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SSPs: A new framework for future scenario development

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Content

1. History and framework for SSPs
2. Organisation, current status and narratives
3. Quantification (Keywan)

Motivation



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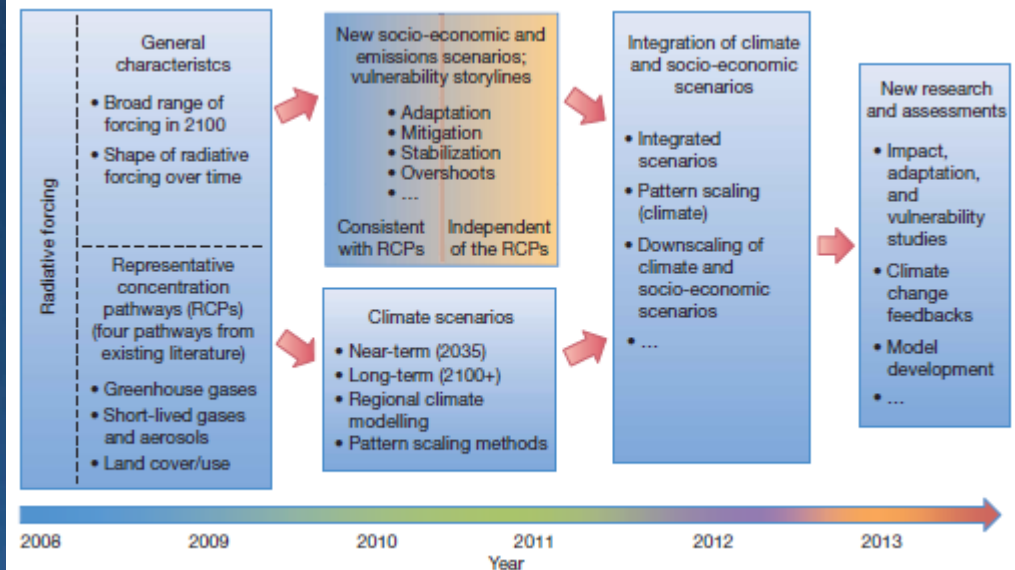
- Noordwijkerhout Parallel Process sought a way to craft NEW storylines & scenarios that could link research products across all three of the climate research communities.

TOWARDS NEW SCENARIOS FOR ANALYSIS OF EMISSIONS, CLIMATE CHANGE, IMPACTS, AND RESPONSE STRATEGIES

TOWARDS NEW SCENARIOS FOR ANALYSIS OF EMISSIONS, CLIMATE CHANGE, IMPACTS, AND RESPONSE STRATEGIES

IPCC EXPERT MEETING REPORT
19–21 September, 2007
Noordwijkerhout, The Netherlands

