

Climate Change Country Profile: Malaysia

1. Country description

1.1 Geography

- Total land area: 329 733 km²
- Most coastal regions are low-lying areas that are less than 0.5 m above the highest tide or are within 100 m inland of the high-water mark. These areas are especially vulnerable to rises in sea level.

Figure 1. Map of Malaysia



1.2 Demographics

- Population: 26.6 million in 2006
- Population growth rate: 2.4% per annum
- Population distribution: 60% living in coastal areas; 81% live in Peninsular Malaysia; 19% live in Sabah and Sarawak
- Multiethnic and multicultural population: Malays (50.4%), Chinese (23.7%), Indian (7.1%), other indigenous peoples (11%) and others (7.8%)

1.3 Economic and industrial development characteristics

- The Malaysian economy recorded a strong overall growth of 5.9% in 2006, compared with the 5.2% registered in 2005.
- The strong annual growth was attributed to expansion in the manufacturing, services and the agriculture sectors.
- Manufacturing achieved a commendable 7% growth compared with 5.2% recorded in 2005. Services sustained a growth of 6.5%, while agriculture also recorded an impressive growth from 2.5% in 2005 to 6.4% in 2006, backed by strong performance in rubber and oil palm production during the year.

- Higher foreign direct investment in the fourth quarter of 2006 (RM18.1 billion) compared with RM12.4 billion in the third quarter also reflected the confidence in Malaysia's economy.

1.4 Climate (climatic zones, trends in temperature and precipitation)

Temperature

- Relatively uniform temperatures throughout the year
- Mean temperature in the lowlands ranges between 26°C and 28°C
- Although the annual variation of the daily mean temperature may be small (about 2°C to 3°C) the diurnal variation may be as large as 12°C.

Precipitation

- Seasonal variations in climate are more evidently marked by rainfall patterns
- Rainfall patterns closely mirror changes in the monsoon winds blowing at different times of the year.
- The north-eastern monsoon is dominant from November to March, bringing moisture and more rain.
- Between June and September, the south-western monsoon winds blow.
- More than 3550 mm of rainfall a year is recorded in the lowlands.

