



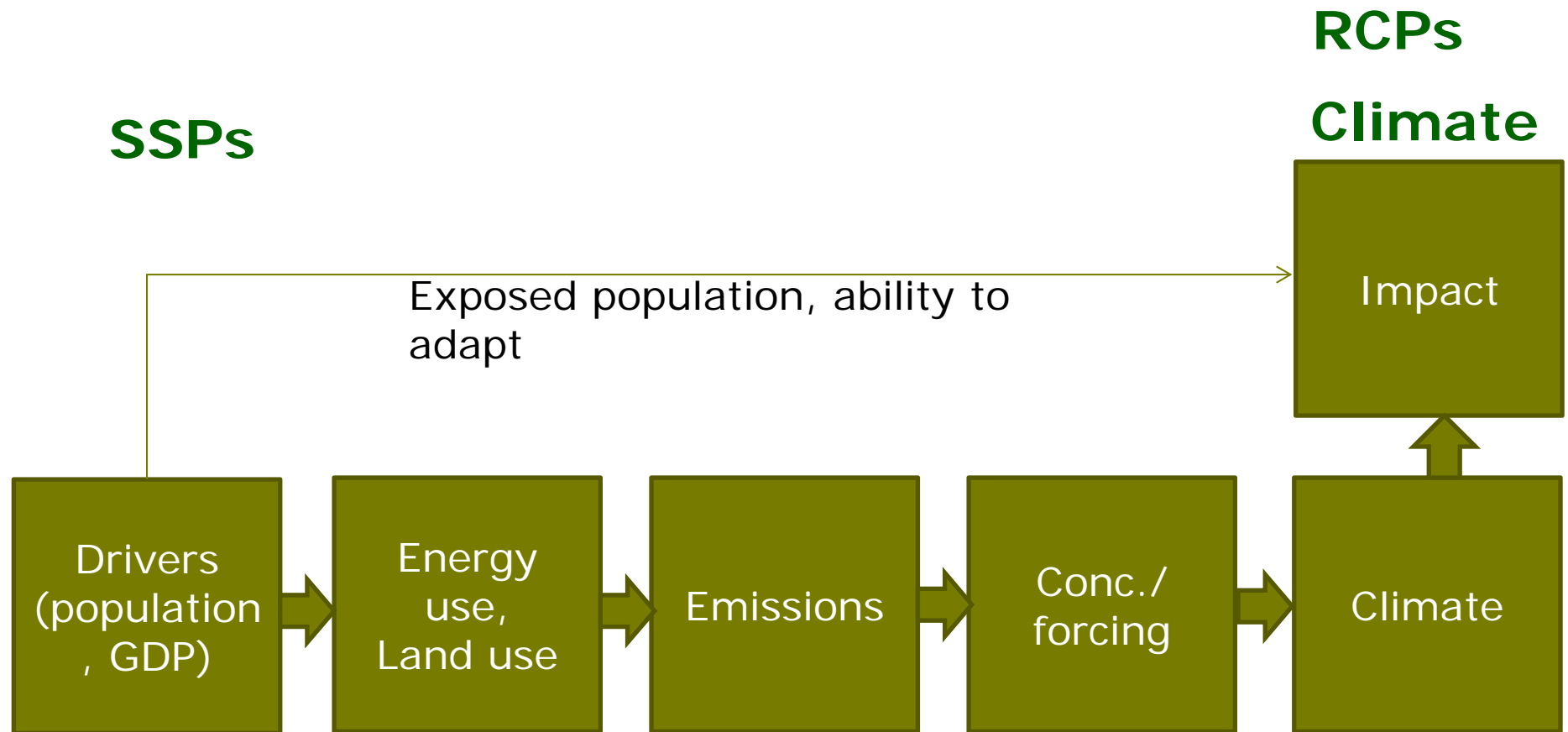
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## SSP/RCP-based scenarios: Implementation