Intergovernmental Panel on Climate Change

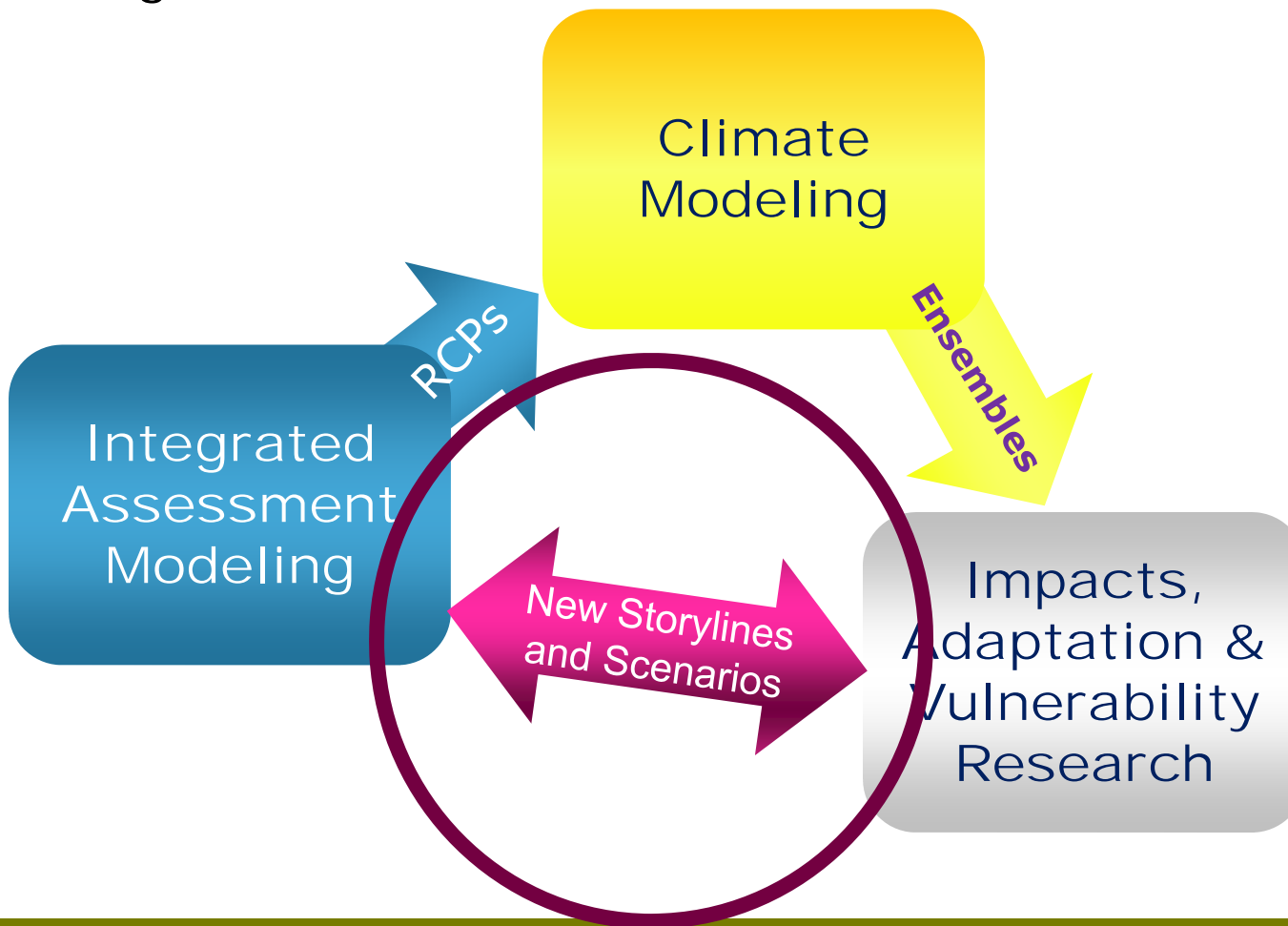


Exchange between communities



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- Better climate assessment; and better assessment in general.
- Adding a new dimension to link IAM, IAV and CM.



History of SSP development



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Feb. 2010: NRC Workshop on Socioeconomic Futures for CC Research

Nov. 2010: IPCC Workshop on Socioeconomic Scenarios, Berlin

Jul. 2011: Meeting on Shared Socioeconomic Pathways, Changwon City

Aug. 2011: Draft Framework Paper posted (review by Oct; currently under revision -> publication)

Oct. 2011: IAMC preliminary intercomparison of SSP storylines and model runs, Laxenburg

Nov. 2011: Workshop on Socioeconomic Pathways, Boulder, CO

Dec. 2011: Formation of Joint IAV/IAM committee on SSP development and application (co-chairs Richard Moss and Tom Kram)

Jan. 2012: SSP quantification meeting, Utrecht

May 2012: Meeting on New Socioeconomic Pathways for Climate Change Research, the Hague

