




**Climate Change -Adaptation Measures
for Forest Ecosystems**

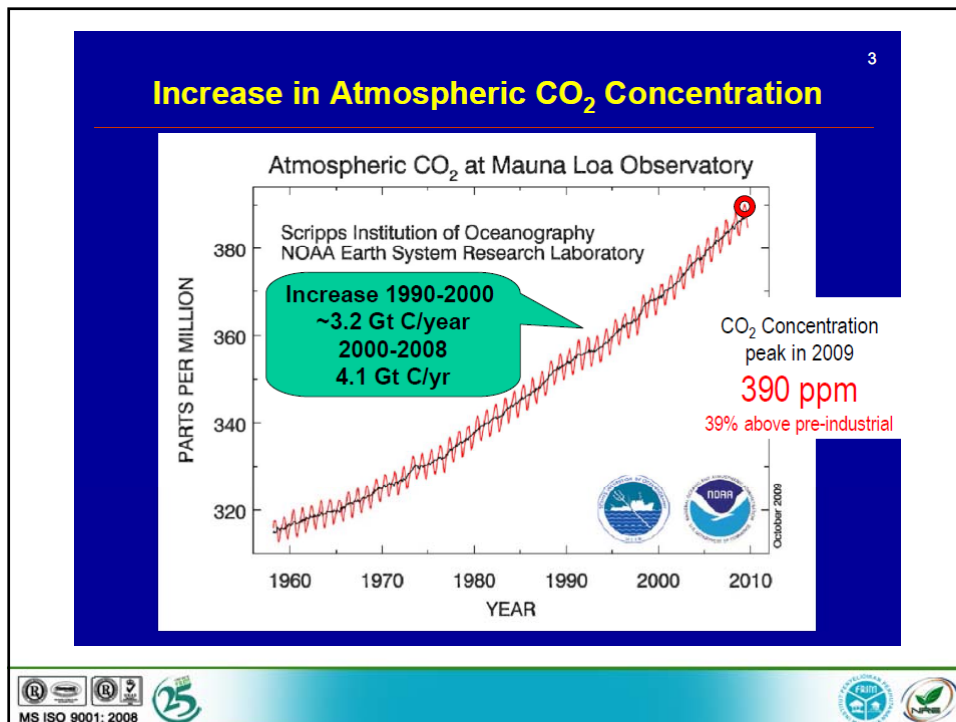
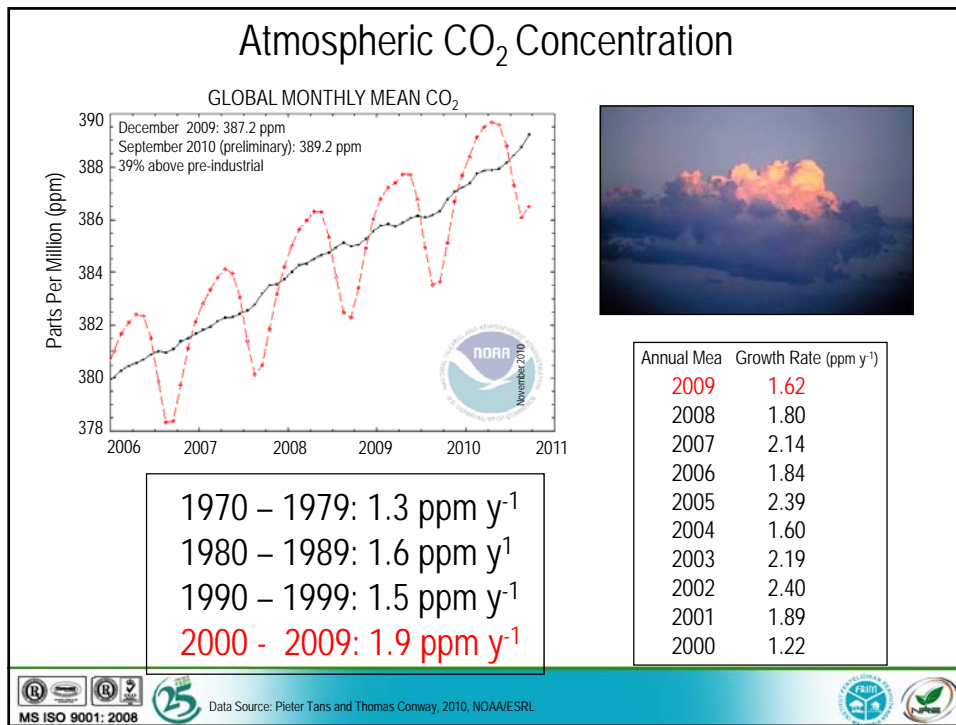
Abdul Rahim Nik