Detlef van Vuuren

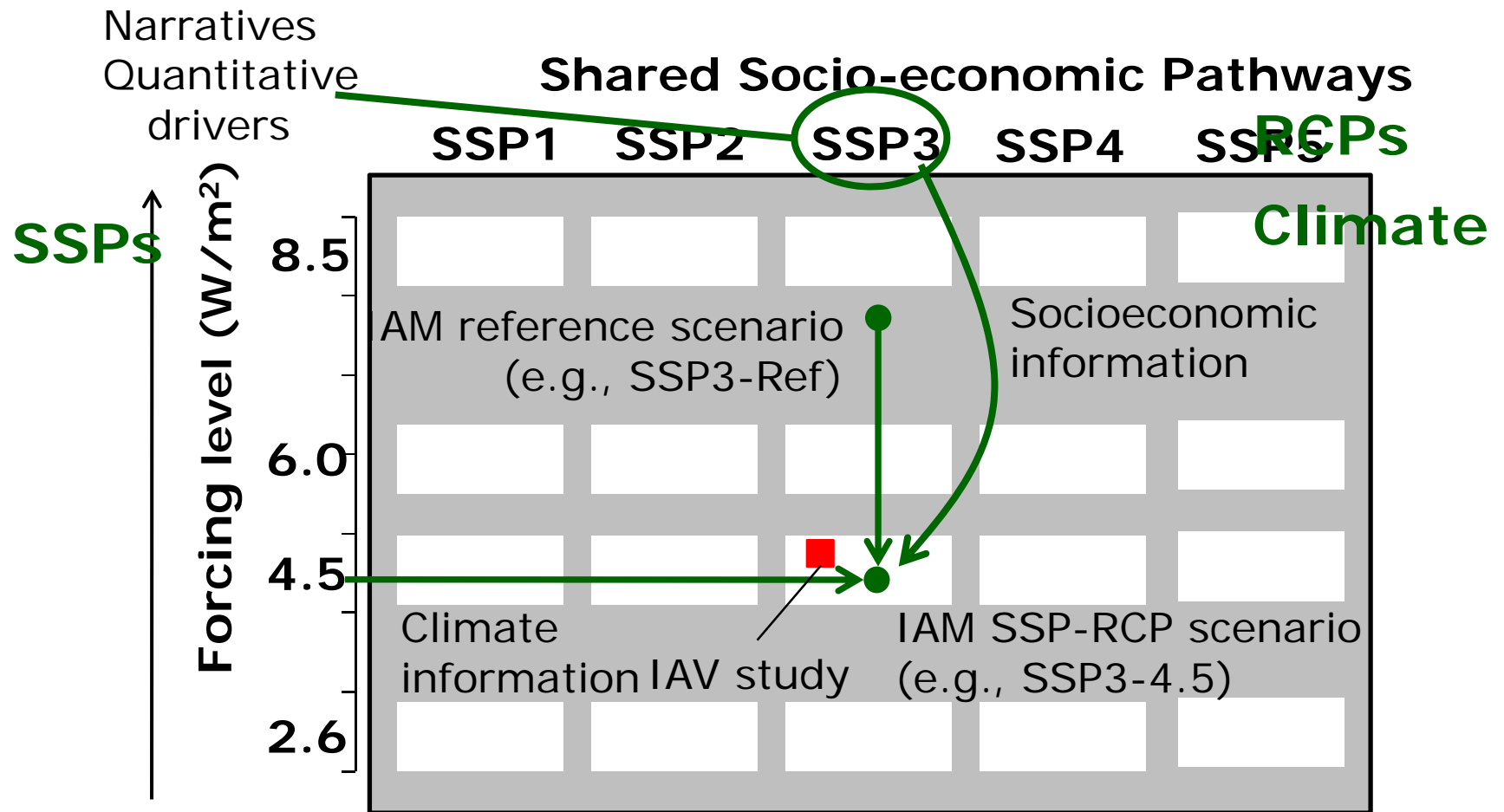


# Starting point: Causal chain





# The Scenario Matrix Architecture





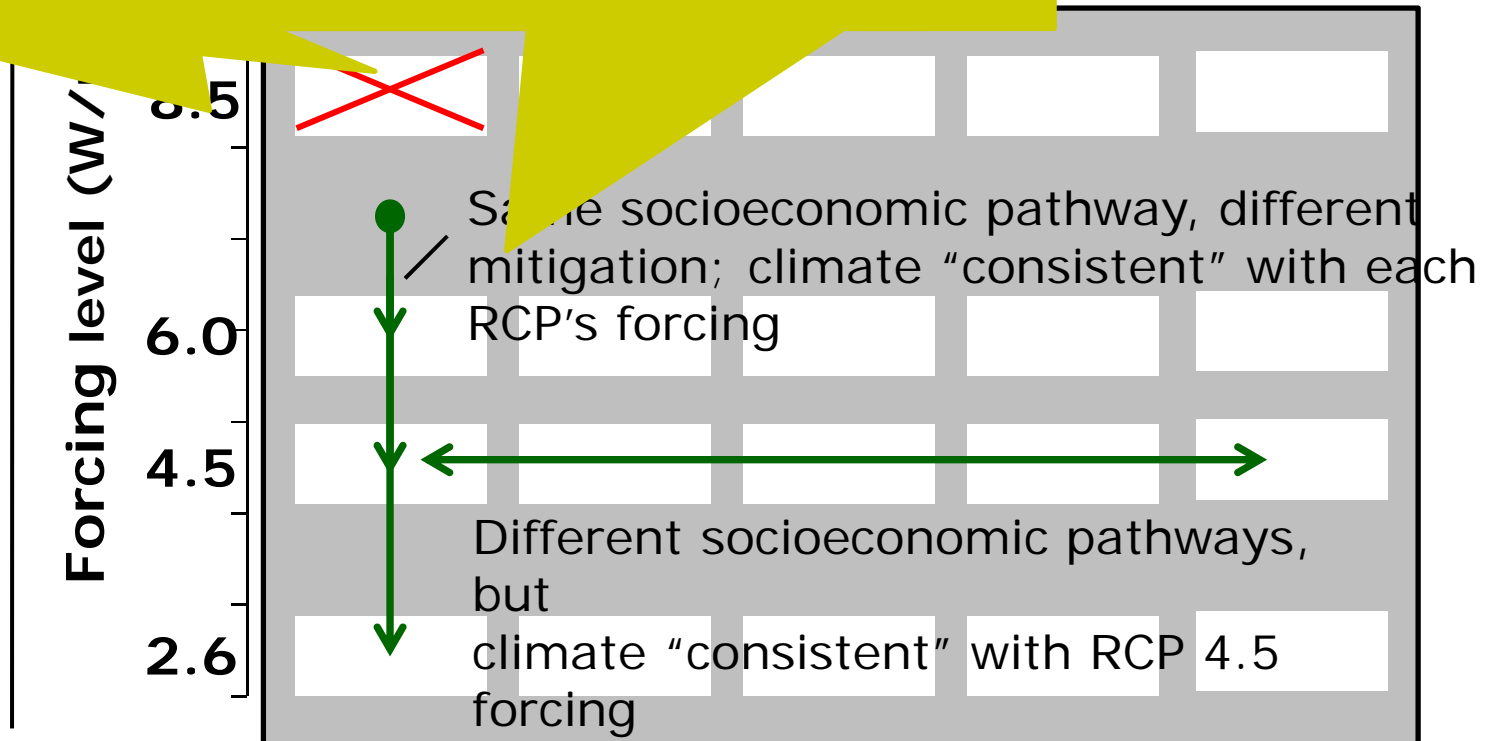
# The Scenario Matrix Architecture

SPA = description of mitigation (to move down a column) and adaptation policies (to deal with climate policy)