The Framework Paper



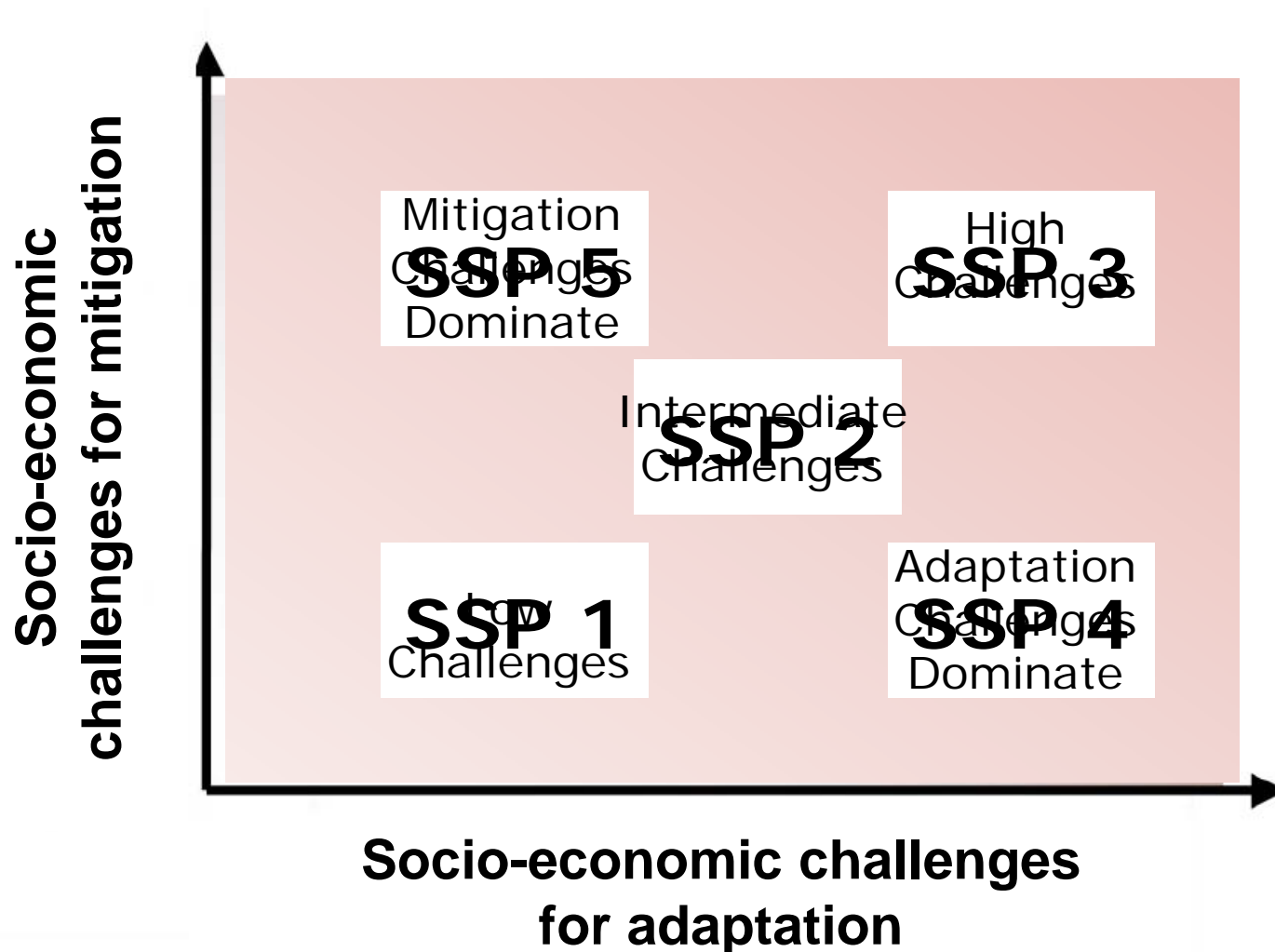
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- **Defines the direction** for new scenario development to explore uncertainty in terms of:
 - **SOCIOECONOMIC CHALLENGES TO MITIGATION; and:**
 - **SOCIOECONOMIC CHALLENGES TO ADAPTATION**
- **Designs a Linkage** from new (SSP-based) scenarios to the Climate Model community's RCP-based ensembles for new research.
- **Creates an intellectual framework in which to categorize scenarios** along the two lines of uncertainty; to test whether or not SSPs really do produce scenarios of the desired character, and to test the ongoing work.

SSP Logic



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Source: Brian O'Neill, Presentation, "Introduction to the Shared Socio-economic Pathways (SSPs)", the Hague.

