

# The Role of Scenarios in Driving Climate Futures

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**DOE Climate and Earth System Modeling PI Meeting**  
Washington, DC

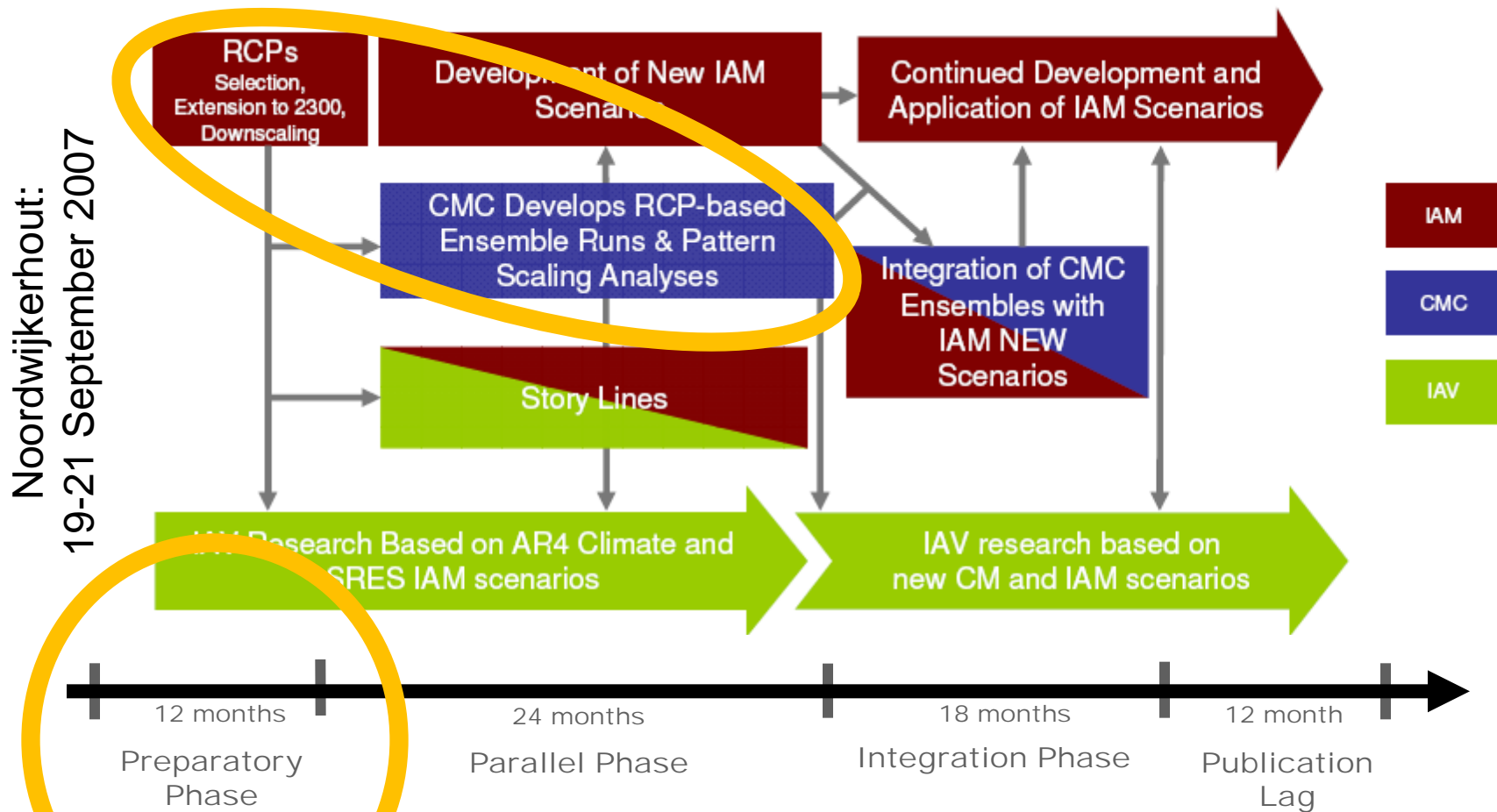
21 September 2011

# A Thread Through the Assessment Process

- ▶ In the IPCC 5<sup>th</sup> Assessment Report there are two sets of scenarios that potentially provide a point of commonality across the research communities.
  - Representative Concentration Pathways (RCPs)
  - Shared Socio-economic-ecological Pathways (SSPs)
- ▶ This presentation will briefly describe those two scenario sets.
- ▶ Note that at this very moment Allison Thomson is presenting more detail on the RCPs in a parallel session. ✓