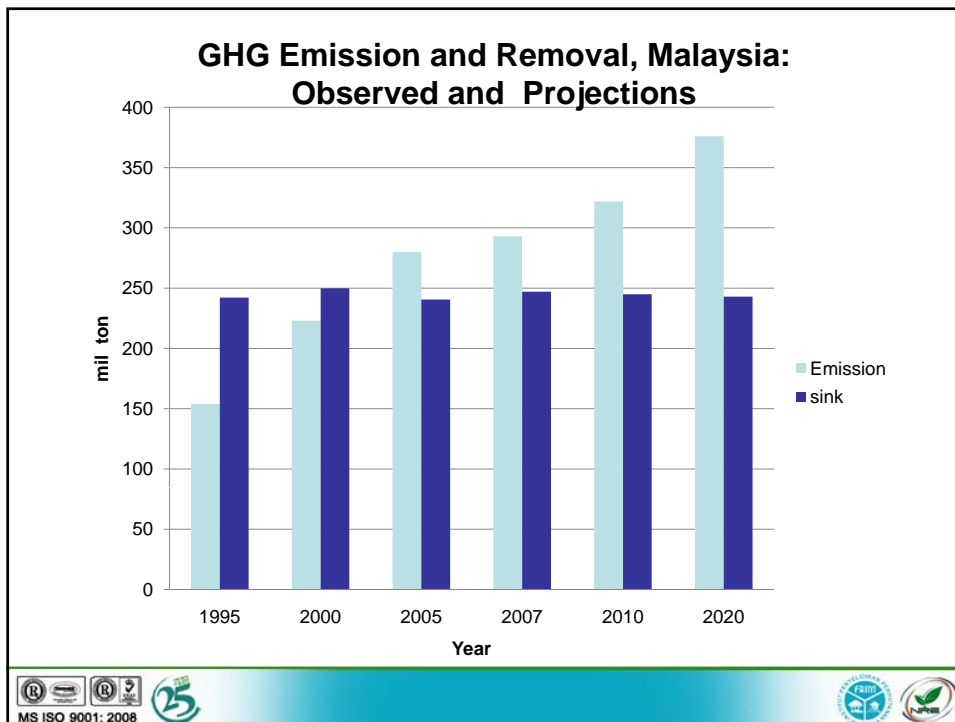
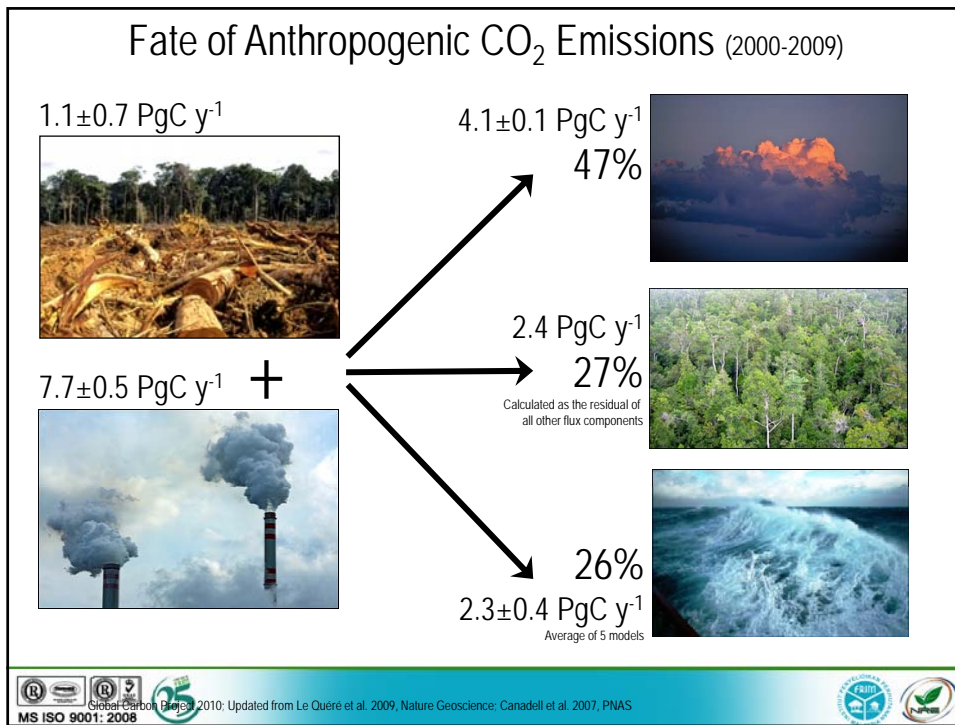
MS ISO 9001: 2008  INSTITUT PENYELIDIKAN PERHUTANAN MALAYSIA
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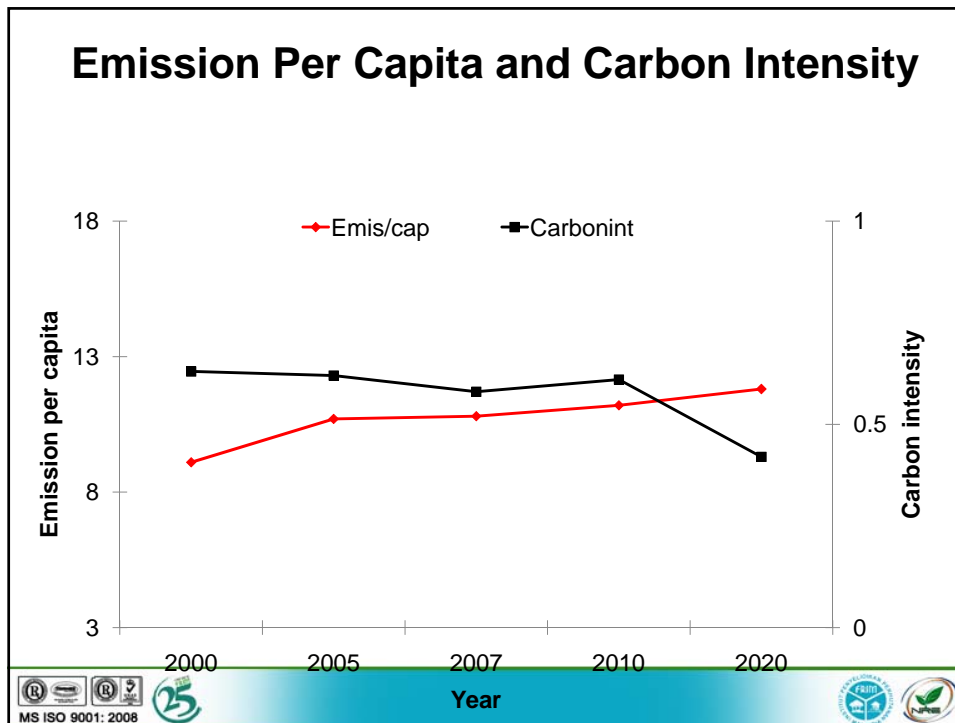
Presentation Outline