Socioeconomic Pathways

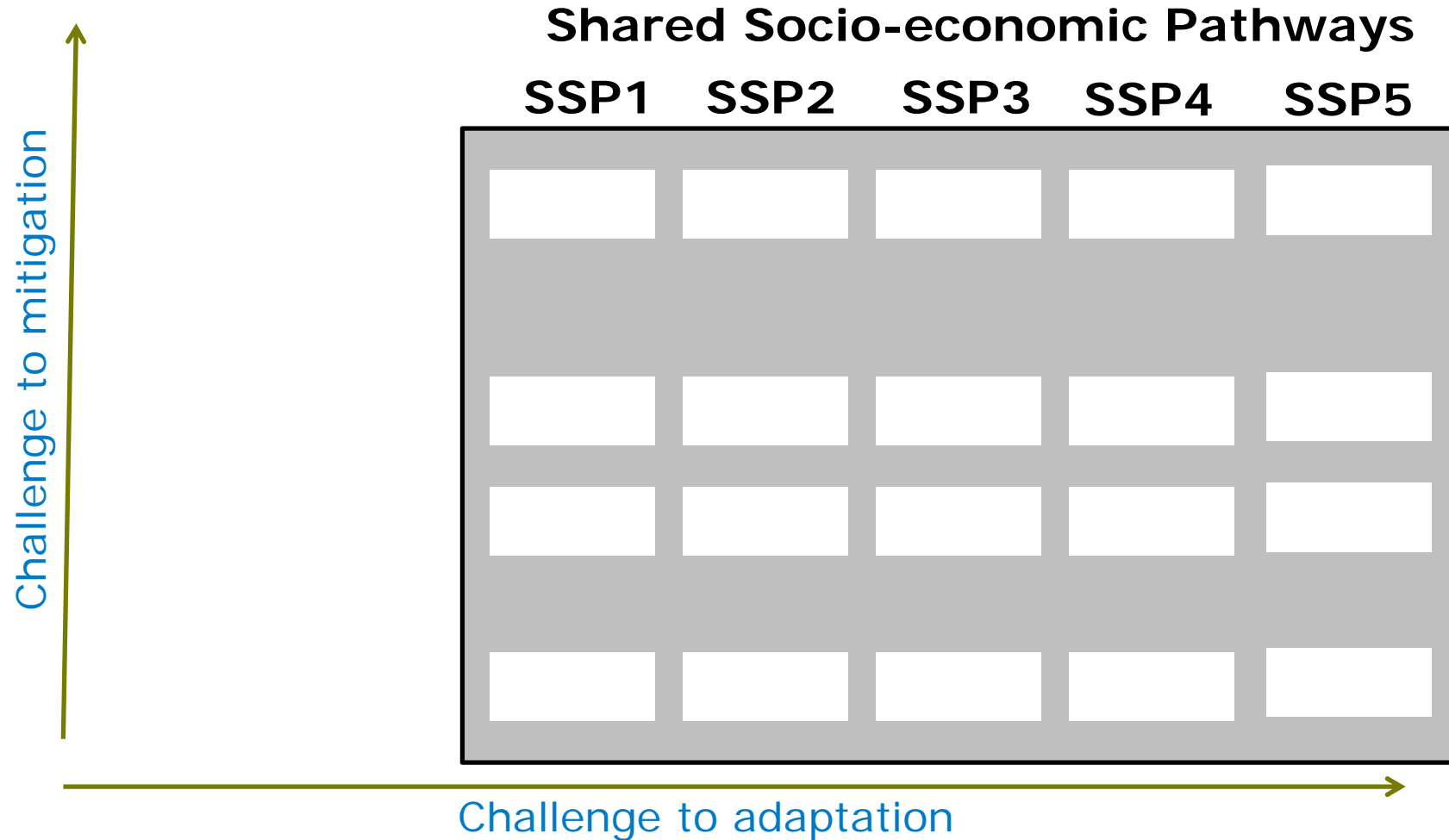
RCP4

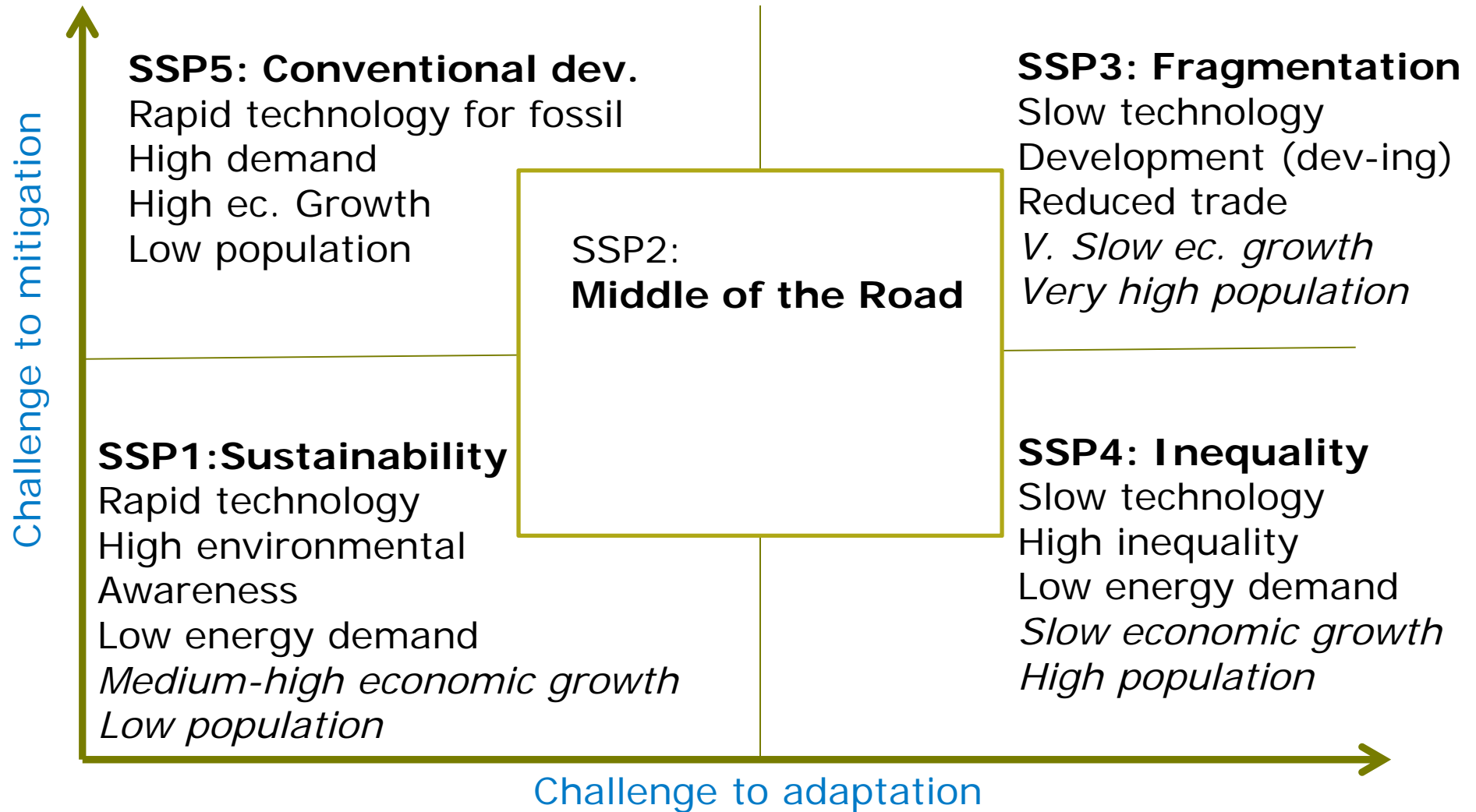
SSP5





# The Scenario Matrix Architecture





# Key SSP elements (three main products + IAV variables)

SSP Storylines **1**



**Iterative Process**

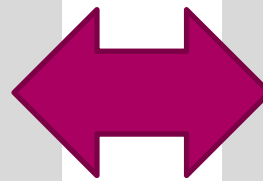


Quantitative drivers **2**

**Population**  
(age, sex,  
mortality, fertility,  
education)

**Urbanization**  
(national)

**Economic  
development**  
(regional/national)



IAM Scenarios **3**

**Energy**  
(technology,  
resources, etc)

**Emissions**  
(forcing,  