Figure 2. Time series of annual mean temperatures of West and East Peninsula

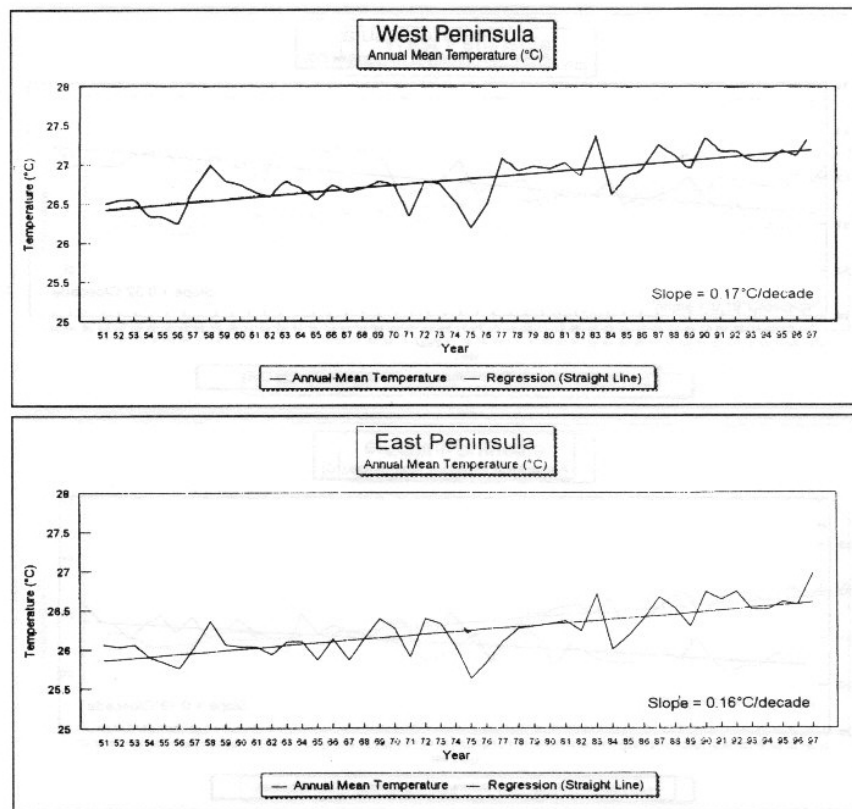


Figure 3. Time series of annual mean temperatures of Sabah and Sarawak

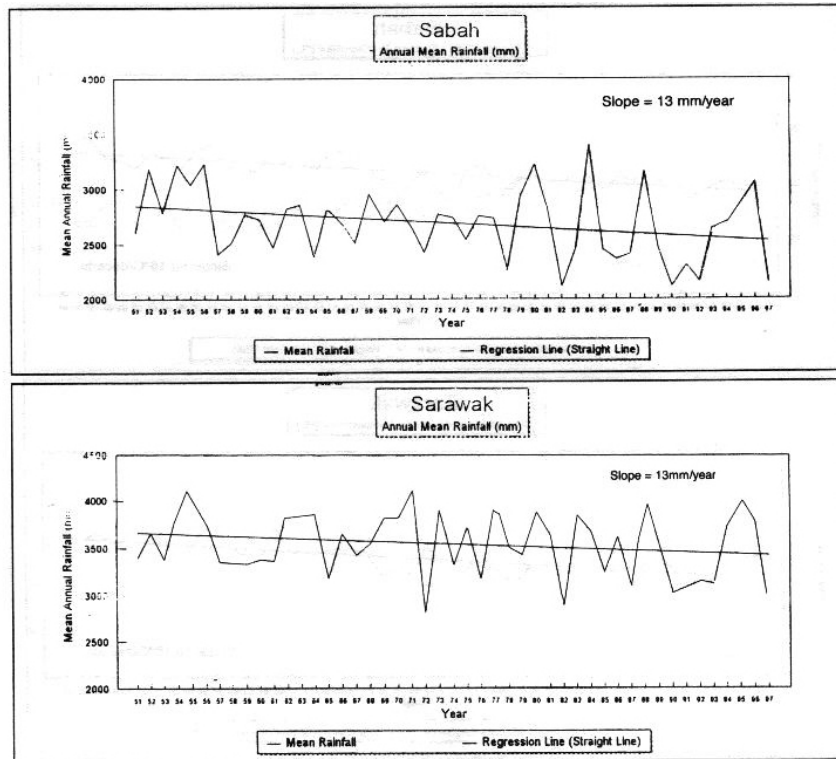


Figure 4. Time series of annual rainfall of West and East Peninsula

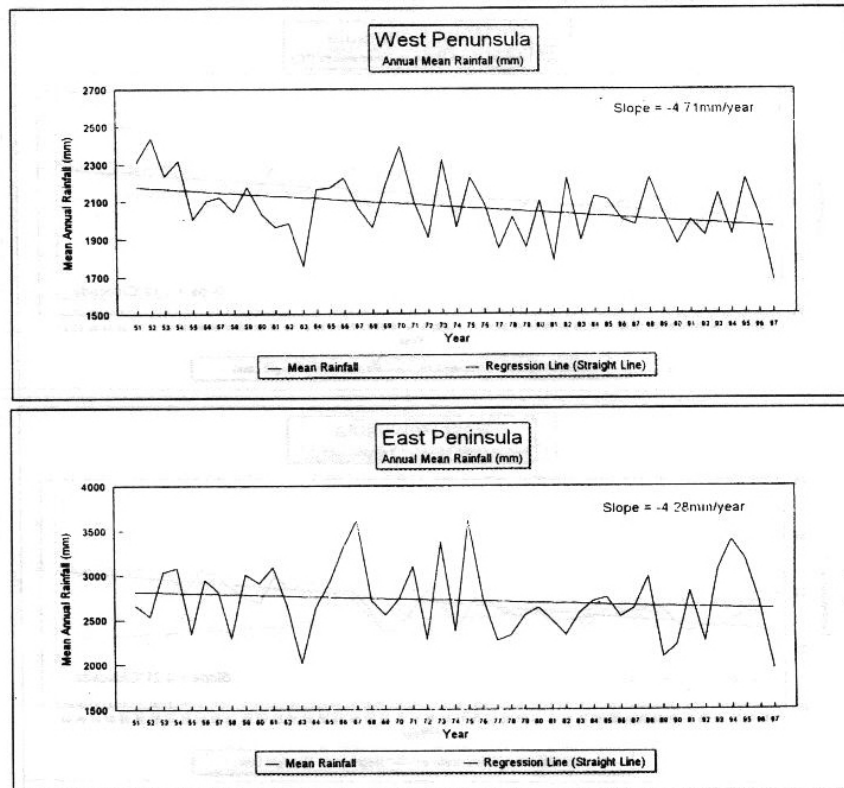
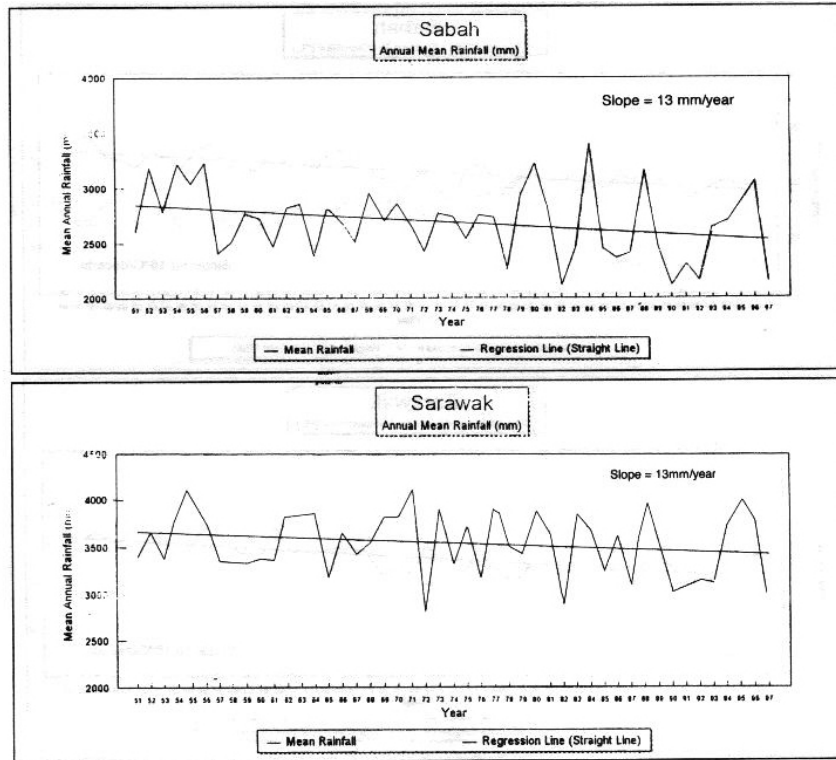


Figure 5. Time series of annual rainfall of Sabah and Sarawak



2. Burden of climate-sensitive health outcomes

2.1 Data on current climate-sensitive disease burdens

Climate-sensitive diseases include heat-related diseases, vectorborne diseases, waterborne diseases, diseases from urban air pollution, and diseases related to extreme weather conditions such as floods, droughts, windstorms and fires.

Common communicable diseases that are sensitive to climate and are endemic in Malaysia are: cholera and malaria (climate is the primary factor); and meningococcal meningitis, dengue, Japanese encephalitis, leptospirosis and rickettsial infections (climate plays a significant role). Figures 6 to 8 show trends for many of these climate-sensitive diseases.

