

# IPCC Technology Cross-Cutting Theme

## *Long-Term Technology Pathways to Stabilization of Greenhouse Gas Concentrations*

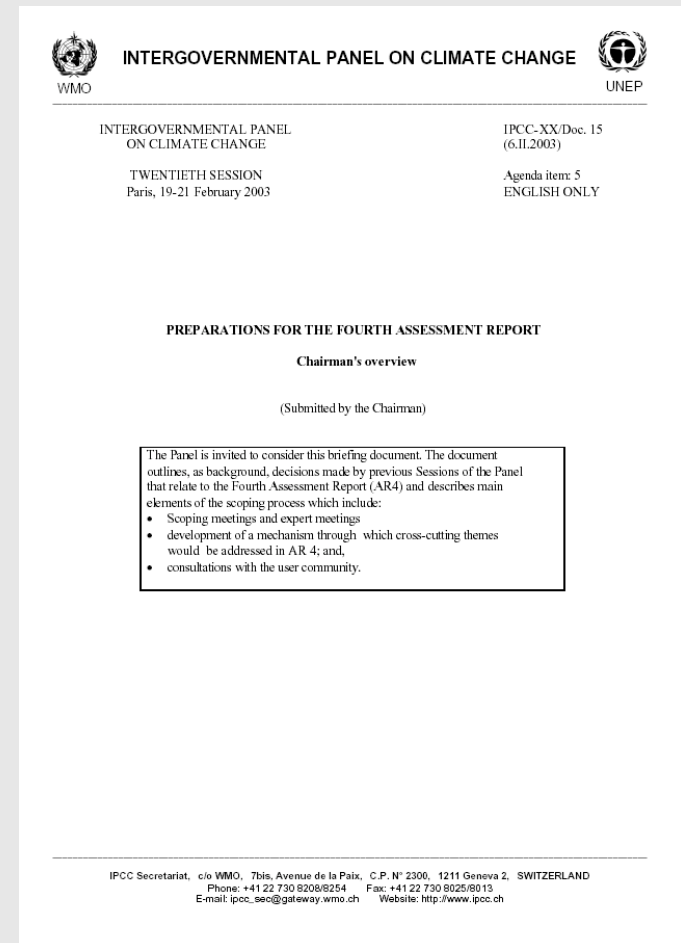
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Aspen, CO

# Topics

- **The IPCC 4<sup>th</sup> Assessment Report**
- **The Technology CCT**
- **How to move forward?**

# The Origins of Cross-Cutting Themes

- ▶ TWENTIETH SESSION of the IPCC
- ▶ Paris, 19-21 February 2003
- ▶ ***Preparations For The Fourth Assessment Report***
- ▶ Created the new function of Cross-Cutting Theme “Anchors”



# Cross-Cutting Themes (CCT)

Purpose: *“To facilitate and improve cross Working Group co-operation and to achieve better integration and consistent treatment of key issues throughout the AR4.”*

# Cross-Cutting Themes (CCT)

CCT	Lead WG	Anchors	Country
1. Risk and Uncertainty	WG1	Manning Petit	USA France
2. Regional Integration.	WG1	Giorgi Carter (Anchor 3)	Italy Finland
3. Water	WG2	Kundze wicz Mata	Poland Venezuela
4. Key Vulnerabilities (including UNFCCC Art. 2 Issues)	WG2	Schneider Semenov Patwardhan	USA Russia India
5. Adaptation & Mitigation	WG3	Grubb Huq	UK Bangladesh
6. Sustainable development	WG3	Srivastava Heller	India USA
7. Technology	WG3	Edmonds Mirera	USA Brazil

# Timing of the Fourth Assessment Report

- ▶ The Fourth Assessment Report (AR4) to be completed in 2007;
- ▶ Working Group reports and, if it is decided to prepare one, the Synthesis Report, would be sequenced such that the
  - Working Group I report finalized first quarter of 2007,
  - Working Group II mid-2007
  - Working Group III mid-2007 and
  - The Synthesis Report last quarter of 2007;

# The IPCC Working Groups in the Fourth Assessment Report

## ▶ Working Group I

- Assesses the scientific aspects of the climate system and climate change.

