

IMPACTS OF CLIMATE CHANGE ON ENVIRONMENTAL SECURITY IN MALAYSIA

By

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Prologue....

The present episode is different. Climate is changing more rapidly than ever before. Human activities become the main cause: burning of fossil fuels has flooded the atmosphere with heat-trapping CO₂ triggering spike in average global temperature, largely in the past 30 yrs.

Previous epochal changes of climate, such as the Ice Age that ended 11,500 yrs ago, were set in motion by natural causes – variations in Earth's orbit that affected the amount of sunlight warming the planet. In those cases, the cycles of cooling and warming unfolded slowly, over the course of millennia.

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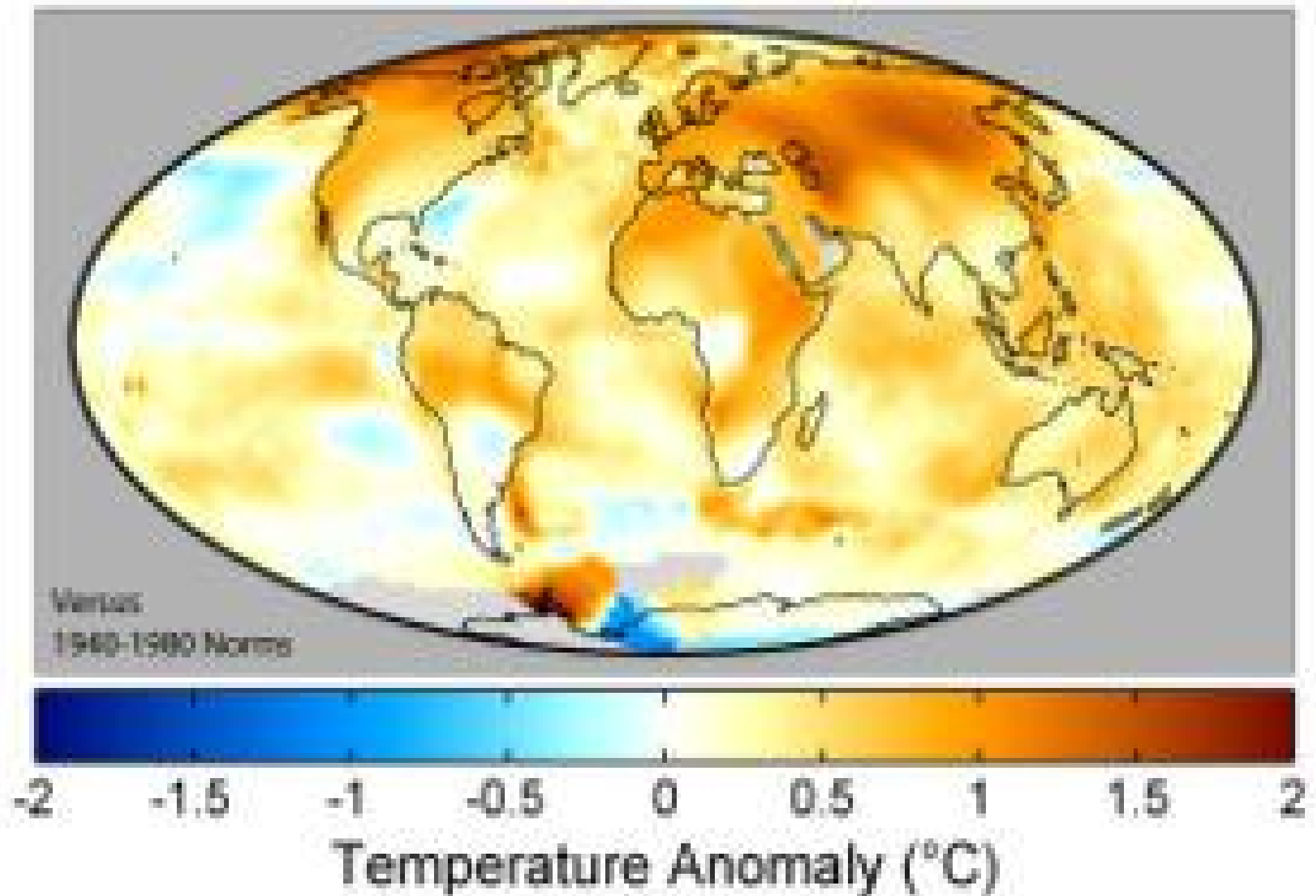
GLOBAL CLIMATE CHANGE SCENARIO

- ▣ Global mean temperature increase: 0.74 deg. C during 1906-2005, and projected to increase by 1.8 – 5.4 deg. C in 2100.
- ▣ Sea-level rise: 1.8 mm/yr. since 1961 and 3.1 mm/yr. since 1993.
- ▣ Sea-level: 18 - 59 cm by end of this century, likely to exceed 1 m and is unlikely to be less by 50 cm (2009 projection), caused by melting of polar ice sheets and glaciers.
- ▣ Shifts in hydrologic cycle results in changes in regional climates with associated ecosystem destruction and species extinction.