- Introduction
 - the latest global GHG emission
 - GHG Emissions in Malaysia
- Framework for Adaptation Measures
 - Climate Change Scenarios and Projection
- Suggested Adaptation Measures
 - Synergy with sustainable forest management
- Way Forward

MS ISO 9001: 2008  







Adaptation-mitigation synergies

- Adaptation - adjustment in natural or human systems in response to actual or expected climate change or their effects
- Mitigation – reduction of GHG sources & emissions and enhancing sinks
- synergy is intrinsic to ecosystem-based approach

Framework for assessment of impacts of climate change and formulation of adaptation options

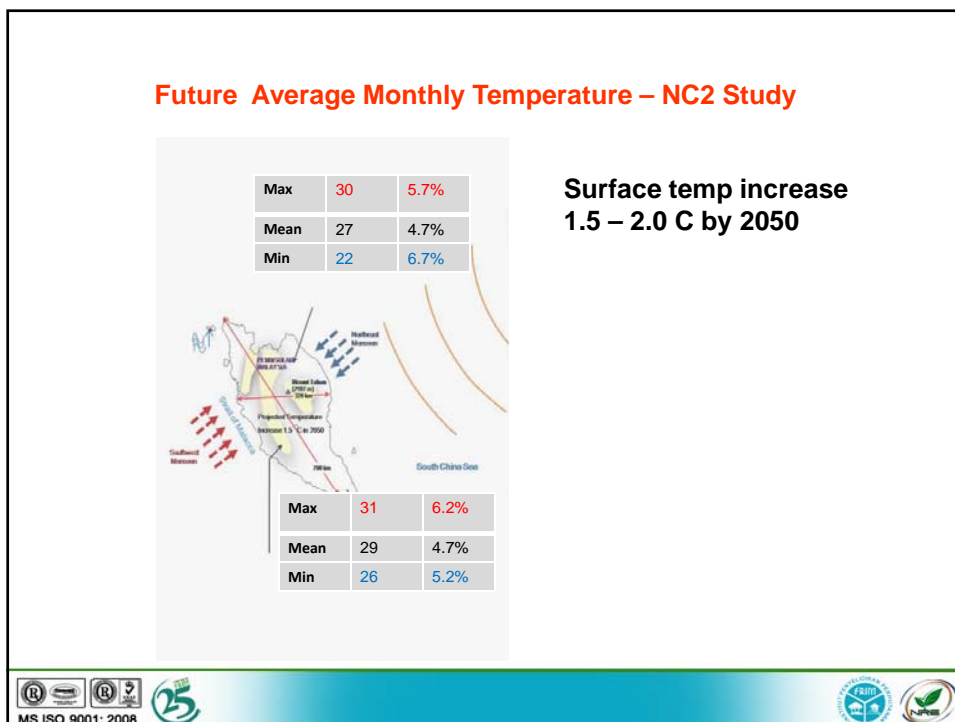
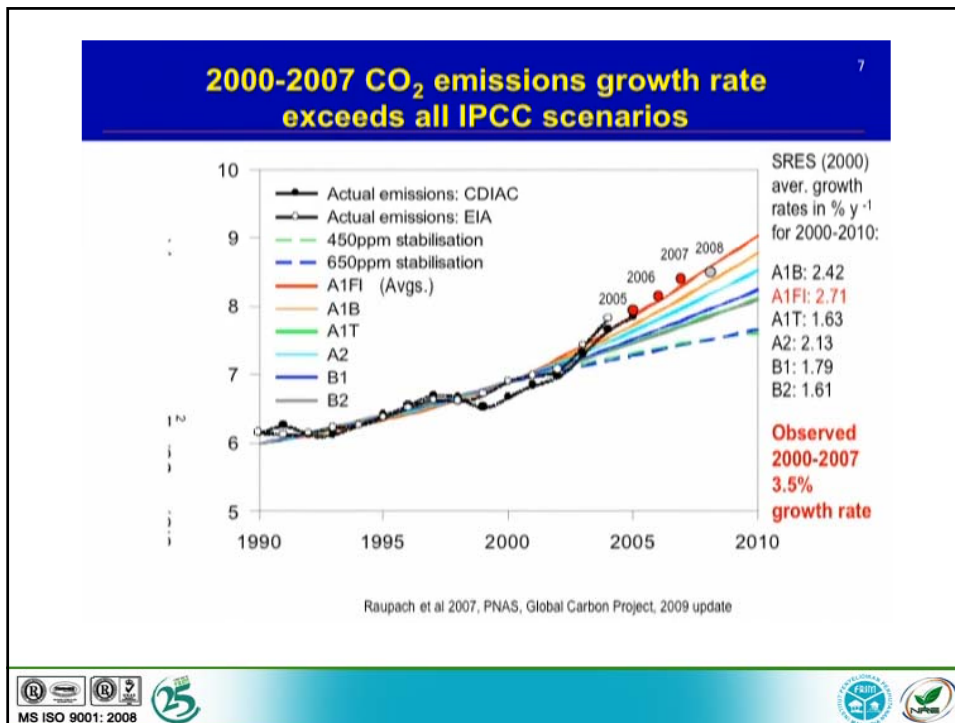
- Scenario of future of climate change forcing (eg SRES)
