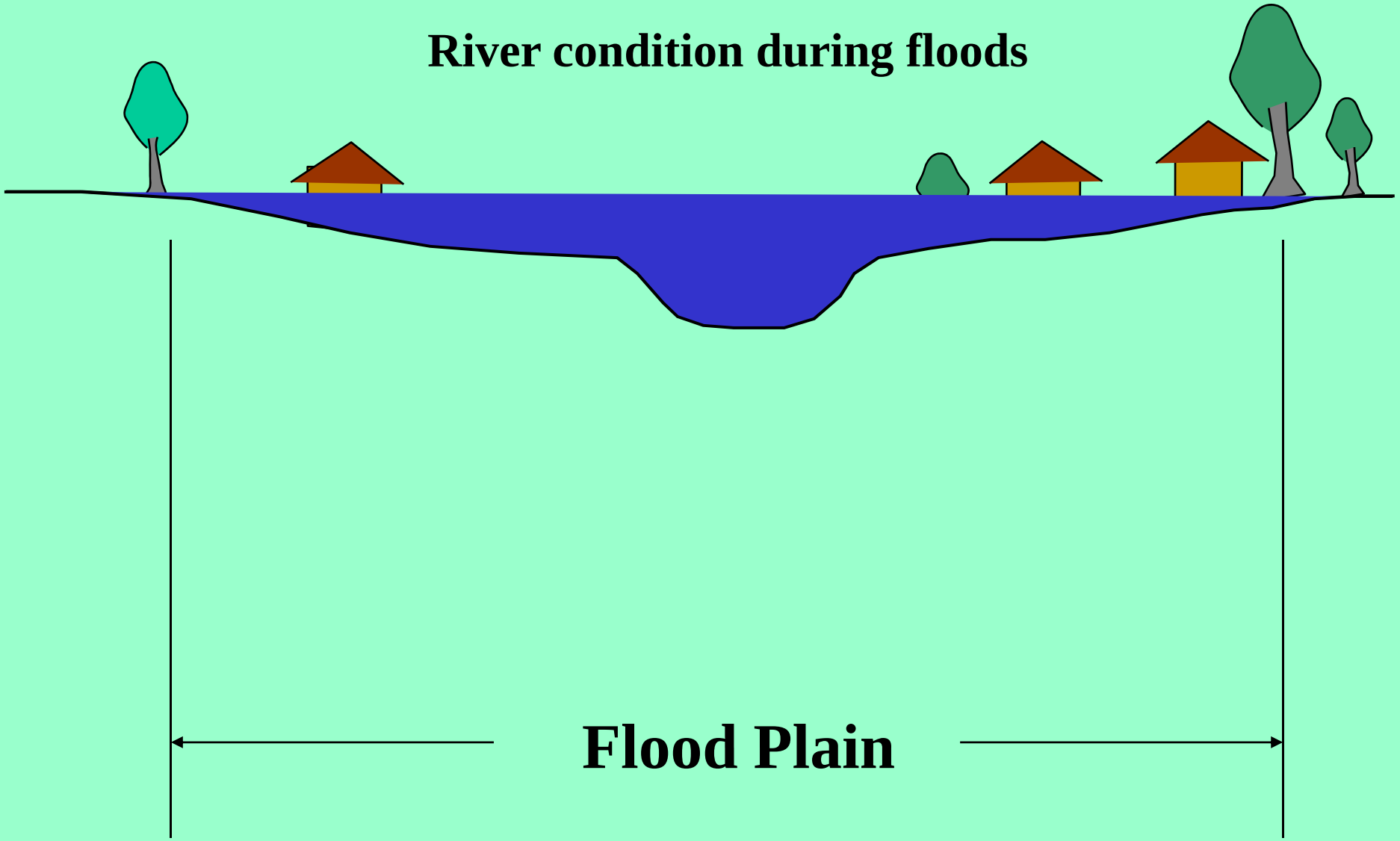
Flood Management

- Living in harmony with floods
  - ICID Congress 2005, Beijing
  - Flood Plain management