GLOBAL IMPACT

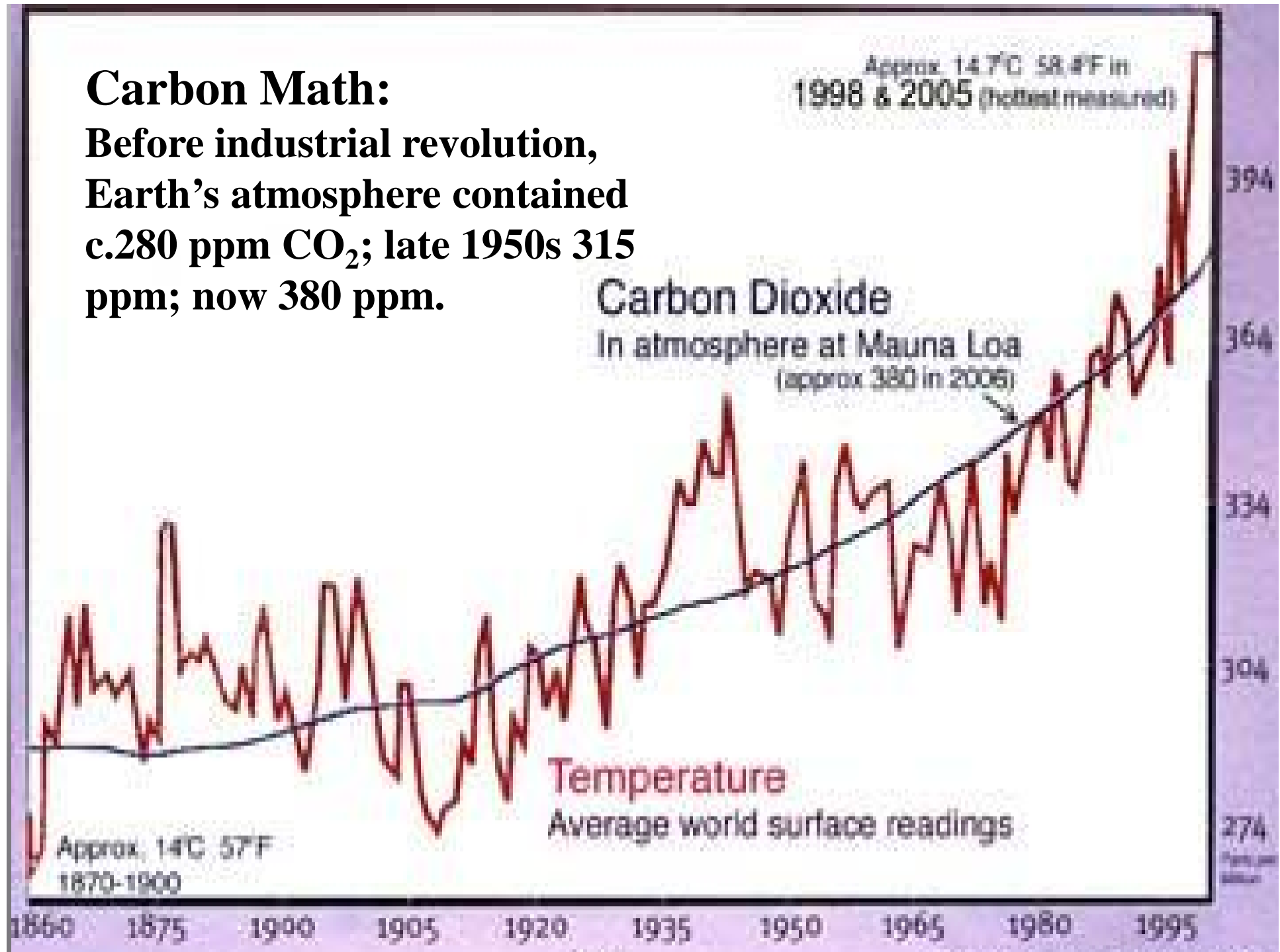
Climate change is the greatest threat facing the planet today, with rising temperatures causing more droughts, floods and storms and causing sea levels to rise. Globally, the ten hottest years on record have all occurred since the beginning of 1990s; 1998 and 2005 were the hottest years on record (measured). According to the IPCC(2001), it appears that the impacts of weather related disasters are increasing two to three times more rapidly than impacts due to earthquakes.