SSPs have three elements



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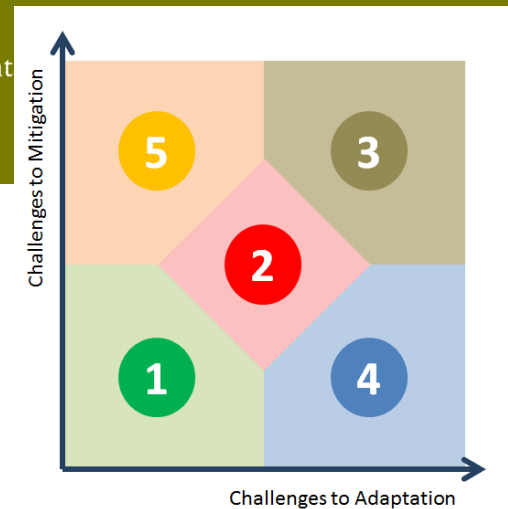
Storyline: a verbal description of the state of the world. All non-quantitative aspects of the scenario are included here

IAM Quantitative Variables

define IAM reference “no-climate-policy” scenario inputs. E.g. reference population, GDP, technology, etc.

Non-IAM Quantitative Variables

define reference “no-climate-policy” scenario, but are not IAM drivers. E.g. governance index or ecosystem productivity and sensitivity.

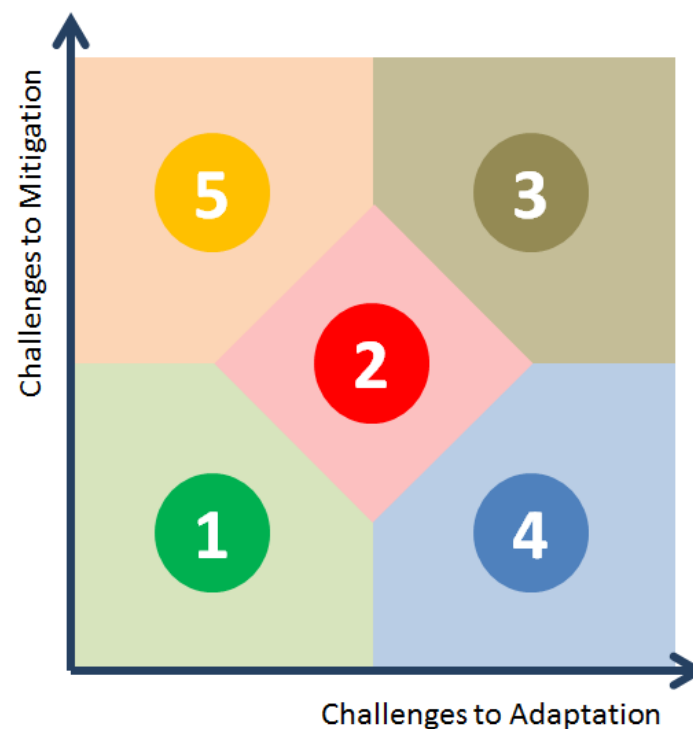


The Sorting Function of the SSP Framework



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- In the AR5 there will be lots of scenarios, and most of them will not be based on new SSPs; the SSP Framework can be useful to us in thinking about how to identify comparable scenarios.
- This could be called the “Sorting Function” of the SSPs
- ANYTHING that has high challenges to mitigation and adaptation belongs in Domain 3.
- *How to define the boundaries between SSPs?*



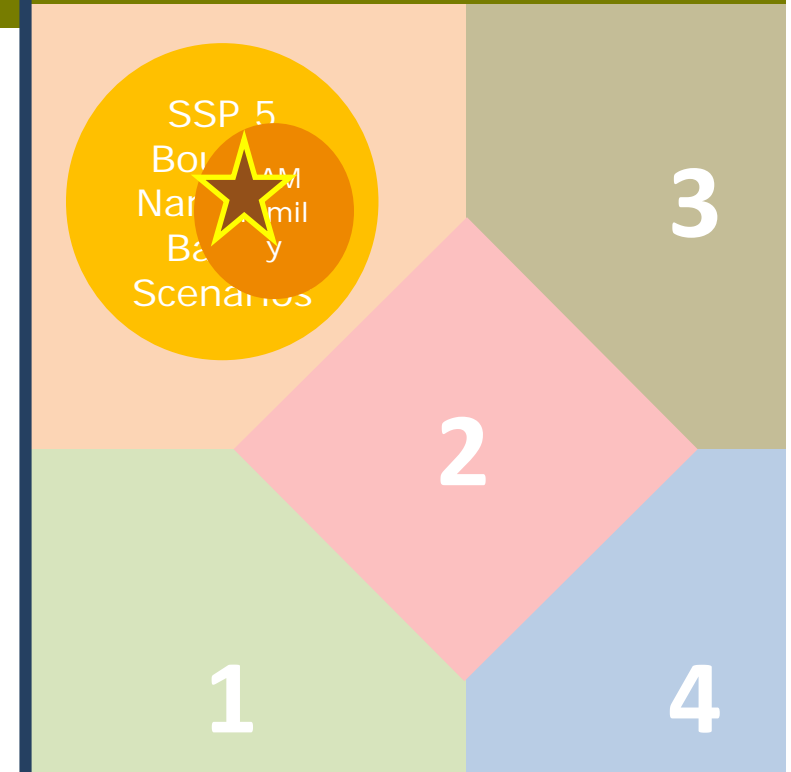
Exactly which SSP5 did you mean? Or, was that SP5?