temperature)

**Land-use**  
(productivity,  
diets, etc)

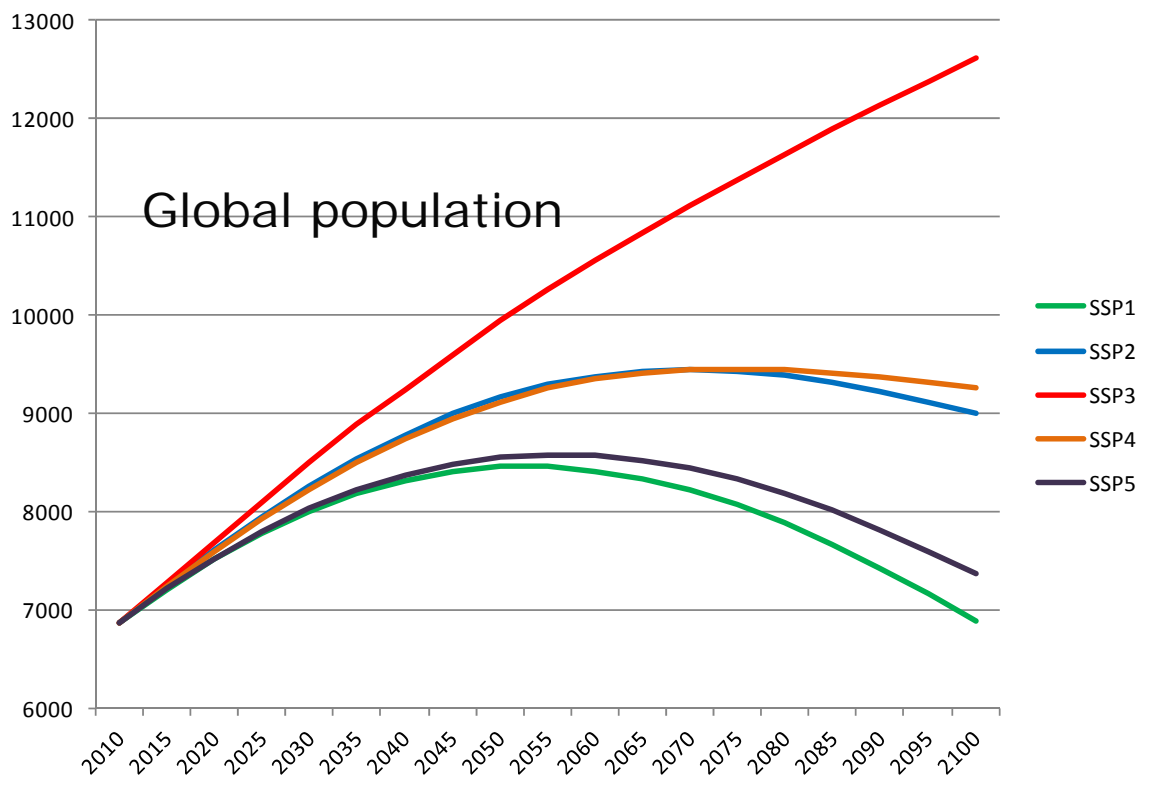
# Qualitative / quantitative (population)

Variable	SSP5	SSP3	SSP2	SSP1
Fertility	D: low I: High	D: high I: low	D: Med I: Med	D: Low I: medium
Mortality	D: low I: low	D: high I: high	D: Med I: Med	D: Low I: Low
Migration	high	low	Medium	High

High economic growth and education of women leads to drop of fertility

High economic growth and investment into health services leads to drop of mortality

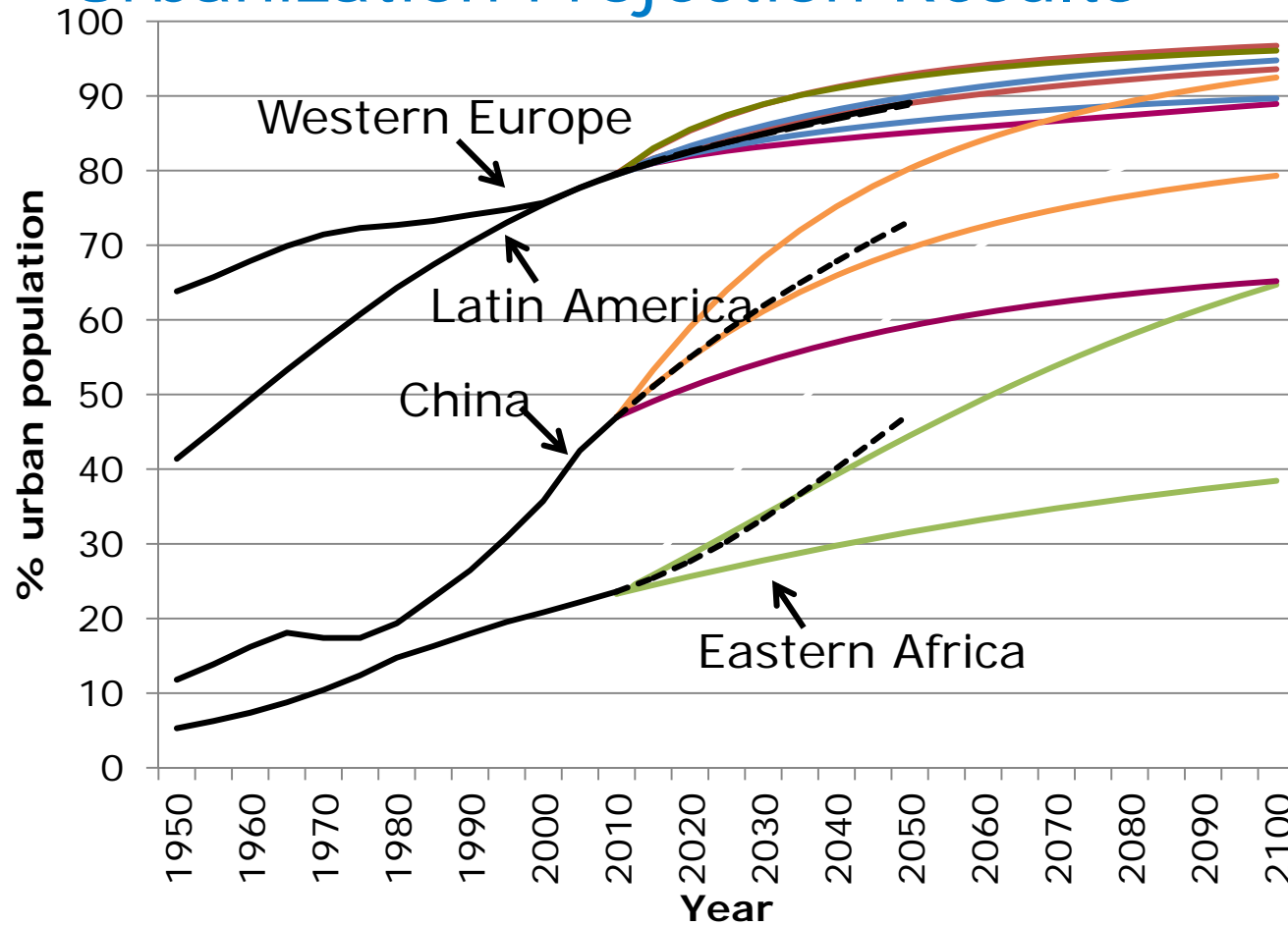
Globalised world has high migration rates