1995-2004 Mean Temperatures



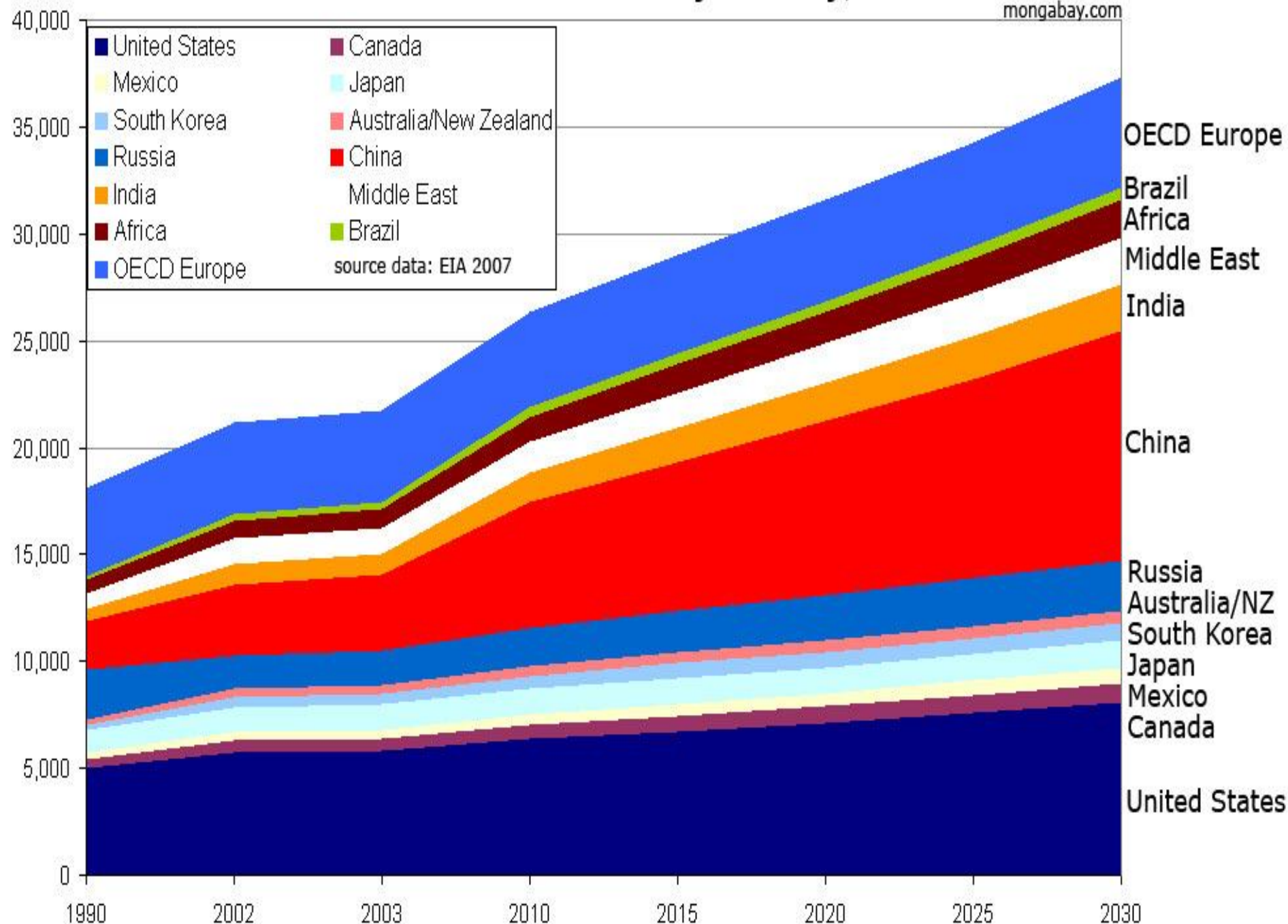
Carbon Math:

Before industrial revolution,
Earth's atmosphere contained
c.280 ppm CO₂; late 1950s 315
ppm; now 380 ppm.