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- Any scenario with high challenges to mitigation, but low challenges to adaptation, regardless of who or how it was crafted, is an element of the SSP5 Challenge Space, but is an SP, not an SSP.
- Any scenario that was build using the SSP5 **narrative** would be a member of a narrower set in the SSP 5 challenge space.
- Any scenario that used the SSP5 narrative storyline, **and** a common set of **quantitative IAM inputs**, e.g. population, economy would be a member of an even narrower subset of SSP5 challenge space.

Challenges to Mitigation



- We might choose one **Representative/Illustrative Scenario Based on SSP5.**

Testing Our Work



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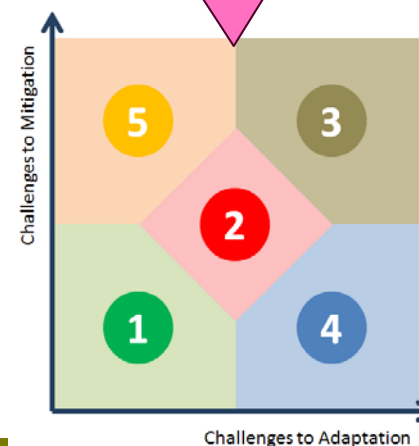
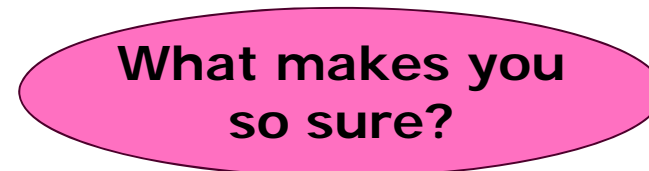
- We will have to combine our SSPs with models to produce scenarios and then produce measures for our challenges to mitigation and adaptation to test whether what we say is an SSP5, does produce scenarios in that portion of challenge space.
- We will need to put units on the challenge space axes!!!!!!



Storyline: The storyline is a verbal description of the state of the world. All non-quantitative aspects of the scenario are included in the storyline.

IAM Quantitative Variables that define IAM reference "no-climate-policy" scenario inputs. E.g. reference scenario population by region by year. GDP, Technology Availability.