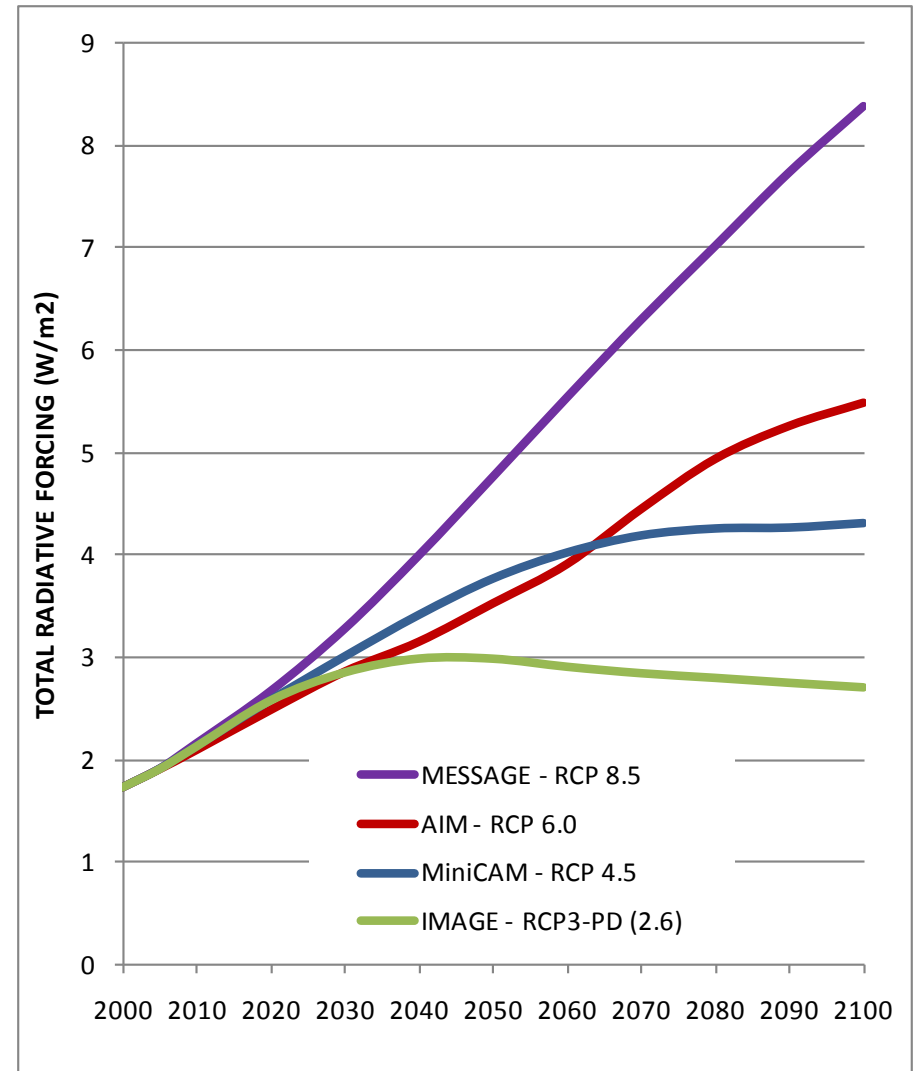
# **NOORDWIJKERHOUT AND THE PREPARATORY PHASE**