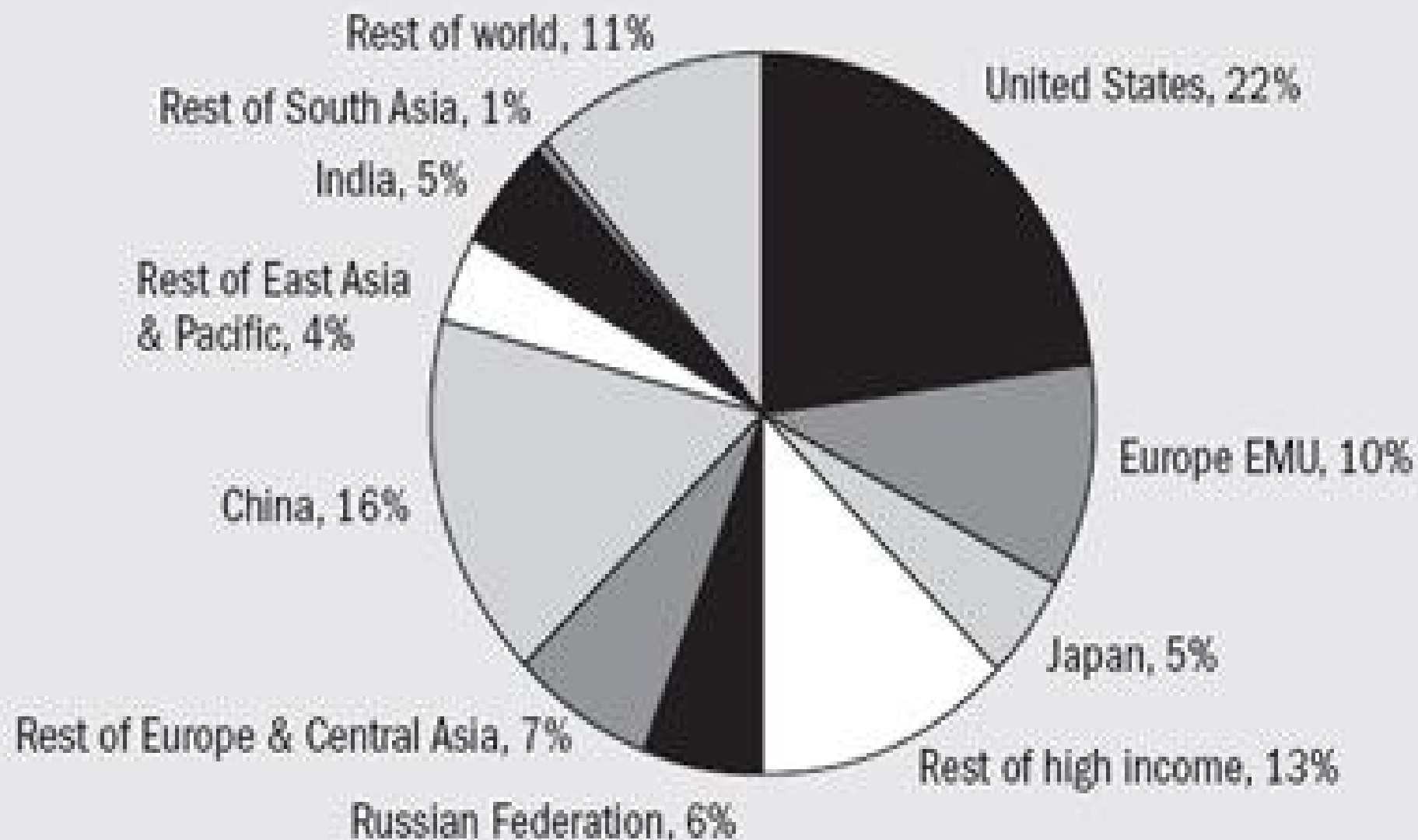


World Carbon Dioxide Emissions by Country, 1990-2030

mongabay.com



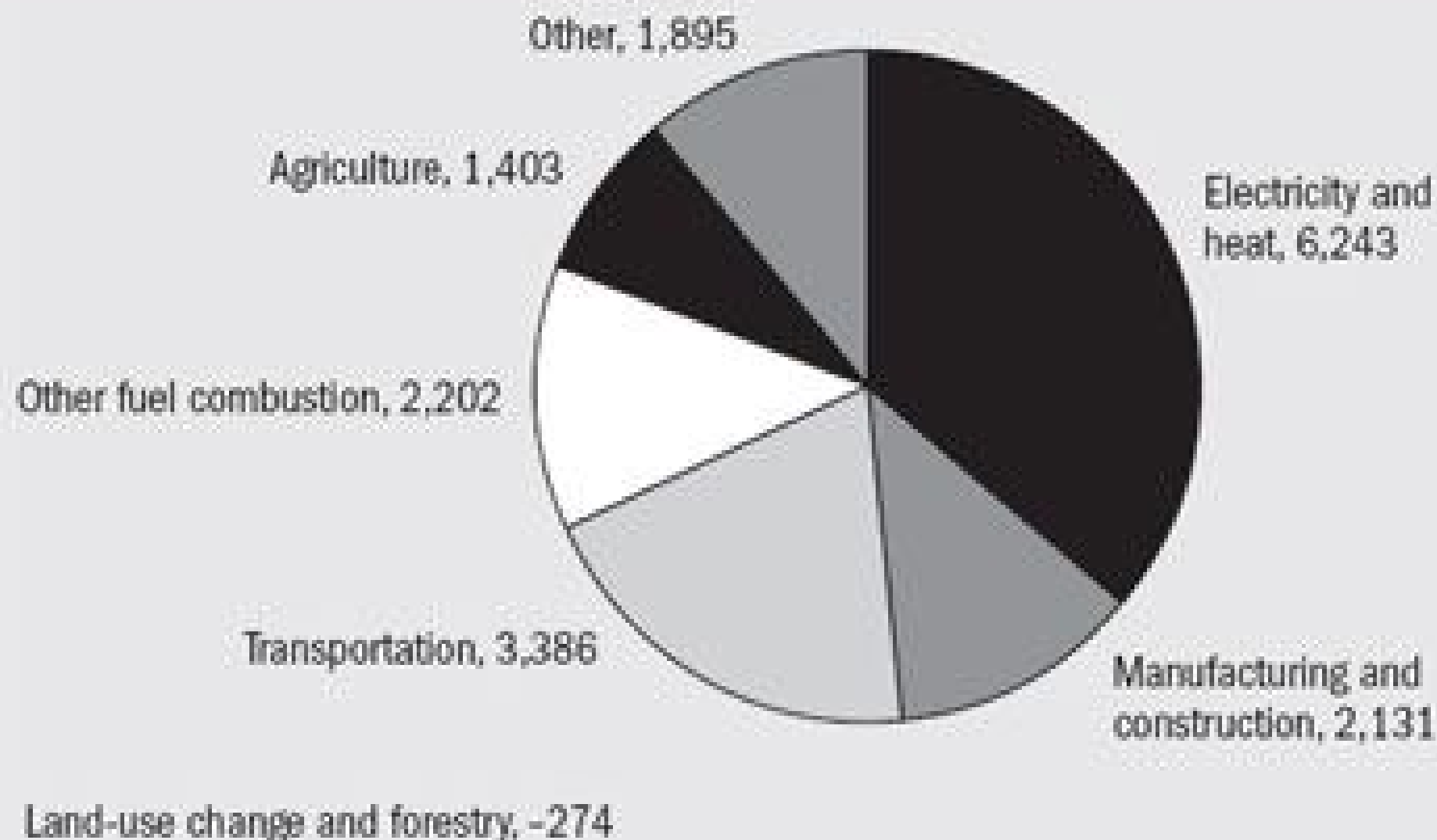
Share of carbon dioxide emissions