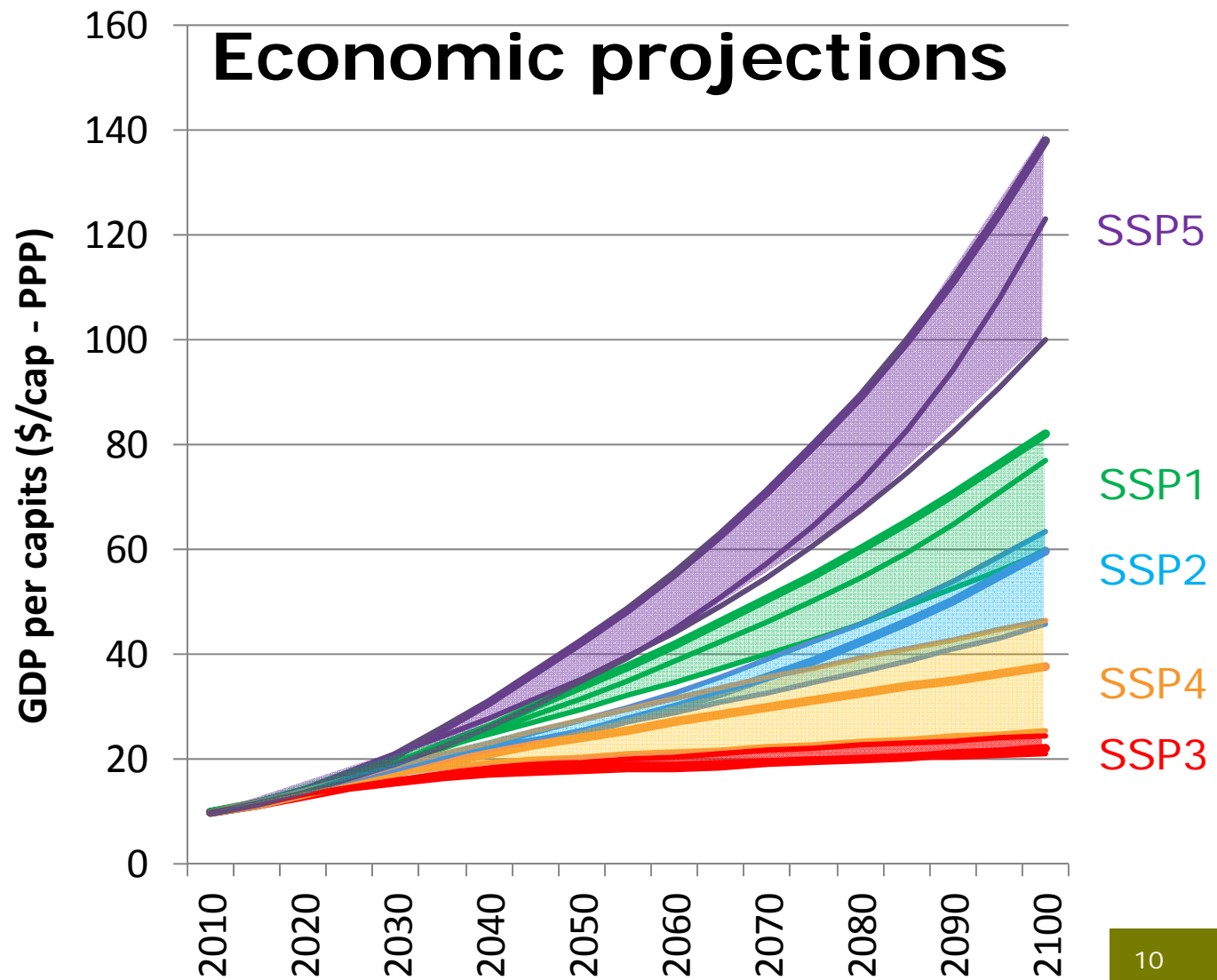




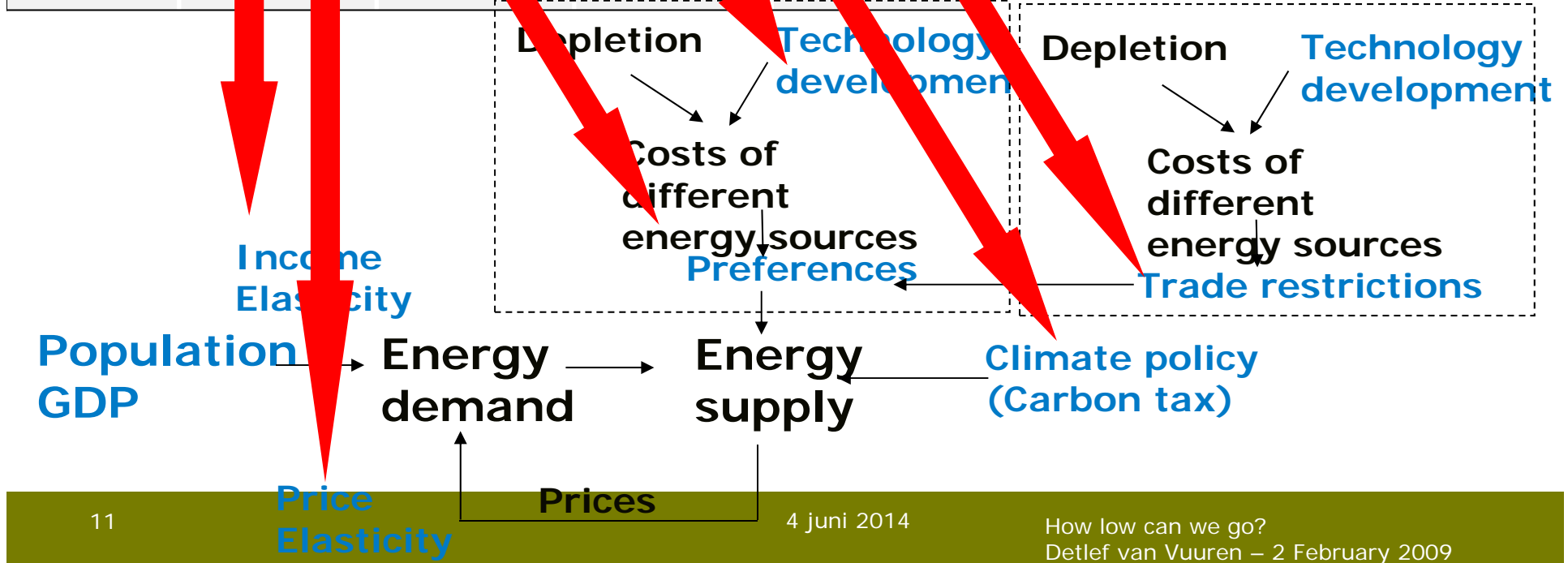
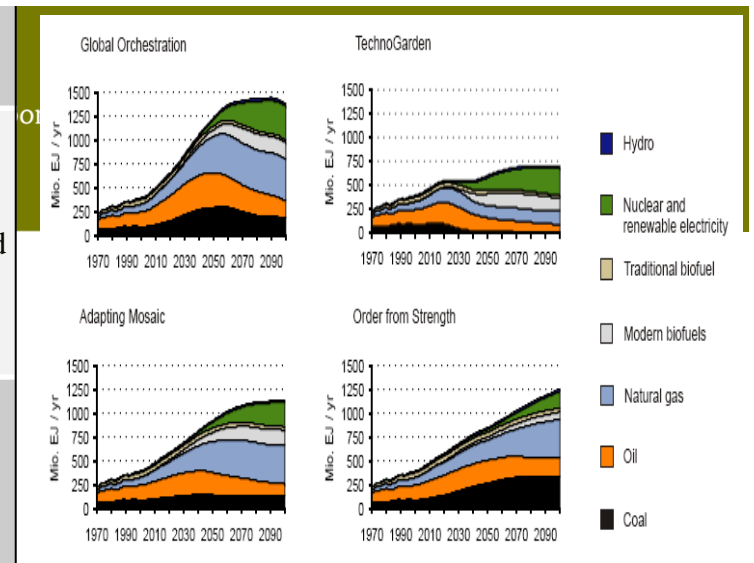
## Urbanization Projection Results