## ▶ Working Group II

- Assesses the vulnerability of socio-economic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it.

## ▶ Working Group III

- Assesses options for limiting greenhouse gas emissions and otherwise mitigating climate change.



# The Technology CCT

- ▶ *For the purposes of the technology cross cut theme (CCT), we will refer to technology as the broad set of processes covering know-how, experience and equipment, used by humans to produce services and transform resources.*
- ▶ *(Not just devices.)*



# Technology in the Three WGs

**Table 1: Overview of sectors for which technology plays a role that may be addressed in the AR4 and the IPCC working group with which they may be expected to be associated.**

Sectors	WG1	WG2	WG3
1 Buildings	X	X	X
2 Industry	X		X
3 Transportation	X	X	X
4 Power	X	X	X
5 Refining	X		X
6 Fossil Fuel Supply	X		X
7 Biomass Supply	X	X	X
8 Nuclear Supply			X
9 Hydro, Solar & Wind Supply		X	X
10 Energy transmission & storage	X	X	X
11 CC&D	X		X
12 Terrestrial Sequestration	X	X	X
13 Agriculture	X	X	X
14 Livestock	X	X	X
15 Forestry	X	X	X
16 Hydrologic Systems	X	X	
17 Coastal zones	X	X	
18 Health		X	
19 Geoengineering	X	X	X
20 Monitoring and Verification	X	X	X

# Technology Components and Systems

- ▶ Technology exists at both the component and system levels.
  - E.g. Hydrogen systems require components from ...
    - Transportation
    - Buildings and Industry
    - Refining
    - Carbon capture and disposal
  - E.g. commercial biomass requires components from
    - Agriculture
    - Refining
    - Transportation

# Technology Characteristics

**Table 3: Technology Characteristics**

- 1 Technology description, system boundaries
- 2 System connections, interactions with other technologies . What for example, is assumed about institutions and infrastructure? Are there resource limitations. Are the resource limitations amenable to technological change? Are there deployment limitations associated with intermittency?
- 3 Output (units) per scale unit
- 4 Output Emissions of greenhouse gases per unit output
- 5 Output Emissions of non -GHG s and other pollutants per unit output
- 6 Health and safety issues per unit output
- 7 Production Inputs: capital (common discount rate)
- 8 Production Inputs: labor (education requirements?)
- 9 Production Inputs: energy (form, c ommon price)
- 10 Production Inputs: water
- 11 Production Inputs: land, other resources, exotic metals
- 12 Climate Interaction: Temperature
- 13 Climate Interaction: Precipitation
- 14 Climate Interaction: Direct CO<sub>2</sub> effect
- 15 Other Issues: Health and safety issues per unit output

# Technological Characterization

## Resources

- Oil
- Gas
- Coal
- Wind
- Solar
- Geologic carbon repositories
- Etc.
- Resources
- Reserves
- Economic
- Non-economic

# Technological Characterization

## Importance of Scale

Characteristics that are trivial for small scale may be extremely important for large scales.

- Commercial biomass
- H<sub>2</sub> vehicles

# Technology and Cost

Table 3 does not focus on cost

- Cost is derived from the relationship between prices for inputs and outputs and production relationships.
- Standardization of prices and interest rates could facilitate comparison of costs

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# Technology Characteristics

**Table 4: Three Periods of Technology Characterization**

Period	Comment
Present average practice	Regional variation
Present best practice	With uncertainty as it appears in the literature
2020 Technology development	
2050 Technology potential	
Long term potential	



# Technological and Time

## Basic Research

1. Curiosity driven
2. Motivated by potential use

# Technological and Time

1. Applied research
2. Learning
3. Scale economies
4. Adaptation of technologies from
  - ▶ related sectors and
  - ▶ regions
5. Serendipity

# Technological and Time

Rate of change

Role of existing capital stocks  
and capital stock turnover.

# How to Move Forward?

- ▶ What can an anchor contribute to an assessment?
  - Anchors do not write the technology sections.
  - The anchor's role is one of coordinator and facilitator.
- ▶ Creating a common vocabulary?
  - *Common system boundaries*
  - *Common boundary conditions*
  - *Common characteristics*
- ▶ Distinguishing between components and systems—how to generate useful information?