Source: World Bank, *World Development Indicators 2007*, table 3.8.

Emissions by source, industrial countries, 2000

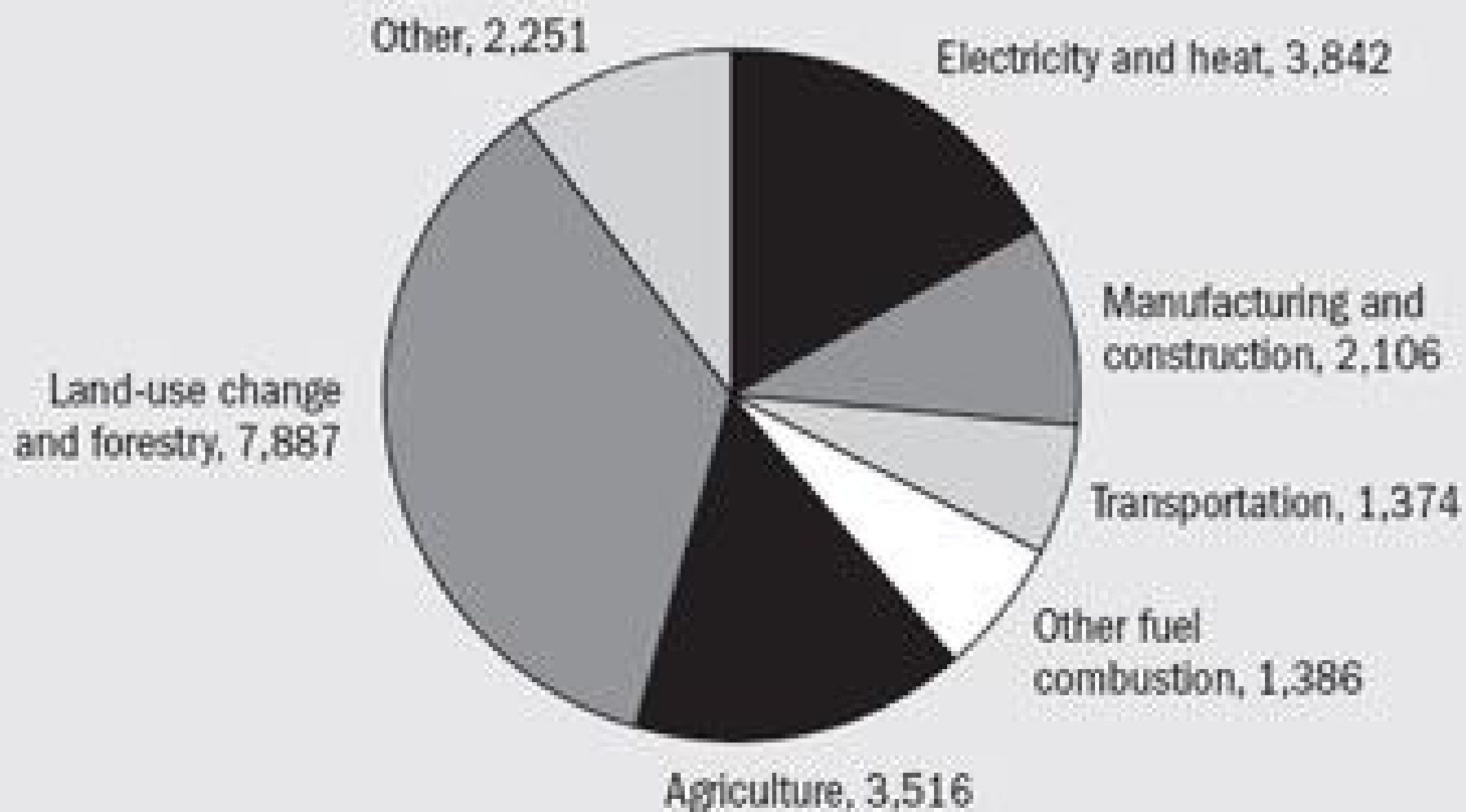
Millions of metric tons



Source: World Resources Institute.