SSP 1	Fast
SSP 2	Central
SSP 3	Slow
SSP 4	Fast/Central
SSP 5	Fast



	Global Orchestration	Order from Strength	Adapting Mosaic	TechnoGarden
<b>Energy demand</b>	lifestyle assumptions and energy efficiency investments based on current North American values	regionalized assumptions	regionalized assumptions	lifestyle assumptions and energy efficiency investments based on current Japan and West European values
<b>Energy supply</b>	market liberalization, selective east-west options, rapid technology change	focus on domestic energy resources	some preference for clean energy resources	preference for renewable energy resources and rapid technology change
<b>Climate policy</b>	No	no	no	yes,

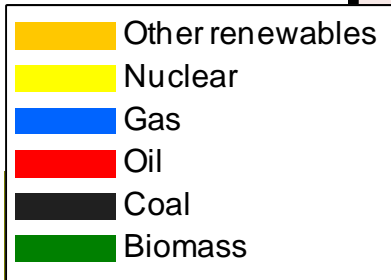
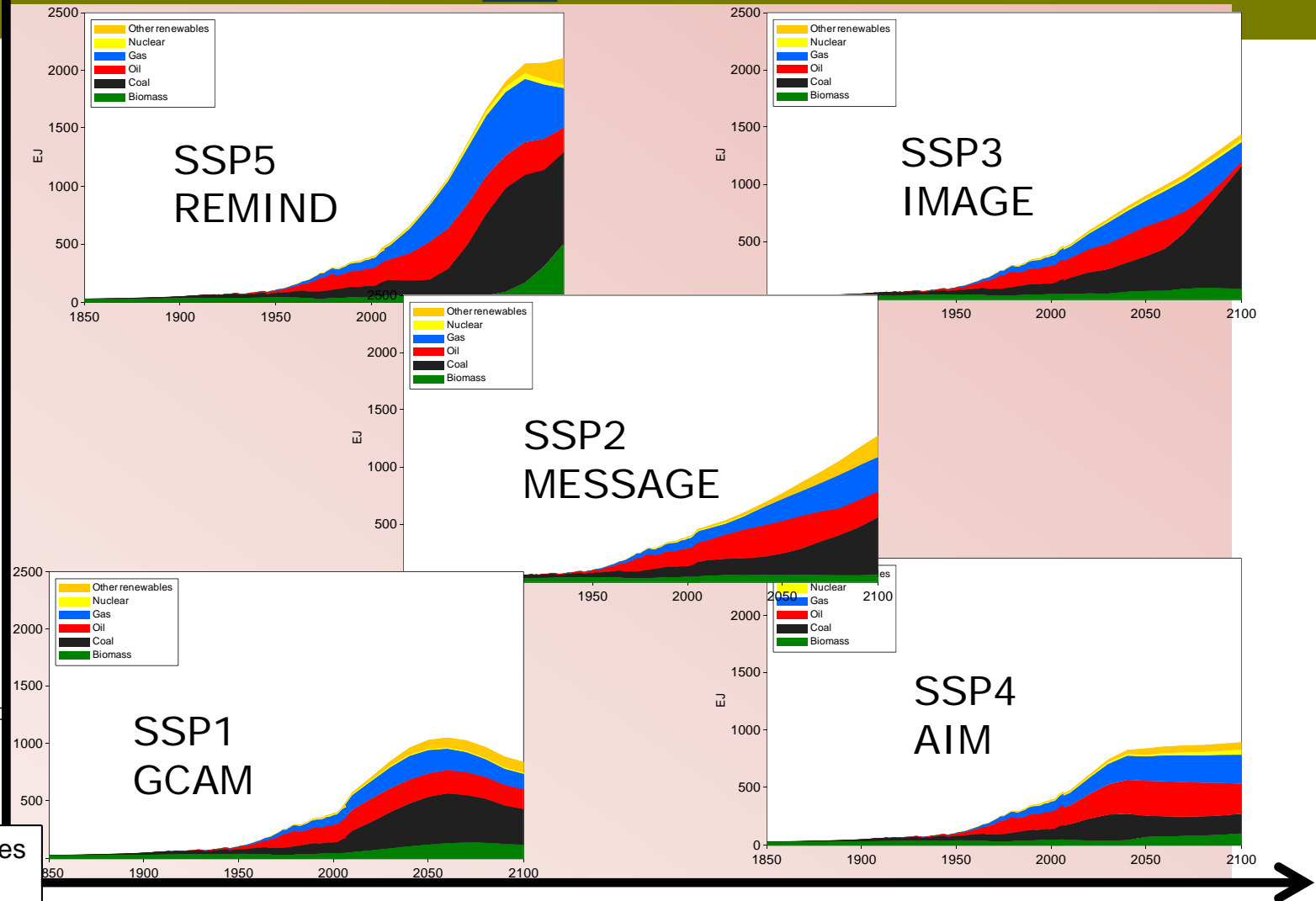