Figure 6. Incidence of waterborne diseases per 100 000 population in Malaysia (1990–2005)

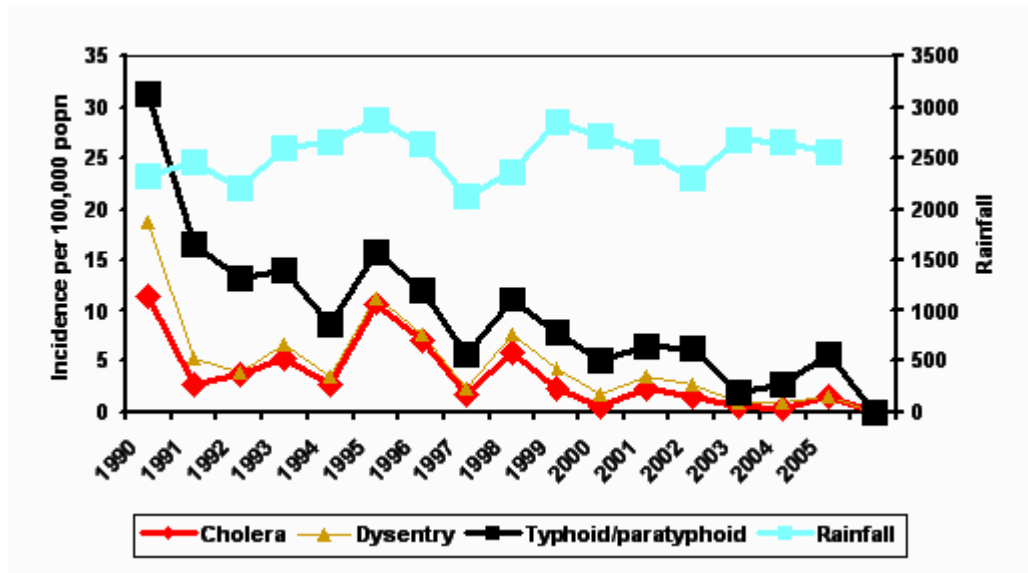


Figure 7. Incidence of malaria per 100 000 population in Malaysia (1990–2005)