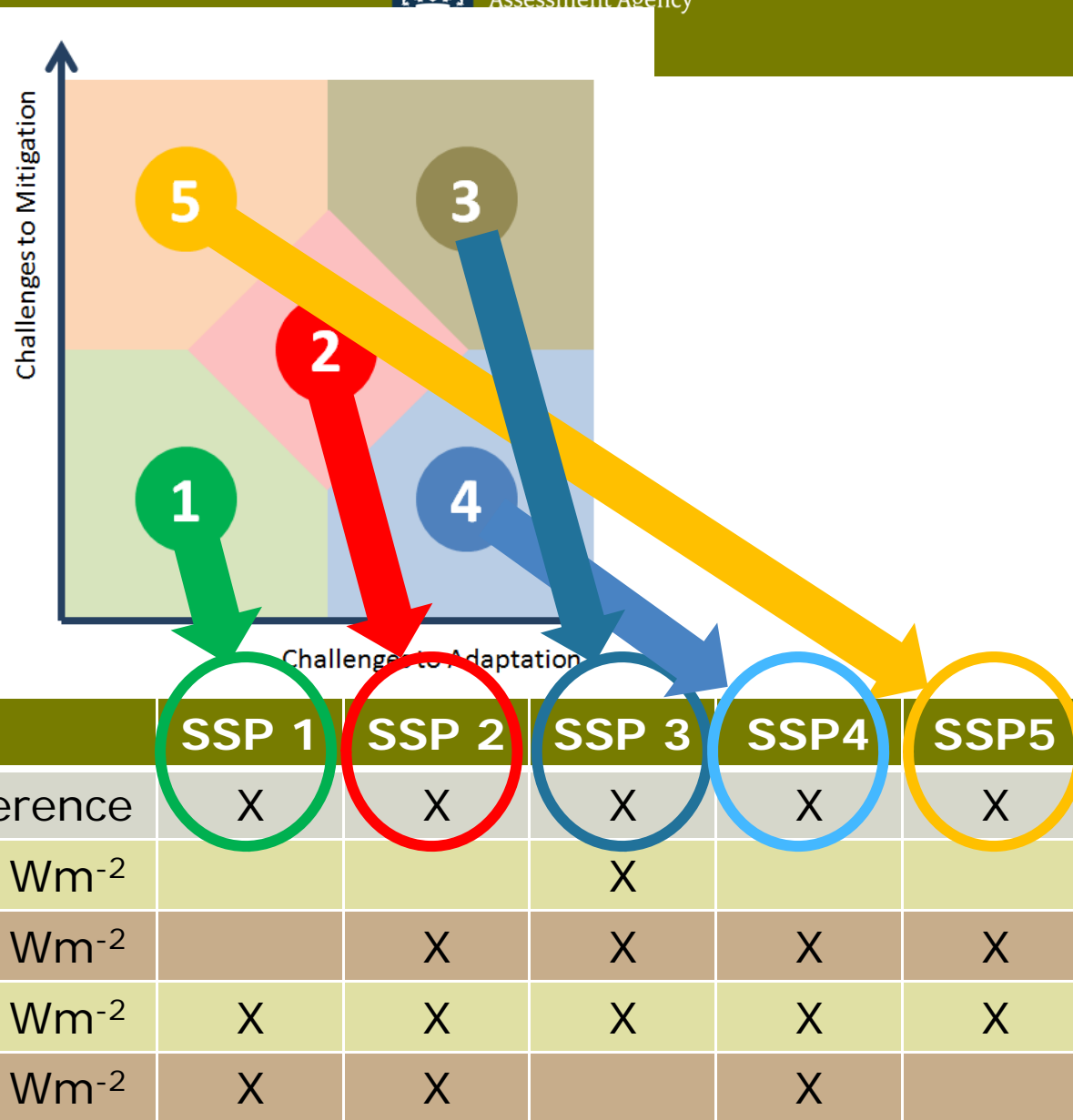
Non-IAM Quantitative Variables that define reference "no-climate-policy" scenario, but which are not IAM drivers. E.g. governance index or ecosystem productivity and sensitivity.



Into the Matrix: SSPs and RCPs



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SPAS

SSP status and plans as of Nov 2012



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Ad-Hoc JIIC to continue co-ordination of SSP development,
work in taskgroups with extended membership:

1. Narratives for SSps
 - > Draft from Boulder Report, open review, response
 - > *Filling gaps, extensions: short term, scales, governance?*
2. IAV-IAM handshake document and research community interactions
 - > Draft document; hand-off and feedback IAMs <-> MIPs
3. IAM quantitative drivers and IAM scenarios for SSPs
 - > Initial set (Pop, GDP, Urbanization) -> open review, response
 - > Tests with IAM models, hand-off to ISI-MIP and AG-MIP
 - > SSP assumptions for IAMs under development & testing; internal review -> open review
 - > *Shorter term points/corridors?*

SSP status and plans as of Nov 2012/cont'd



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4. IAV quantification and metrics
 - > Expanded list of topics/activities, also link with Earth System Governance community

5. Nested scale applications and tools (incl. downscaling methods)
 - > 1st attempt failed, new initiative under way

6. Roadmap for future IAV–IAM collaboration on scenarios
 - > Start document prepared



2. NARRATIVES



SSP 1: Sustainability

Summary: This is a world making relatively good progress towards sustainability, with sustained efforts to achieve development goals, while reducing resource intensity and fossil fuel dependency. Elements that contribute to this are a rapid development of low-income countries, a reduction of inequality (globally and within economies), rapid technology development, and a high level of awareness regarding environmental degradation. Rapid economic growth in low-income countries reduces the number of people below the poverty line. The world is characterized by an open, globalized economy, with relatively rapid technological change directed toward environmentally friendly processes, including clean energy technologies and yield-enhancing technologies for land. Consumption is oriented towards low material growth and energy intensity, with a relatively low level of consumption of animal products. Investments in high levels of education coincide with low population growth. Concurrently, governance and institutions facilitate achieving development goals and problem solving. The Millennium Development Goals are achieved within the next decade or two, resulting in educated populations with access to safe water, improved sanitation and medical care. Other factors that reduce vulnerability to climate and other global changes include, for example, the successful implementation of stringent policies to control air pollutants and rapid shifts toward universal access to clean and modern energy in the developing world.