Emissions by source, developing countries, 2000

Millions of metric tons



Source: World Resources Institute.

Malaysia's Scenario



MALAYSIA'S CLIMATE CHANGE SCENARIO

- ▣ **Temperature increase: 0.7 - 2.6 deg. C.**
- ▣ **Sea-level rise: 1.25 mm/yr. 1986 - 2006.**
- ▣ **Rainfall: -30% to +30% since 1960.**
- ▣ **Storm magnitude: 10% to 20% now.**
- ▣ **Malaysia's GHG emissions in 2005 totalled 253.9 million tonnes (CO₂ equivalent) without LULUCF.**

IMPACTS ON ENVIRONMENTAL SECURITY



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What is Environmental Security?

- ▣ Environmental security is viability of environmental assets to support life.
- ▣ Viability depends on availability and quality of environmental resources.

Environmental Media Affected by Climate Change

- ▣ **Lands and soils – quantity and quality (moisture stressed or saline).**
- ▣ **Water – availability (spatial and temporal distribution), quantity (high or low), and quality (fresh, saline or polluted).**
- ▣ **Forests – montane, upland and lowland, peatland, and mangrove.**
- ▣ **Variable ecosystems – marine, estuarine and coastal, floodplain, and mountain.**

Main Sectors that Depend on Environmental Media to Support Livelihood

- ▣ **Agriculture: food, fibre and fisheries.**
- ▣ **Industries: agro-based and non-agro based.**
- ▣ **Energy.**
- ▣ **Spatial distribution of sectors: coastal areas (agriculture, fisheries, tourism, urban centres), and floodplains (agriculture and fisheries).**

Vulnerability of Key Sectors to Impacts of Climate Change

Sub-Regions	Food and Fibre	Biodiversity	Water Resources	Coastal Eco-system	Human Health	Land Degradation
North Asia	Mod. resilient	Highly vul.	Mod. resilient	Mod. vul.	Mod. vul.	Mod. vul.
Central & West Asia	Highly vul.	Mod. vul.	Highly vul.	Mod. vul.	Highly vul.	Highly vul.
East Asia	Highly vul.	Highly vul.	Highly vul.	Highly vul.	Mod. vul.	Highly vul.
South Asia	Highly vul.	Highly vul.	Highly vul.	Highly vul.	Highly vul.	Highly vul.
South-East Asia	Highly vul.	Highly vul.	Mod. vul.	Highly vul.	Highly vul.	Highly vul.
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Impacts in Sub-Regions

- ▣ Temperatures above 29 deg. C give rise to increased in occurrences of hurricanes which affect countries in South and South-East Asia.
- ▣ Increased occurrences of extreme rains in South-East Asia causing floods and landslides have emerged.
- ▣ By 2050, freshwater availability in Central, South, East and South-East Asia in large river basins is projected to decrease.
- ▣ Coastal areas in mega delta regions in South, East and South-East Asia are at greatest risks due to increased flooding from seas and deltas.
- ▣ Endemic morbidity and mortality due to increased diarrhoeal disease associated with floods and droughts have increased in East, South and South-East Asia.

Impacts by Sectors

Global Mean Annual Temperature Changes (deg. C)

Decreased water availability

1-2 deg.C: 0.4-1.7 bil. people affected

2-2 deg.C: 1.0-2.0 bil. people affected

3-4 deg. C: 1.1-3.2 bil. people affected

4-5 deg. C: more people under water stress

Ecosystems

1-2 deg. C: increased amphibian extinction, increased coral bleaching,
increased spp range shifts and wildfire risks

2-4 deg.C: about 20-30% spp at increased high risk of extinction,
widespread coral bleached and mortality

Impacts by Sectors

Global Mean Annual Temperature Changes (deg. C)

Food and Crop Productivity

1-3 deg.C: decreased for some cereals at low latitudes and increased for some cereals at mid and high latitudes

3-5 deg.C: decreased for all cereals at low latitudes and decreased for some cereals at mid and high latitudes

Coastal Areas

1-3 deg. C: increased damages from floods and storms and about 1.2 bil. people at risk each yr. due to coastal flooding

3-5 deg.C: about 30% loss of coastal wetlands

Health

1-5 deg.C: increased burden from malnutrition, cardio-respiratory and infectious diseases