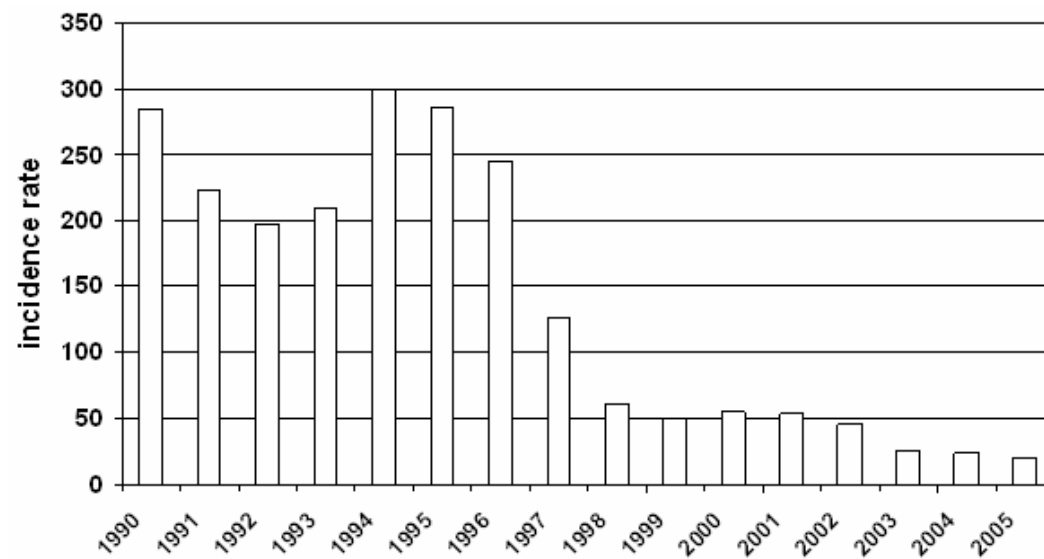
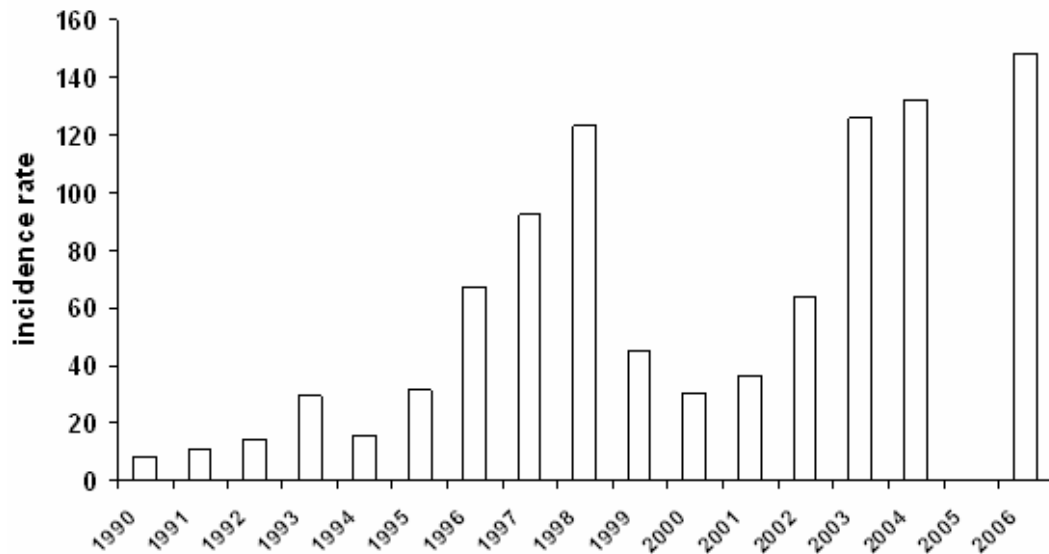


Figure 8. Incidence of dengue per 100 000 population (1990–2006)



2.2 Potential impacts of climate change on health burden, i.e. qualitative and quantitative projections of future health burdens

- Very little work has been done on projecting potential impacts of climate change on health burdens. The following has been studied:
 - temperature and vectorial capacity of *Anopheles maculates* (Figure 9), and
 - rainfall and dengue outbreak (Figure 10).
- The impacts of climate change on health will be addressed in NC2 (Malaysia's Second National Communication)

Figure 9. Temperature and vectorial capacity of *Anopheles maculatus* and projected number of malaria cases