Flood Plain
Levees
Ox-bow lake
Line of bluffs
Bluffs
Plain produced by deposition
Alluvium
Bedrock
Valley produced by erosion

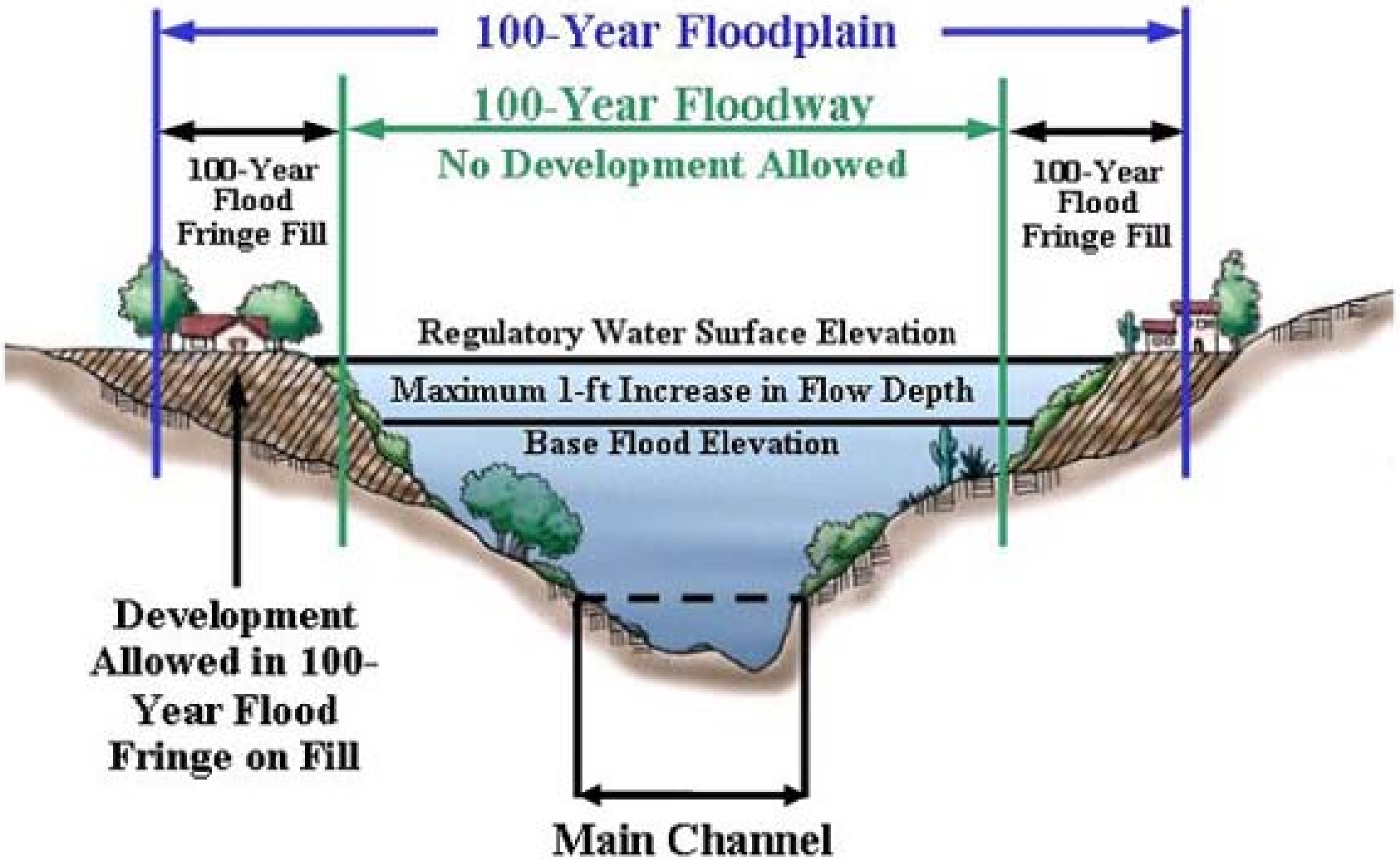

Flood Plain

River condition during floods



Flood Management

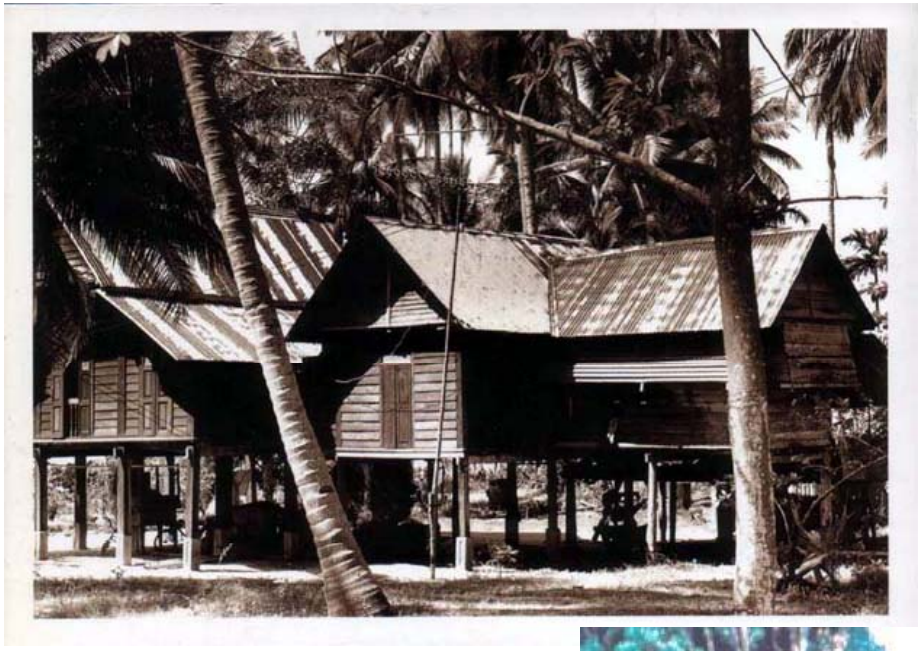
- Living in harmony with floods
  - ICID Congress 2005, Beijing
  - Flood Plain management
  - Restrict human activities in flood plains
  - Modify impact of flooding on human settlements


100-Year Floodplain
100-Year Floodway
No Development Allowed
100-Year Flood Fringe Fill
100-Year Flood Fringe Fill
Regulatory Water Surface Elevation
Maximum 1-ft Increase in Flow Depth
Base Flood Elevation
Development Allowed in 100-Year Flood Fringe on Fill
Main Channel

Flood Management

- Living in harmony with floods
  - ICID Congress 2005, Beijing
  - Flood Plain management
  - Restrict human activities in flood plains
  - Modify impact of flooding on human settlements
  - Go back to traditional house design
  - Give space to rivers