# The Noordwijkerhout process: RCPs were developed by the IAM community for the climate modeling community.



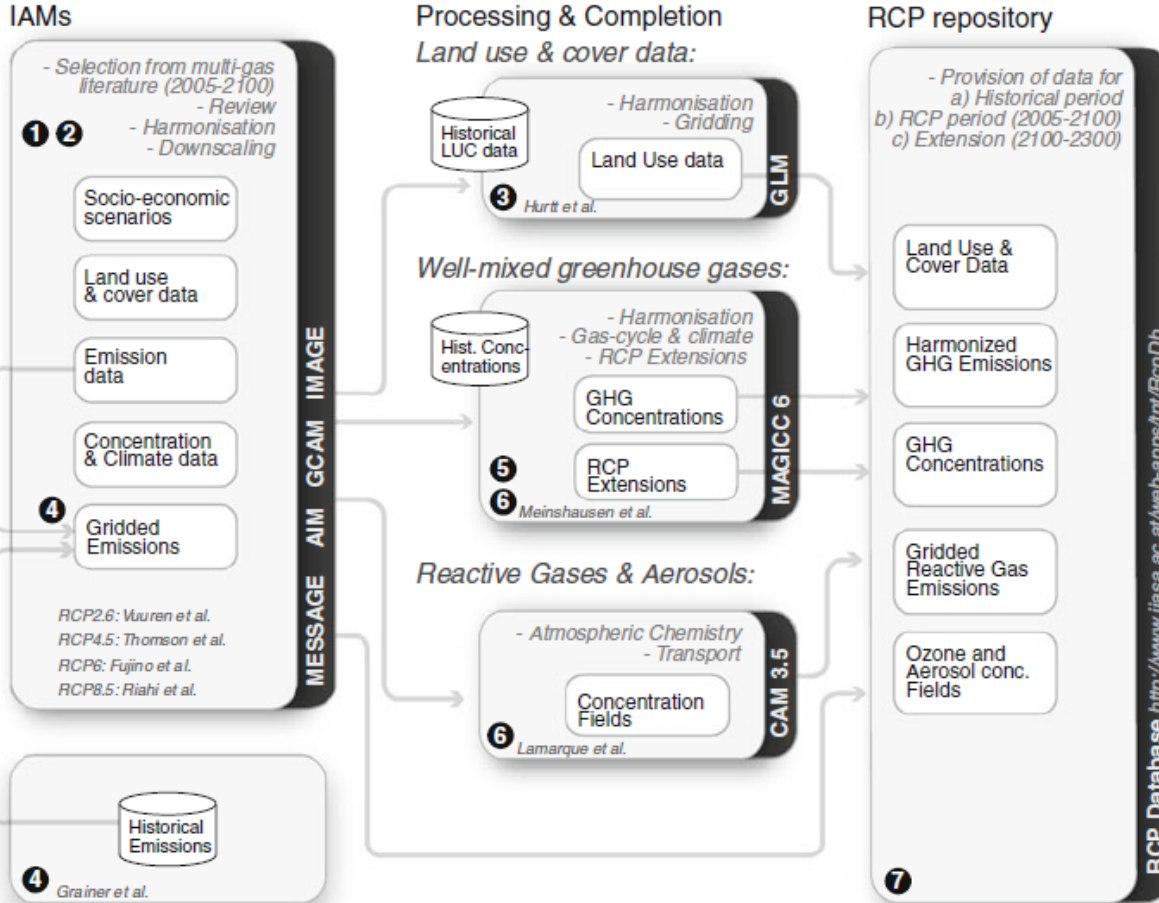
# FOUR RCPs developed by the IAMC to provide emissions scenarios to the climate/Earth system modeling (ESM) community to jumpstart the assessment process.

- **RCP8.5 (IIASA/MESSAGE)**
  - $>8.5 \text{ W/m}^2$  in 2100,
  - Rising
- **RCP6.0 (NIES/AIM)**
  - $\sim 6 \text{ W/m}^2$  at stabilization after 2100
  - Stabilization without exceeding target
- **RCP4.5 (PNNL/MiniCAM)**
  - $\sim 4.5 \text{ W/m}^2$  at stabilization after 2100
  - Stabilization without exceeding target
- **RCP2.6 (PBL/IMAGE)**
  - $<3 \text{ W/m}^2$  in 2100
  - peak & decline stabilization



# What's New

- ½ degree by ½ degree spatial resolution
- Land use and land cover
- Developed by the IA community (NOT the IPCC).



1. Overview (van Vuuren et al.)
2. MESSAGE paper (Riahi et al.)
3. AIM paper (Matsui et al.)
4. GCAM paper (Thomson et al.)
5. IMAGE paper (van Vuuren et al.)
6. Land use paper (Hurtt et al.)
7. Emission inventory (Garnier et al.)
8. Atm. Chem. (Lamarque et al.)
9. GHG conc./extension (Meinshausen et al.)