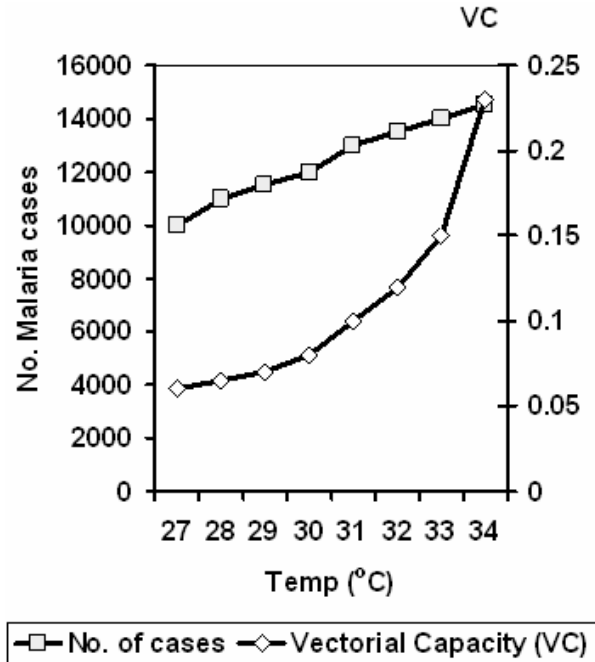
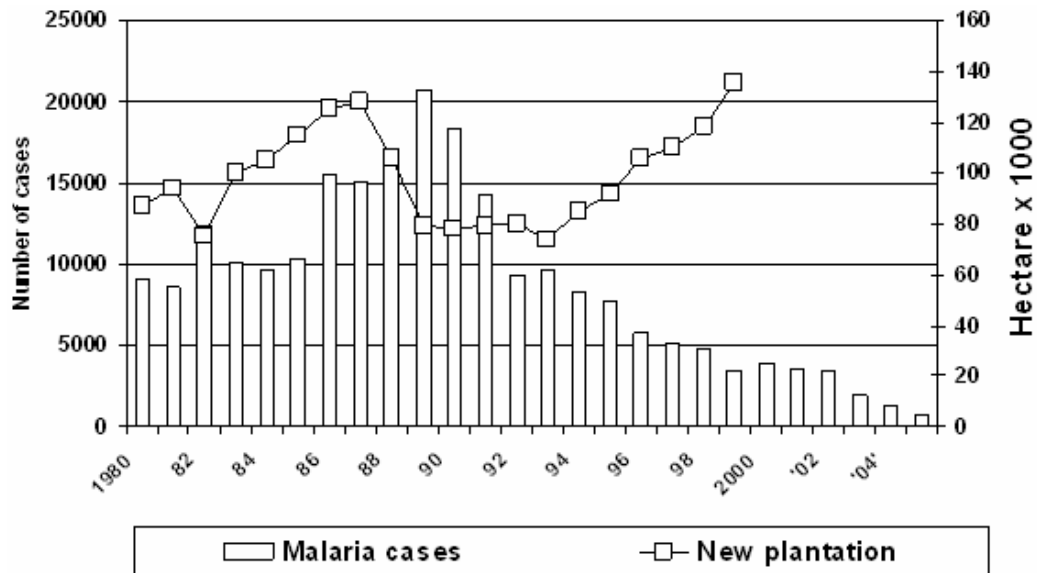


Figure 10. Changing land use and malaria outbreaks in Malaysia



Source: Ministry of Health and Statistic Department, Malaysia

Rainfall and dengue outbreak in Malaysia

- Modification of Mogi et al. 1990 model
- Study the threshold of rainfall actually required to trigger an outbreak
- Dengue incidence and rainfall data in 1986-1997
- Model indicated relatively fewer raining days are required for high transmission
- Heavy rain flushes off breeding habitats

Table 1.

Number of days examined for rain	Low transmission: Number of raining days required for an outbreak	High transmission: Number of raining days required for an outbreak
30	2.89	0.47
60	4.57	2.15
90	6.25	3.83
120	7.93	5.51
150	9.61	7.19
180	11.29	8.87
210	12.97	10.55
240	14.65	12.33
270	16.33	13.91
300	18.01	15.59
330	19.69	17.27
360	21.37	18.95

2.3 Information on particularly vulnerable populations

(1) Rural population

- Vectorborne, foodborne and waterborne diseases
- Coastal areas
- Mobile, interior natives

(2) Urban population

- Air pollution
- Heat-related morbidity

3. National programmes and projects

3.1 Programmes to reduce and/or mitigate greenhouse gas emissions

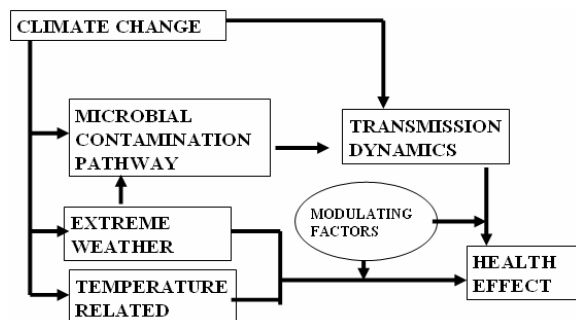
- Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP)
- Biomass-based Power Generation and Co-generation in the Malaysian Palm Oil Industry (BioGen)
- Malaysia Building Integrated Photovoltaic (MBIPV)
- Comparative studies on carbon sequestration potentials
- Clean Development Mechanism (CDM) projects – energy, waste, agriculture sectors