Traditional Malaysian Houses



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Cambodia

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Vietnam

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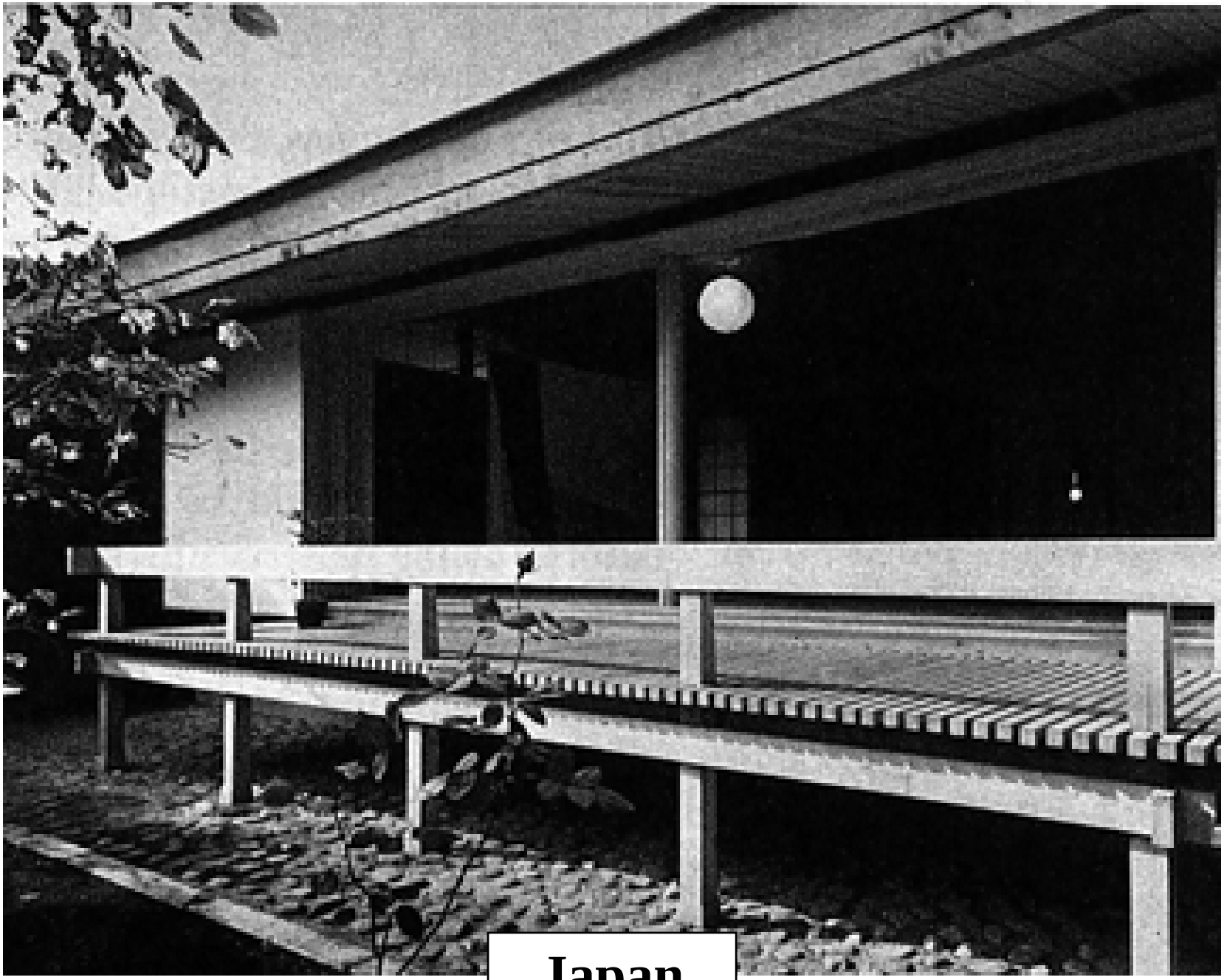

Japan

Sept
2008

Asian Monsoon Region

Mitigated home along the Russian River in Guerneville, CA sits 28 feet above neighboring homes. Photo by Greg E. Mathieson/FEMA

USA

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House on silts built above flood level

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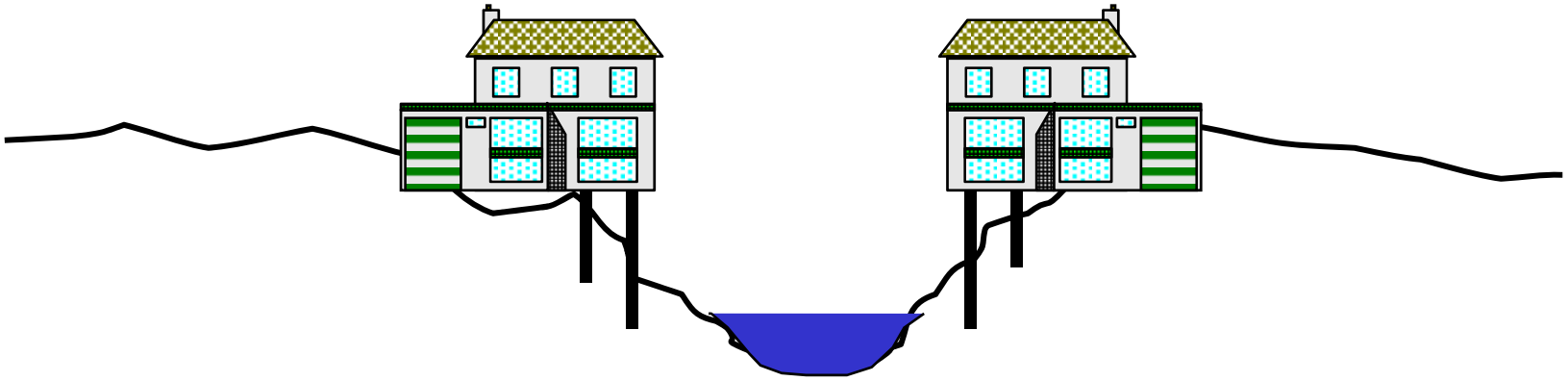