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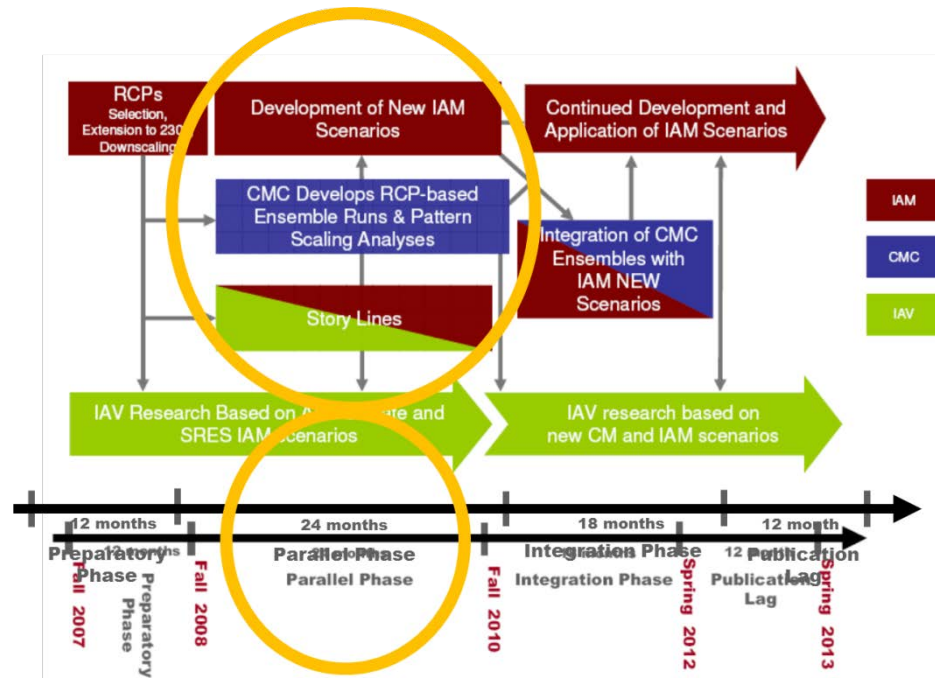


# THE PARALLEL PHASE



# The Scenario Matrix Approach and SSPs—A work in progress

- ▶ The first and most important thing to say is: **THIS IS ALL A WORK IN PROGRESS.**
- ▶ And, if you think you have questions, they pale in comparison to the questions that arise when you actually try to implement these ideas.



# The Parallel Phase

- ▶ The parallel phase of the assessment process defined in Noordwijkerhout calls for the development of new scenarios and storylines useful to the impacts, adaptation and vulnerability community (IAV).
  - Though there will be thousands of other scenarios developed for other reasons.
- ▶ **The two key ideas were:**
  - **Development of new scenarios useful to the IAV community AND**
  - **Capable of providing a link across all 3 research communities.**

# The Framework Document

- ▶ This architecture is incorporated in something called the **Framework Document**, that is open for general review.



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# **A NEW SCENARIO ARCHITECTURE**

# The New Scenario Matrix Architecture: Two Components

- ▶ **The Scenario Matrix:** Reference Scenarios and Mitigation
- ▶ **Mitigation and Adaptation Space:** Reference Scenarios—adaptive versus mitigative challenges



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# The New Scenario Matrix Architecture

- ▶ The Matrix: Reference Scenarios and Mitigation
  - There are many variations on this theme, but all have the following character.
  - Reference scenarios are described by a set of characteristics that are referred to as SSPs.

		SSP 1	SSP 2	SSP 3	SSP4	SSP5
	Reference	X	X	X	X	X
Replication RCP	8.5 Wm <sup>-2</sup>				X	X
	6.0 Wm <sup>-2</sup>		X	X	X	X
	4.5 Wm <sup>-2</sup>	X	X	X	X	X
	2.6 Wm <sup>-2</sup>	X	X	X		X

- Note that some combinations may not exist.