# Primary Energy

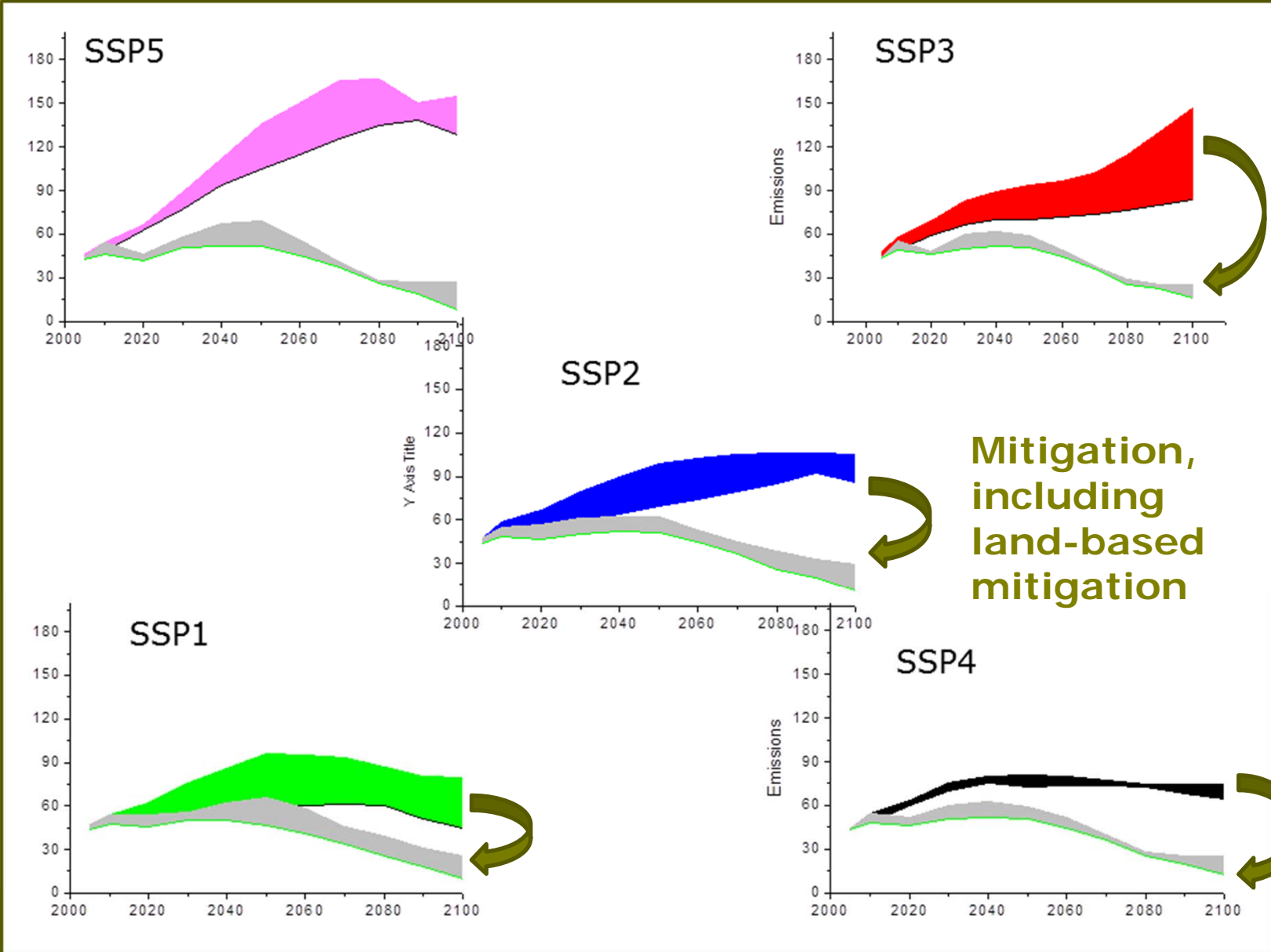


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Socio-economic challenges for mitigation

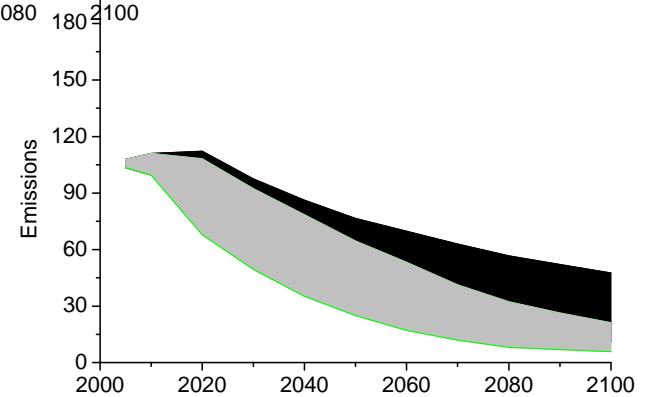
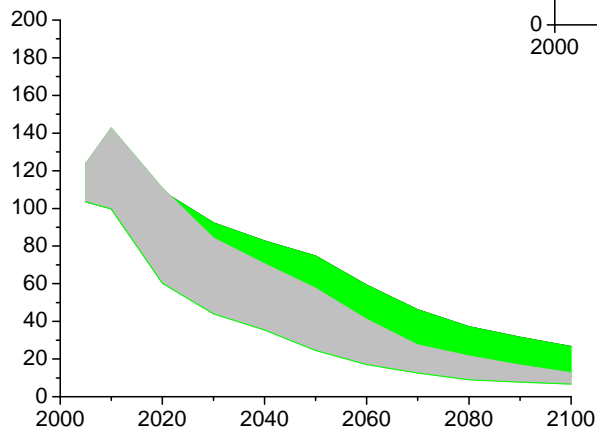
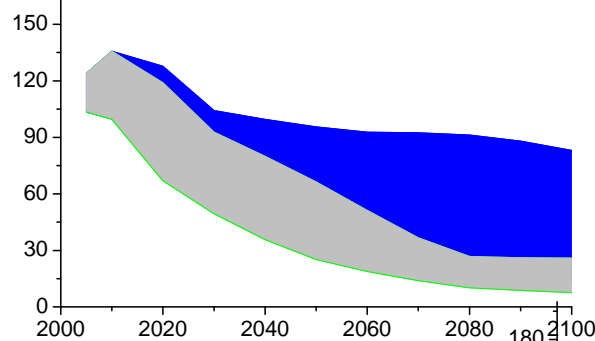
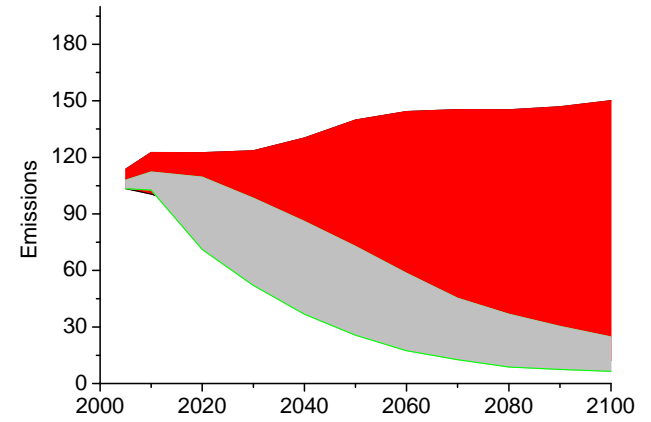
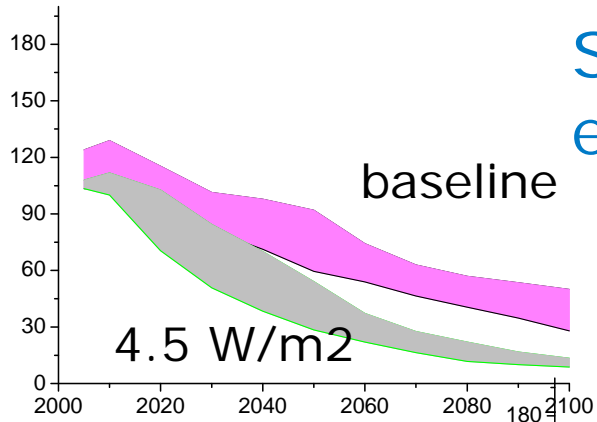