Economic Impacts of Mitigation

- ▣ In 2030:
macro-economic costs for stabilization of emissions trajectories between 445-710 ppm CO₂-eq are estimated at 3% decrease of global GDP, but regional costs may differ significantly from global average.
- ▣ In 2050:
macro-economic costs for stabilization of emissions trajectories between 590-710 ppm CO₂-eq are estimated at 0.5% decrease of global GDP, and between 535-590 estimated at 1.3%

IMPACTS ON RURAL COMMUNITIES IN MALAYSIA



Water Resources

- ▣ **Vulnerability**: high.
- ▣ **Impacts**: frequent rains and floods give rise to inability of rural farmers to do farm work; floods destroy crops; droughts tends to be severe, depleting water supply and destroy crops, due to water stress – resulting in decrease farm production.
- ▣ **Adaptation**: promote water conservation; explore the potential use of groundwater; undertaking flood mitigation/control measures.



Agriculture

- ▣ **Vulnerability: high.**
- ▣ **Impacts: too much rain and severe droughts reduce crop production and destroy some; 1 deg. C temperature reduces rice yield by 10% and oil palm fruiting by 5%; pests infestation increased.**



Agriculture

Adaptation:

- ▣ Develop plant varieties that are tolerant and resilient to high temperatures and high water-use efficiency;
- ▣ Develop means to maximise efficient usage of water and nutrients;
- ▣ Preserve water catchment areas to ensure adequate water supply for agriculture;
- ▣ Develop appropriate management practices for post-harvest handling to prevent spoilage of agricultural produce; and
- ▣ Develop appropriate responses to land use conversion that address socio-economic causes.

Biodiversity

- ▣ Vulnerability: high
- ▣ Impacts: disrupt functioning of ecosystems, rendering low survival or extinction of some spp that rural communities depend on.
- ▣ Adaptation: strengthening and integrating conservation of protected areas; identification of alternate spp that have similar uses.



Coastal Resources

- ▣ **Vulnerability: high.**
- ▣ **Impacts: sea-level rise and increased storm surge strength causing higher tidal inundation, shoreline erosion, increased wave action and saline intrusion; destruction and loss of habitat (mangroves).**
- ▣ **Adaptation: building defence options such as bunds, seawalls, levees or dykes; regulating building development in the coastal zone; creating a coastal buffer zone; reclaim the intervening areas; and coastal land buy-back by the Government for conversion to natural reserves or conservation corridors.**



Health

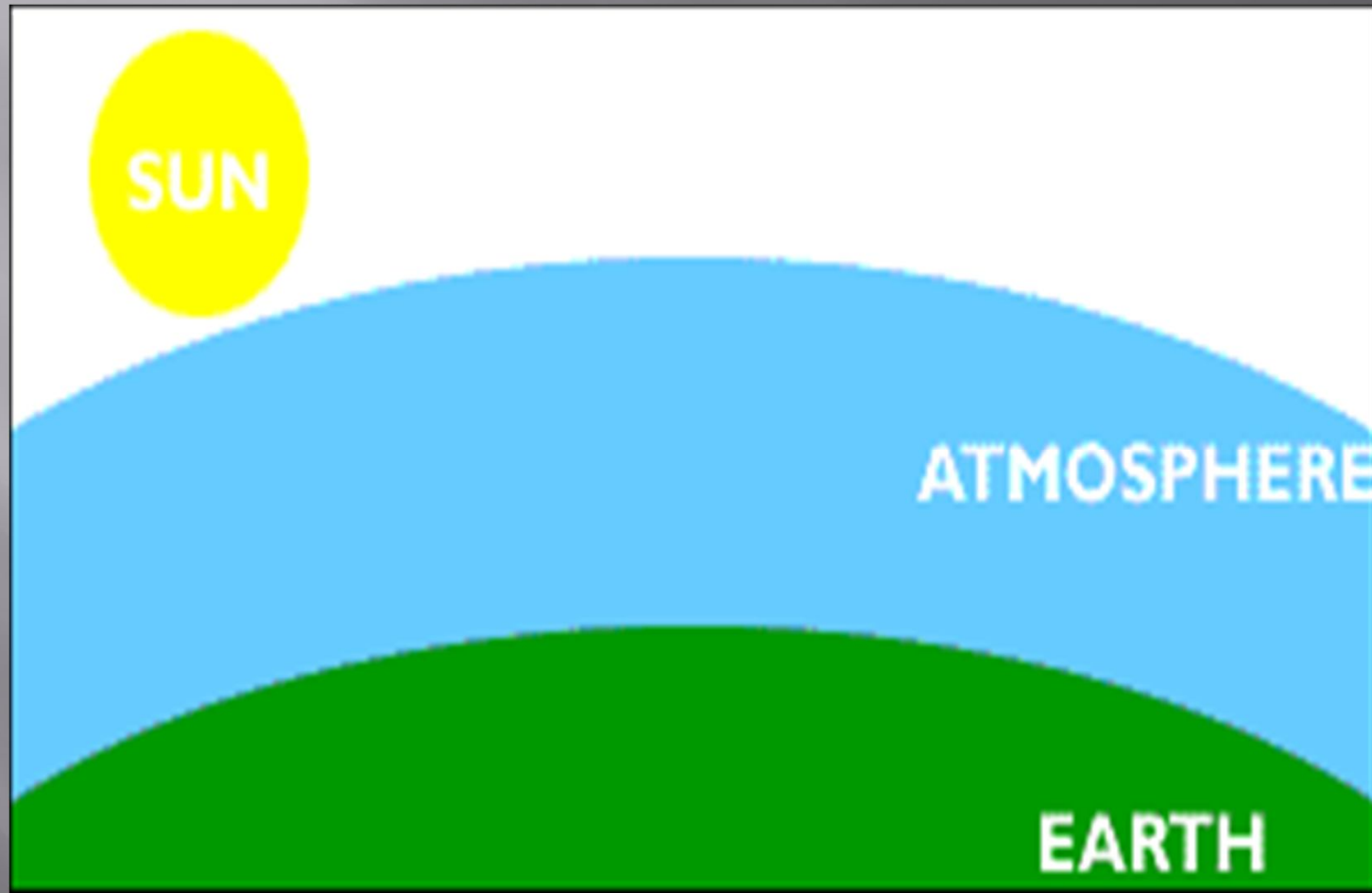
- ▣ **Vulnerability:** high.
- ▣ **Impacts:** increased burden from malnutrition, cardio-respiratory and infectious diseases, vector-borne diseases such as malaria and dengue fever caused by mosquitoes.
- ▣ **Adaptation:** continuous implementation of strategic plans by health authorities to become better prepared in handling disease outbreaks by implementing and managing appropriate response actions.