SSP 2: Middle of the Road (or Dynamics as Usual, or Current Trends Continue, or Continuation, or Muddling Through)

Summary: In this world, trends typical of recent decades continue, with some progress towards achieving development goals, reductions in resource and energy intensity at historic rates, and slowly decreasing fossil fuel dependency.

Development of low-income countries proceeds unevenly, with some countries making relatively good progress while others are left behind. Most economies are politically stable with partially functioning and globally connected markets. A limited number of comparatively weak global institutions exist. Per-capita income levels grow at a medium pace on the global average, with slowly converging income levels between developing and industrialized countries. Intra-regional income distributions improve slightly with increasing national income, but disparities remain high in some regions. Educational investments are not high enough to rapidly slow population growth, particularly in low-income countries. Achievement of the Millennium Development Goals is delayed by several decades, leaving populations without access to safe water, improved sanitation, medical care. Similarly, there is only intermediate success in addressing air pollution or improving energy access for the poor as well as other factors that reduce vulnerability to climate and other global changes.



SSP 3: Fragmentation (or Fragmented World)

Summary: The world is separated into regions characterized by extreme poverty, pockets of moderate wealth and a bulk of countries that struggle to maintain living standards for a strongly growing population. Regional blocks of countries have re-emerged with little coordination between them. This is a world failing to achieve global development goals, and with little progress in reducing resource intensity, fossil fuel dependency, or addressing local environmental concerns such as air pollution. Countries focus on achieving energy and food security goals within their own region. The world has de-globalized, and international trade, including energy resource and agricultural markets, is severely restricted. Little international cooperation and low investments in technology development and education slow down economic growth in high-, middle-, and low-income regions..... Governance and institutions show weakness and a lack of cooperation and consensus; effective leadership and capacities for problem solving are lacking. Investments in human capital are low and inequality is high. A regionalized world leads to reduced trade flows, and institutional development is unfavorable, leaving large numbers of people vulnerable to climate change and many parts of the world with low adaptive capacity. Policies are oriented towards security, including barriers to trade.



SSP 4: Inequality (or Unequal World, or Divided World)

Summary: This pathway envisions a highly unequal world both within and across countries. A relatively small, rich global elite is responsible for much of the emissions, while a larger, poorer group contributes little to emissions and is vulnerable to impacts of climate change, in industrialized as well as in developing countries. In this world, global energy corporations use investments in R&D as hedging strategy against potential resource scarcity or climate policy, developing (and applying) low-cost alternative technologies. Mitigation challenges are therefore low due to some combination of low reference emissions and/or high latent capacity to mitigate. Governance and globalization are effective for and controlled by the elite, but are ineffective for most of the population. Challenges to adaptation are high due to relatively low income and low human capital among the poorer population, and ineffective institutions.



SSP 5: Conventional Development (or Conventional Development First)

Summary: This world stresses conventional development oriented toward economic growth as the solution to social and economic problems through the pursuit of enlightened self interest. The preference for rapid conventional development leads to an energy system dominated by fossil fuels, resulting in high GHG emissions and challenges to mitigation. Lower socio-environmental challenges to adaptation result from attainment of human development goals, robust economic growth, highly engineered infrastructure with redundancy to minimize disruptions from extreme events, and highly managed ecosystems



3. Quantification (over to Keywan)

Info on the JIIC: <http://www.isp.ucar.edu/joint-iav-iam-committee>

Draft Framework paper:

www.isp.ucar.edu/sites/default/files/Scenario_FrameworkPaper_15aug11_0.pdf

Narratives: <https://www.isp.ucar.edu/narratives-ssps-working-group>

SSP quantification: <https://secure.iiasa.ac.at/web-apps/ene/SspDb/>