- Climate scenarios from General Circulation Models (GCM)
- Ecological scenarios from DGVMs or other ecological models
- Translation of ecological results into growth and disturbance effects
- Economic impacts



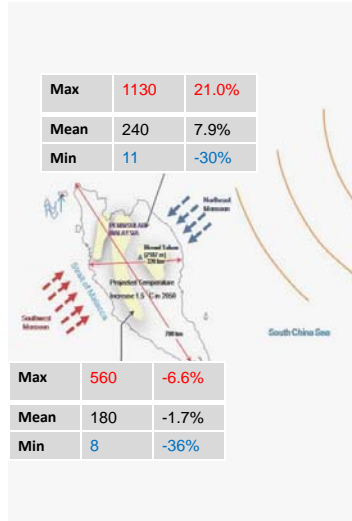
Climate-Change Scenarios

- SRES – Special Report on Emission scenarios – (pop growth, GDP, emissions)
- Second Malaysia National Communication
 - National obligation to report to UNFCCC
 - GHG inventory
 - Planned mitigation and adaptation Measures
 - Strategies to address climate change
- Other assessments – ADB, IDRC & SIDA, EPU





Future Average Monthly Rainfall – NC2 Study

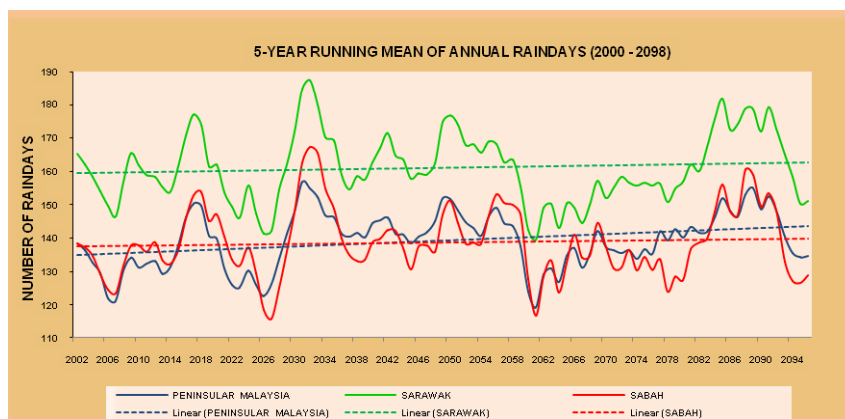


NE region annual rainfall increase by 9%

Central region rainfall decrease by 5%



Future Climate Projections (Precip)