Giving space to the River

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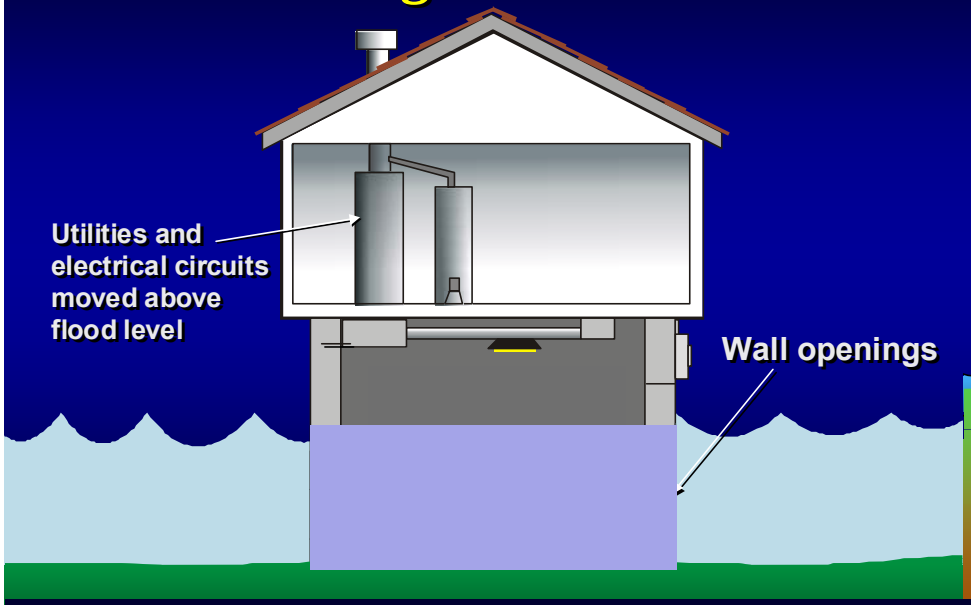
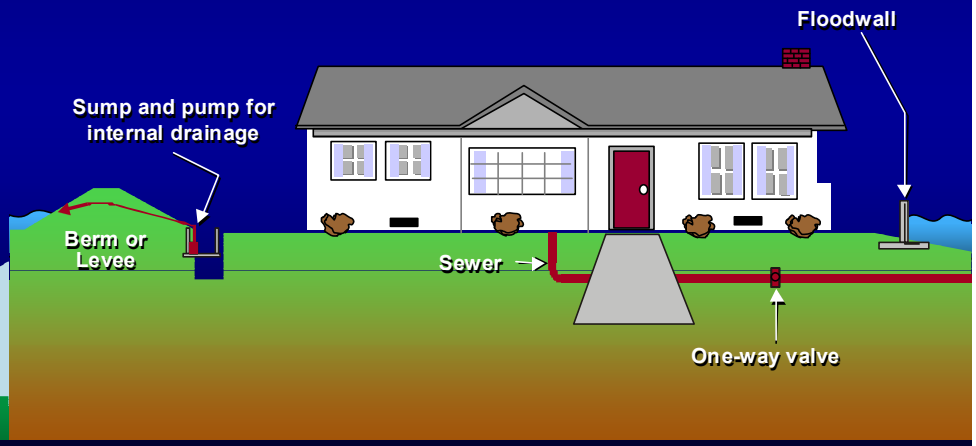
Flood Management