Socio-economic challenges for adaptation



# Sulphur emissions

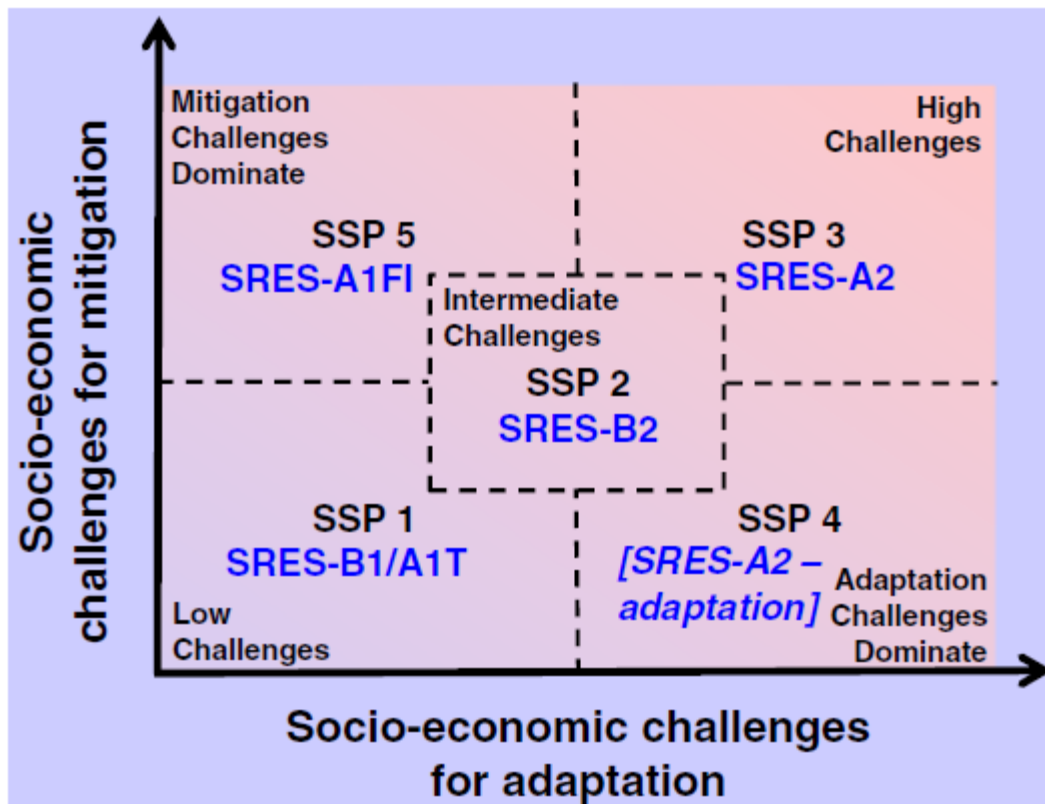
Challenge to mitigation



Challenge to adaptation



## Reconciling the old and the new:



Van Vuuren, Carter, 2014



**Table 1** Key assumptions and approximate mappings of archetypal scenario “families” (van Vuuren et al. 2012a)

Archetype	Global sustainable development	Business as usual	Regional competition	Economic optimism	Reformed markets	Regional sustainability
SSP mapping	<b>SSP1</b>	<b>SSP2</b>	<b>SSP3/SSP4</b>	<b>SSP5</b>		
Economic development	Ranging from slow to rapid	Medium	Slow	Very rapid	Rapid	Medium
Population growth	Low	Medium	High	Low	Low	Medium
Technology development	Ranging from medium to rapid	Medium	Slow	Rapid	Rapid	Ranging from slow to rapid
Main objectives	Global sustainability	Not defined	Security	Economic growth	Various goals	Local sustainability
Environmental protection	Proactive	Both reactive and proactive	Reactive	Reactive	Both reactive and proactive	Proactive
Trade	Globalisation	Weak globalisation	Trade barriers	Globalisation	Globalisation	Trade barriers
Policies and institutions	Strong global governance	Mixed	Strong national governments	Policies create open markets	Policies target market failures	Local actors
Vulnerability to climate change	Low	Medium	Mixed – varies regionally	Medium-high	Low	Low
Other mappings:						
SRES	B1 (A1T)	B2 <sup>(a)</sup>	A2	A1FI		B2 <sup>(a)</sup>
GEO3/GEO4	Sustainability First		Security First	Markets First	Policy First	
Global Scenario Group	New Sustainability Paradigm		Barbarisation	Conventional World	Policy Reform	Eco-communalism
Millennium Assessment	Technogarden		Order from Strength		Global Orchestration	Adapting Mosaic

<sup>a</sup> The B2 storyline emphasized a focus on environmental and social issues from a regional perspective; in the quantitative elaboration, however, the choice was made to use medium projections for all relevant variables. Therefore, the B2 scenario is listed here in two columns. *Note: This table summarises key assumptions in very general terms. Where differences within a set of scenario families exist, broad ranges are indicated. For references to scenario exercises, see text*





## Process of the quantification group

- GDP and population data : finished March 2013 (IIASA, OECD, PIK)
- IAM teams elaborating scenarios (IIASA, PIK, PBL, GCAM, NIES, FEEM....). June/July 2014: final submission
- Special Issue on SSPs in GEC (storylines, GDP, population, IAMs)
- From Summer 2014: Data available for impact/mitigation studies
- Summer 2014?: Decisions on use of scenarios in CMIP6



## Conclusions

- SSPs: combination of storylines and initial, global, quantification
- Storylines can be the basis of downscaling / use outside original domain:
  - SSP1: Sustainable dev. world (env. tech, good governance, low population, wealthy, social/env goals important)
  - SSP2: Medium
  - SSP3: Fragmented world (regional competition, low tech., little trade, poor)
  - SSP4: Fragmentation in regions (strong rich/poor divide, poor on average)
  - SSP5: High economic growth (strong technology, fossil fuel driven, consumption, human development)



# SSP database:

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

SSP Database - Windows Internet Explorer

https://secure.iiasa.ac.at/web-apps/ene

RIAHI Keywan - Outlook Web A... SSP Database

Science for Global Insight

SSP Database Version 0.9.3

About Series Countries Scatter Download

Select region(s), scenario(s), and variable to define your query

(1.) Regions: World, 5 Regions, OECD 90, REF, ASIA, MAF, LAC, 32 Regions, Australia and New Z, Canada, United States of Ame, Mexico, Brazil

(2.) Scenarios: IIASA Population, SSP1 (illustrative), SSP2 (illustrative), SSP3 (illustrative), SSP4 (illustrative), SSP5 (illustrative), NCAR Urbanization, SSP1 (illustrative), SSP2 (illustrative), SSP3 (illustrative), SSP4 (illustrative), SSP5 (illustrative), OECD GDP

(3.) Variable: data, data, GDP, PPP, Population, Total, Male, Female, Urban, Share

Query Results - Chart Preview: Population

Query Results:

Region	Scenario	Variable	Unit	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
World	IIASA POP - SSP1_v5_120427	Population	million			6869.855	7209.737	7504.769	7752.297	7968.464	8150.960	8296.060	8394.935	8445.110	8453.283	8424.095	8362.788	8271.176	8150.70
World	IIASA POP - SSP2_v5_120427	Population	million			6869.855	7267.545	7650.804	8001.978	8314.352	8596.569	8856.808	9089.272	9285.297	9444.458	9570.951	9670.401	9747.802	9804.1
World	IIASA POP - SSP3_v5_120427	Population	million			6869.855	7320.974	7789.482	8244.971	8660.944	9060.321	9469.205	9882.461	10282.502	10663.517	11035.268	11406.682	11786.547	12172.7

Output Options: Microsoft Excel, Portable Network Graphics, Scalable Vector Graphics

Notes: 2. Projections are made for all 151 countries with population larger than 1 million and land area bigger than 2000 square kilometer (excluding Hong Kong, Kuwait, and Puerto Rico). Those 151 countries account for 99.1% world population in 2010. 3. Projections are made every 5 years for the period 2010-2100; 4. There are potentially 9 urbanization scenarios for each country, covering the range of uncertainty

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