Five-year Moving Averages for Annual Rain Days



HIGHLIGHTS

The Economics of Climate Change in Southeast Asia: A Regional Review

Asian Development Bank

Secretariat of the Convention on Biological Diversity

CBD Technical Series No. 50

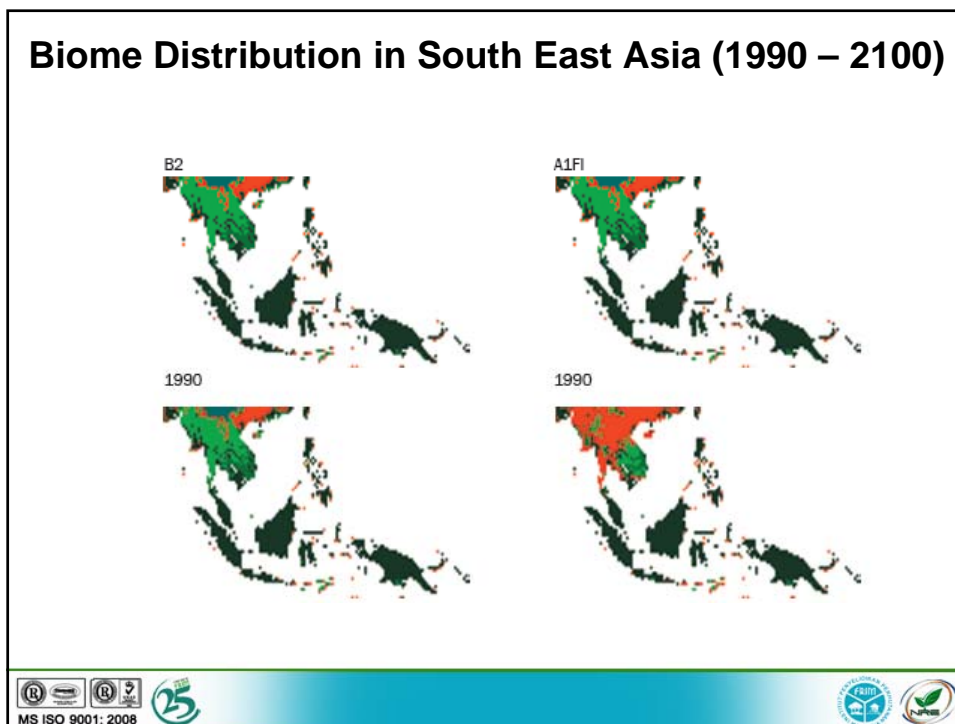
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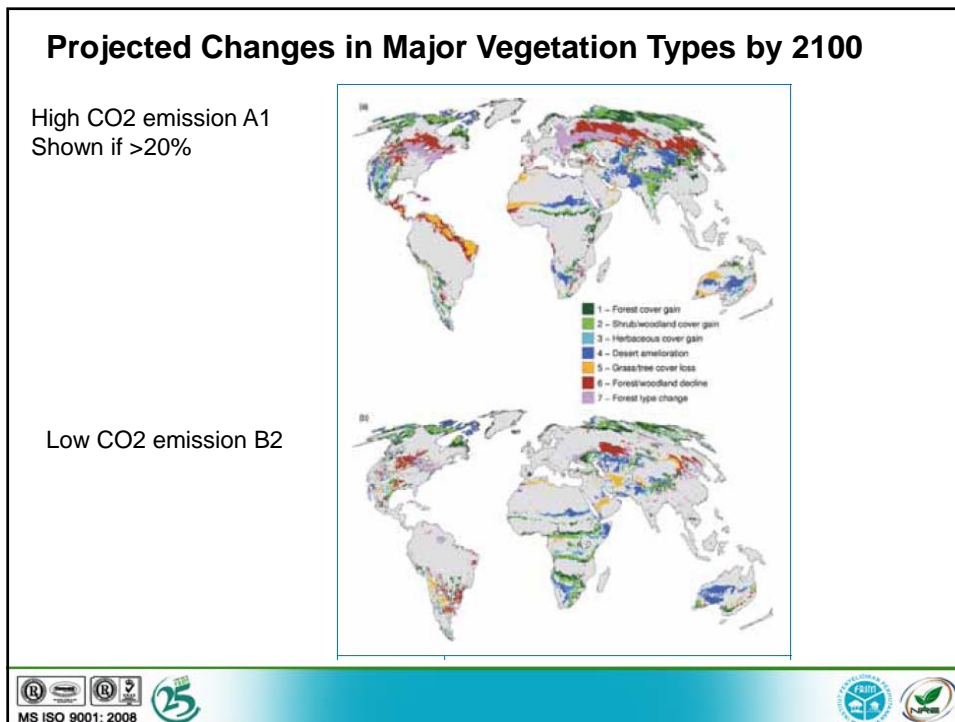
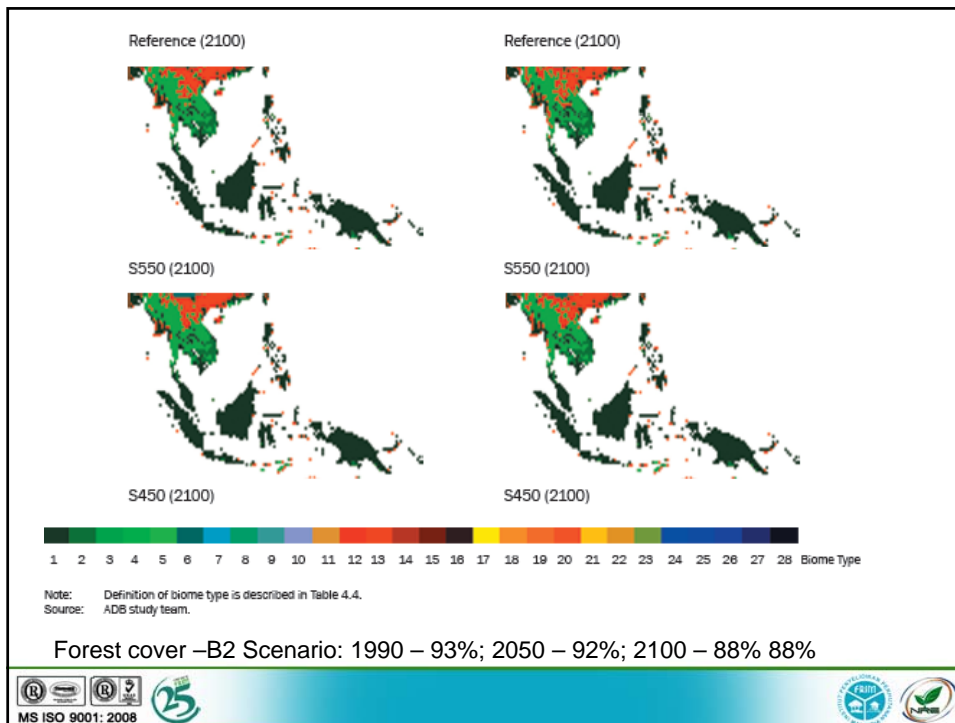
BIODIVERSITY SCENARIOS: PROJECTIONS OF 21st CENTURY CHANGE IN BIODIVERSITY AND ASSOCIATED ECOSYSTEM SERVICES