FIGURE 2-4 Female *Anopheles gambiae* during a blood meal. (Photo courtesy of Dr. Robert Gwadz, NIAID, NIH)

How to Mitigate Impacts...

Global Phenomenon



GHG Emissions by Sectors in Malaysia, 2005

- ▣ **Energy 204.4 M/tonnes**
- ▣ **Industrial processes 15.6 M/tonnes**
- ▣ **Agriculture 6.6 M/tonnes**
- ▣ **Wastes 27.4 M/tonnes**
- ▣ **Land Use, Land Use Change and Forestry (LULUCF) 25.3 M/tonnes**
- ▣ **Total 279,2 M/tonnes**



MITIGATION IN MALAYSIA

▣ Measures:

- ❖ **Promote energy efficiency among industries, building and transport sector, including implementation of public awareness programmes by government agencies and NGOs to promote energy efficiency, recycling of waste, and use of public transport;**
- ❖ **Promote initiative focusing on better utilization of energy resources, with emphasis on reducing dependency on fossil fuels and enhance efforts to integrate use of alternative fuels.**

MITIGATION

- ❖ Assess changes in end-use demands and activity levels across sectors;
- ❖ **Evaluate specific technologies and options across sectors;**
- ❖ Develop scenarios for energy and non-energy GHG emitting sectors to assess the potential for GHG emission reduction.

Carbon Intensity Reduction in Malaysia

- ▣ At COP15 under UNFCCC, held in Copenhagen in December 2009, a voluntary pledge of 40% reduction of GHG emissions intensity of GDP by 2020 was made by PM, subject to availability of technology and finance.
- ▣ Bottom-up approach has been adopted to assess changes in end-use demands and capacity levels across sectors, evaluate specific technologies and options across sectors, and develop scenarios for energy and non-energy GHG emitting sectors to assess the potential for GHG emission reduction.

Mitigation Sector

- ▣ **The scope of mitigation sector involves evaluation and prioritization of key options for energy and non-energy sectors, and proposing policies and strategies for catalyzing efforts towards resource efficient utilization of energy and GHG emission reduction in key sectors.**

Evaluation and Prioritization

- **Provide comprehensive understanding and analysis of the Energy Sector, Waste Sector, LULUCF, Agriculture, and Industrial Processes.**
- **Identify opportunities for GHG emissions reduction.**
- **Prioritize options by analyzing barriers, costs and benefits of various options.**
- **Develop a road map on carbon intensity reduction up to and beyond 40% of 2005 levels by 2020 and beyond.**
- **Propose specific policy and regulatory initiatives to guide the nation in progressing towards the identified low carbon path.**

CHALLENGES

- ▣ **Increasing urbanization;**
- ▣ **Increasing population growth;**
- ▣ **Increasing GDP and energy demand;**
- ▣ **Continuing reliance on fossil fuels;**
- ▣ **Higher expectation for better standard of living;**
- ▣ **Changes in land-use for development.**

CONCLUSION

- ▣ Malaysia needs to enhance preparedness and capabilities to sustaining economic growth and maintain livelihoods.
- ▣ Effective climate policy aimed at reducing risks of climate change involves a portfolio of diverse adaptation and mitigation actions.
- ▣ COP15 voluntary pledge of GHG emission intensity reduction requires effective and sound roadmap.





Thank You
Terima Kasih