3.2 Climate change related studies and projects, including their roles in the Second National Communications

- Second National Communication (NC2) Project – greenhouse gas inventory; projections and mitigation options; vulnerability assessment and adaptation strategies
- Malaysian Meteorological Department studies: climate change modelling, global canopy programme and forest climate interaction study
- Climate Change and Its Relationship to Disease Patterns in Malaysia
- Impact of Climate Change on Hydrologic Regime and Water Resources in Peninsular Malaysia
- National Coastal Vulnerability Index Study
- National Study for Effective Implementation of Integrated Water Resources Management (IWRM) in Malaysia
- Conservation and Sustainable Use of Tropical Peat Swamp Forests and Associated Wetlands Ecosystem
- National Self-Assessment for Capacity Building Needs for Global Environment Management

3.3 Further data and research needs on potential health impacts of climate change

Figure 11. Further data and research are needed on the linkages between climate change and its health effects



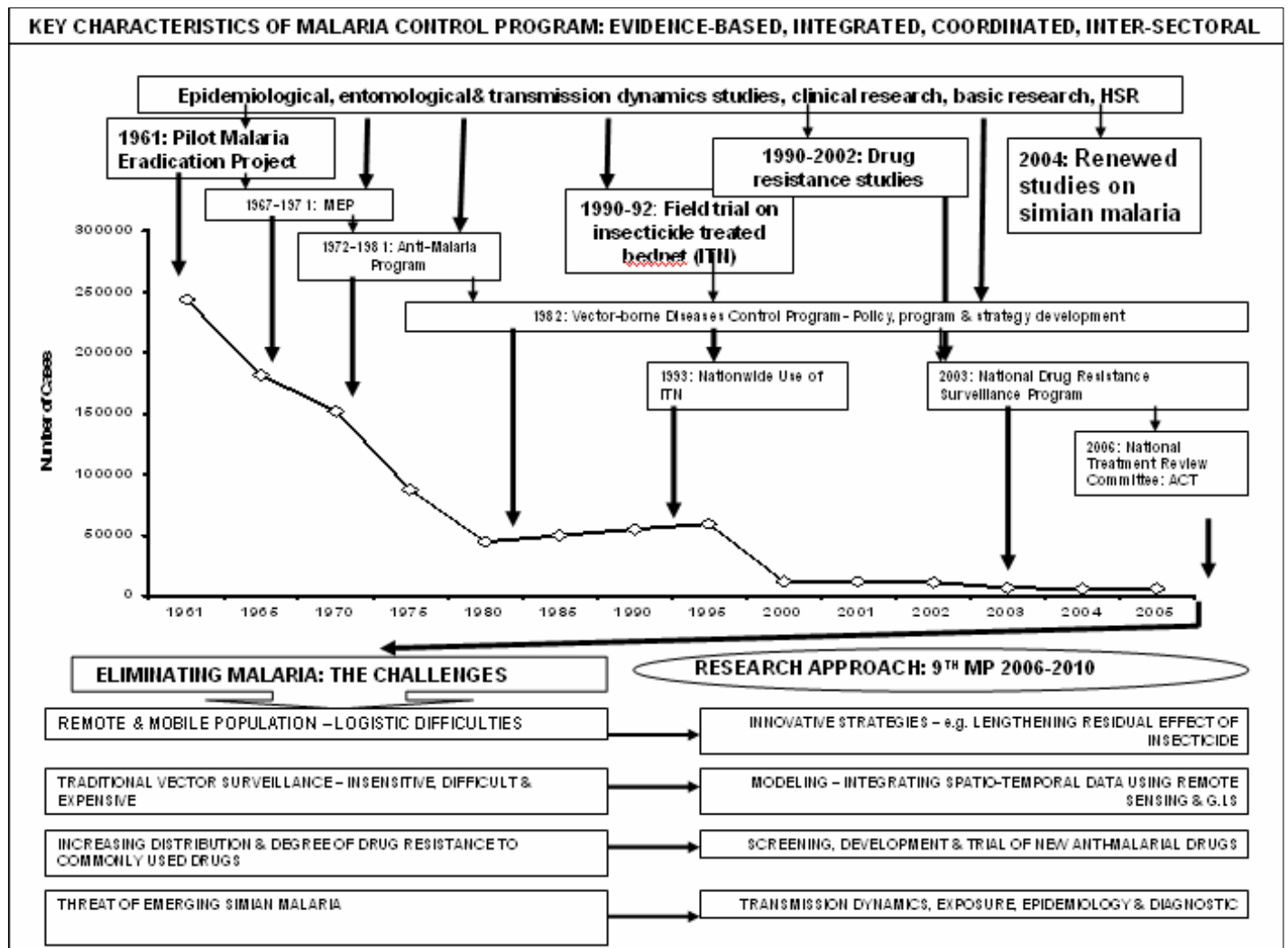
3.4 Current and expected programmes and activities for adaptation to current and projected climate-related health burdens