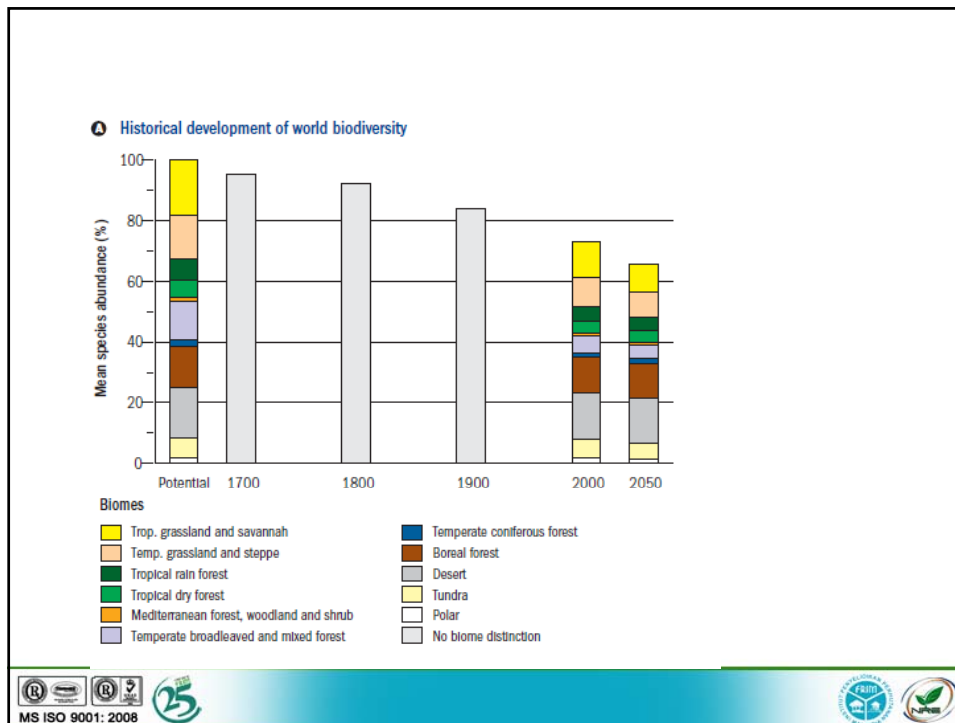
A Technical Report for the Global Biodiversity Outlook 3