- Living in harmony with floods
  - ICID Congress 2005, Beijing
  - Flood Plain management
  - Restrict human activities in flood plains
  - Modify impact of flooding on human settlements
  - Go back to traditional house design
  - Give space to rivers
  - Flood proofing

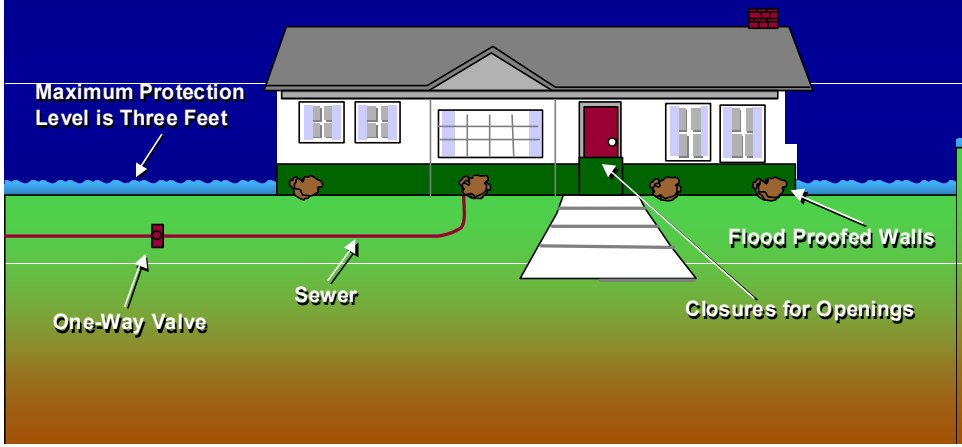
Elevating the Structure



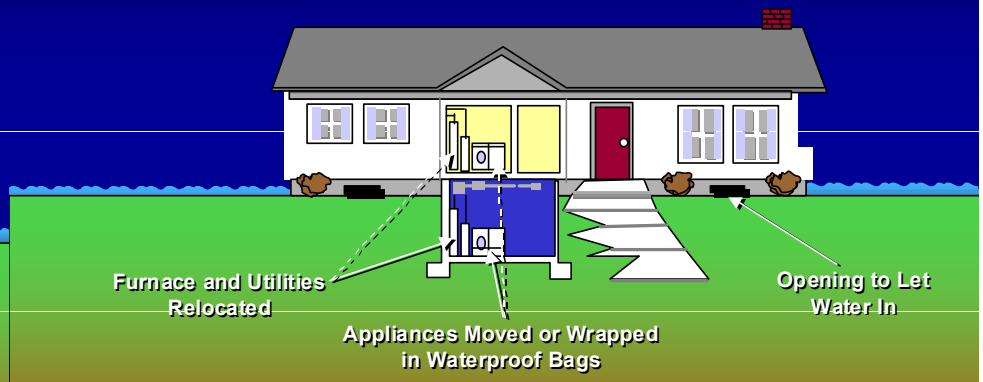
Construction Barriers
Berms, Levees and Floodwalls



Dry Flood Proofing



Wet Flood Proofing



Ref : Jerome Priscoli

Flood Management

- Living in harmony with floods
  - ICID Congress 2005, Beijing
  - Flood Plain management
  - Restrict human activities in flood plains
  - Modify impact of flooding on human settlements
  - Go back to traditional house design
  - Give space to rivers
  - Flood proofing
  - Community and stakeholder involvement

Conclusion

- Floods → major problem in Monsoon Asia region
- Changing conditions → increase runoff → intensity and frequency of floods
- New approaches being implemented in Monsoon Asia region to mitigate flood problem
- Learning to live in harmony with floods