- Continued investment in health infrastructures and human resources
 - Network of public health laboratories
- Continued vigilance on infectious diseases
- Strengthening surveillance system and disaster preparedness and response
 - Rapid Response Command Centre
 - Malaysian Centre for Disease Control and Prevention in 9th Malaysian Plan
 - Research and development

Table 2. Comparison of the number of health facilities (1980, 1990, 2005)

	Number of facilities		
	1980	1990	2005
Hospitals	93	95	122
Health centres	351	497	809
Rural health clinics	1509	198	2008

Figure 12. Translational research: The way forward towards elimination of indigenous malaria by 2015



4. Institutional Organization

Key organizations and/or institutions dealing with climate change are:

- Ministry of Natural Resources and Environment
- Economic Planning Unit, Prime Minister Department
- Ministry of Energy, Water and Communication
- Ministry of Agriculture and Agro-Based Industries
- Ministry of Plantation Industries & Commodities
- Ministry of Science, Technology & Innovation
- Ministry of Health
- Ministry of Transport

- Ministry of Housing and Local Government
- Ministry of International Trade and Industry
- Ministry of Education
- Ministry of Higher Learning
- Malaysian Meteorological Department
- Department of Statistics
- Sabah State Economic Planning Unit
- Sarawak State Planning Unit.

5. Issues and challenges

Critical issues and challenges that the country faces in relation to mitigation and adaptation to climate change to reduce health impacts are:

- modelling climate change: capacity to better adapt, develop and run a climate model to generate relevant and localized scenarios;
- greenhouse gas inventories: research to establish local emission factors, enhancement of institutional capacity for collection and collation of data;
- food sufficiency: stress on food production due to anticipated rise in temperature and prolonged periods of drought;
- coastal vulnerability index (CVI): national mapping exercise to identify coastal areas that are susceptible to the impacts of sea level rise;
- technology transfer: access to cost-effective technology to reduce carbon emissions;
- land use, land use change and forestry: enhance management to balance development goals while reducing and/or avoiding deforestation and land degradation. Preparation of a position paper on *Changing Landscape and rural health impact* by Academy of Science, Malaysia;
- trans-boundary haze: further enhance regional cooperation with neighbouring countries to prevent and/or reduce the haze;
- data availability: climatic parameters not available for all stations; incomplete dengue data available only for the last seven years (1997–2004);
- data quality: many missing data; double entry and wrong zoning of dengue cases;
- differences in diagnostic methods and reporting system; and
- meteorological station representativeness and disease transmission dynamics.