MS ISO 9001: 2008

UNEP WCRC







Modelling of Forest Ecosystem Response and Vulnerability

- Understanding recent changes in climate and forest ecosystems remains a complicated task
 - Many drivers and dimensions of environmental changes operating simultaneously
 - Interactions can have positive, negative or synergistic consequences for forest ecosystems
 - Interactions with natural disturbance agents (disease or pest outbreaks)

Forest Responses and Vulnerabilities to Climate Change

- Adequacy of available information to support quantitative assessment of the impacts and vulnerability
 - Lack of quantitative information about nature, extent and causes of forest ecosystem change
 - Uncertainties about relative contributions of climate change & other factors
 - Uncertainties about contributions about rel contributions of natural and human factors



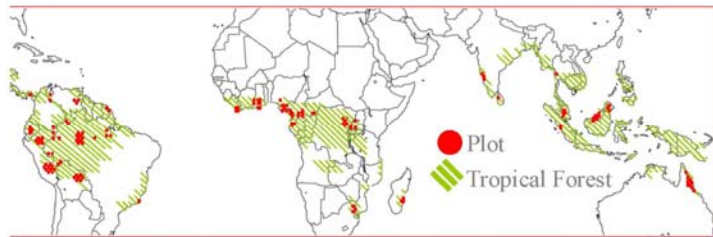
Climate Change Projections

- Dynamic Global Vegetation Model – DGVM
 - Project future land vegetation under any climate change scenario
 - Represents forests only at the biome level
- Patch Dynamic Model – operates at species level, but limited geographical coverage

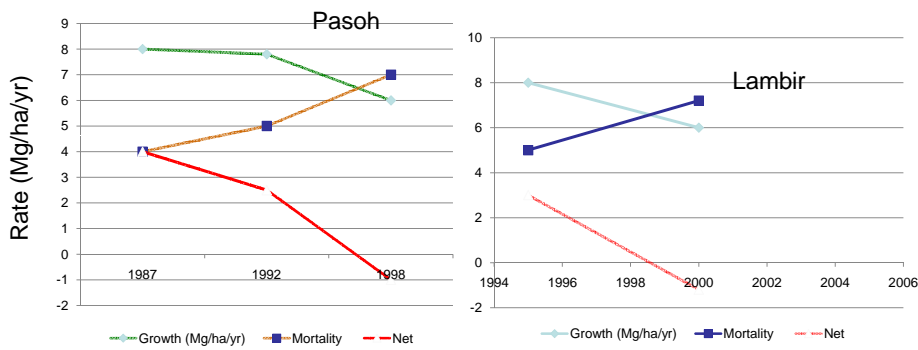


Effects of Climate on Forest Productivity and Biodiversity

- Need a long term data to detect changes on stand structure, aboveground biomass, net productivity
- Long term ecological plots proved useful eg Pasoh and Lambir 50 ha plot