# SSPs

- ▶ **SSPs are Shared Socioeconomic Pathways**
- ▶ **The SSPs:** Assumptions about the state of global and regional society and ecosystems as they evolve over the course of the 21<sup>st</sup> century **defined in terms of their reference scenario values.**

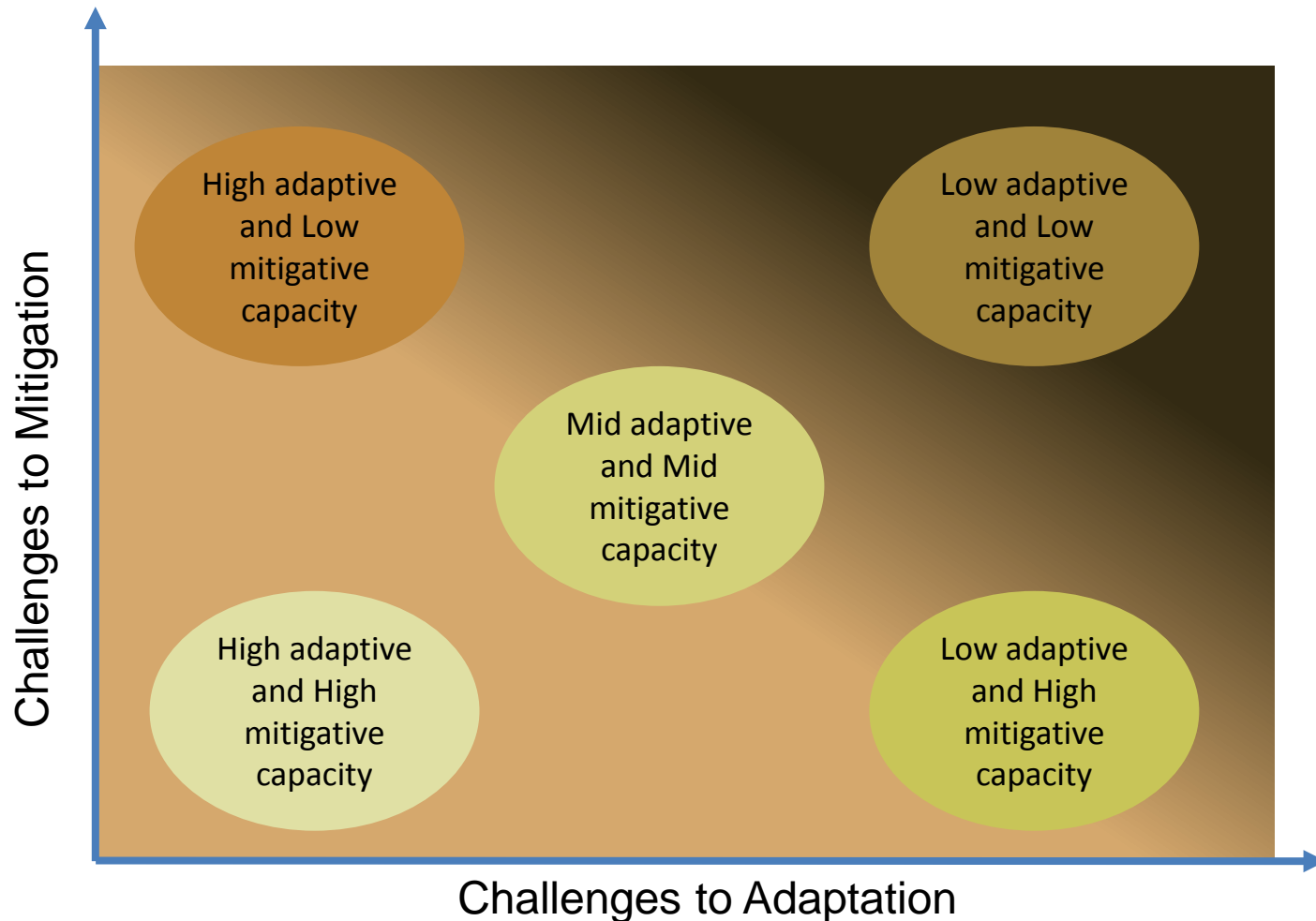


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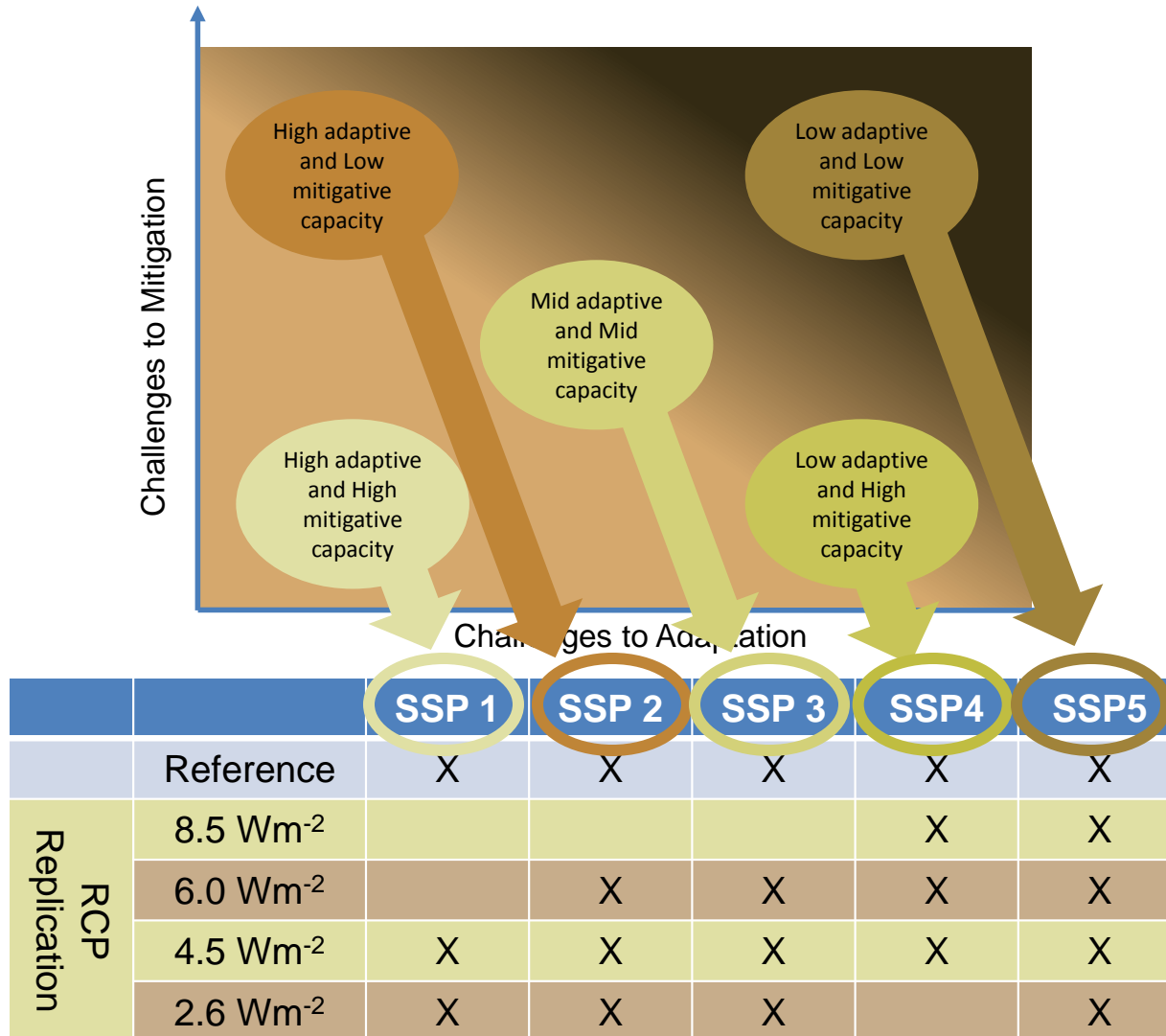
# The Mitigation and Adaptation Space

- ▶ Reference Scenarios' Mitigative and Adaptive Challenges.





# Mapping From the Mitigation and Adaptation Space to the Matrix



# Implementation of the new SSPs

- ▶ Several groups have tried begun experiments on the development of a set of SSPs.
- ▶ Major question: *How do you measure challenges to mitigation and challenges to adaptation?*



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# Through Basic and Extended: Timing and Products

- ▶ Desire for the first scenarios early in 2012—“Basic”
- ▶ Continued work to add details—“Extended”



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# The SMA/SSP Workshop was held in Changwon City, Korea July 16 & 17

- ▶ *The goal of this workshop was to bring together researcher, who are exploring specific options for implementation of the SMA/SSP concepts, and to exchange information and results from their exploratory research, both positive and negative.*
- ▶ No decisions were taken—it was a “Show-and-Tell”.
- ▶ Feeds into a longer-term process still under development.
  - **Laxenburg, Austria—the IAMC meeting October 6-7 (update on progress).**
  - **NCAR SMA/SSP meeting November 3-4.**



# DISCUSSION



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