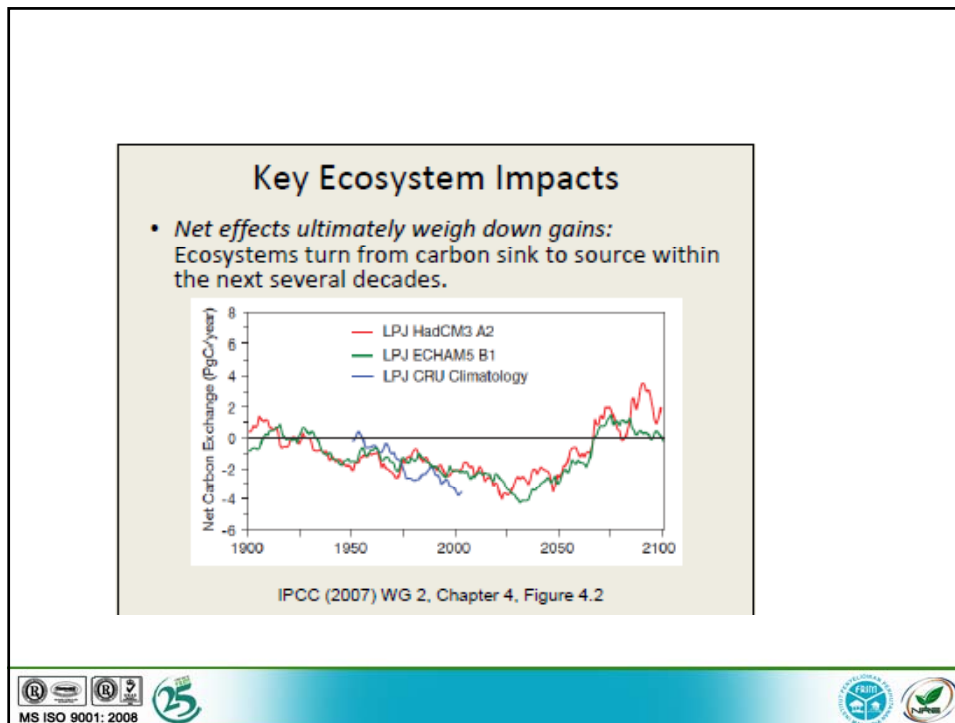
Aboveground Biomass Changes



- Aboveground biomass growth rate
- AGB mortality rate
- Increased mortality due to drought
- Fast growing group had greater mortality than slow growing

Chave et al 2008





SFM and Adaptation to Climate Change

- SFM provides a flexible, robust, credible and well-tested framework for simultaneously reducing carbon emissions, sequestering carbon and enhancing adaptation to climate change
- Mainstreaming adaptation strategies into national development programme

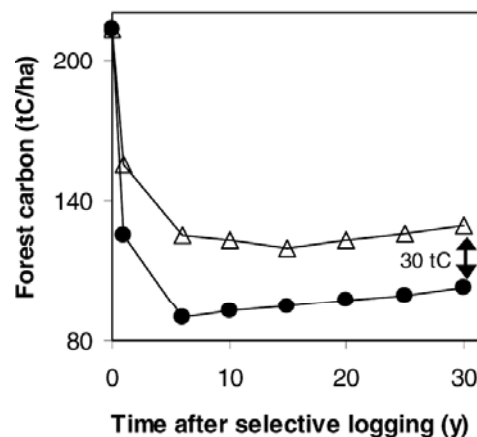
Integration of Thematic Elements of SFM in adaptation strategies

1. **Extent of forest resources**
 - maintaining significant forest cover and stocking;
2. **Biological diversity-its conservation and management;**
3. **Forest health and vitality-reducing fires, pollution, invasive species, pests and diseases;**
4. **Productive functions**
 - maintaining production of wood and non-wood forest products;
5. **Productive functions-in relation to soil, hydrological and aquatic systems;**
6. **Socio-cultural and economic functions**
 - the support provided by forests to the economy and to society; and
7. **Legal, policy and institutional framework- to support the above themes**



Carbon retention from Reduced Impact Logging (RIL) practices

Before logging=213 t/ha ● Conventional ▲ Improved



Putz, et al., 2007



Adaptation Measures

Thematic Measures that may be considered to achieve following adaptation objectives:

- Management Objective of Maintaining (or increasing) Forest Area.
- Management Objective of Conserving Biological Diversity of Forest Ecosystems
- Management Objective of Maintaining the Productive Capacity of Forest Ecosystems
- Management Objective of Maintaining the Health and vitality of Forest Ecosystems
- Management Objective of conserving and maintaining the soil and water Resources Forest Ecosystems
- Management Objective of Maintaining Forest Contributions to Global Carbon Cycles



Adaptation Options to Achieve the Management Objective of Conserving Biological Diversity of Forest Ecosystems

Impact	Adaptation Options
Alteration of plant and animal distribution	Minimize fragmentation of habitat and maintain connectivity
	Maintain representative forest types across environmental gradients in reserves
	Identify and protect functional groups and keystone species
	Strategically increase size and number of protected areas, especially in 'high-value' areas
	Provide buffer zones for adjustment of research boundaries
	Protect most highly threatened species ex situ



Adaptation Options to Achieve the Management Objective of Maintaining the Health and vitality of Forest Ecosystems

Impact	Adaptation Options
Increased frequency and severity of forest pestilence	Adjust harvest schedules to harvest stands most vulnerable to insect outbreaks
	Improve governance of frontier forest areas to reduce the risk of fires associated with settlement
	Plant genotypes tolerant of drought, insects and/or disease
	Breed for pest resistance and for a wider tolerance to a range of climate stresses and extremes
	Employ silvicultural techniques to promote forest productivity and increase stand vigour
	Increase the genetic diversity of trees used in plantations
	Establish landscape-level targets of structural or age-class, of landscape connectivity for species movement, and of passive or active measures to minimize the potential impacts of fire, insects and diseases



Way Forward

- Forests exert a strong influence in the global carbon cycle and vice versa climate change is already affecting forest ecosystems
- SFM provides an effective framework for forest-based adaptation & mitigation of climate change
- More rigorous and interdisciplinary R&D in CC integrating ecological, economic and social aspects
- Mainstreaming forest adaptation into policy framework





Thank You

