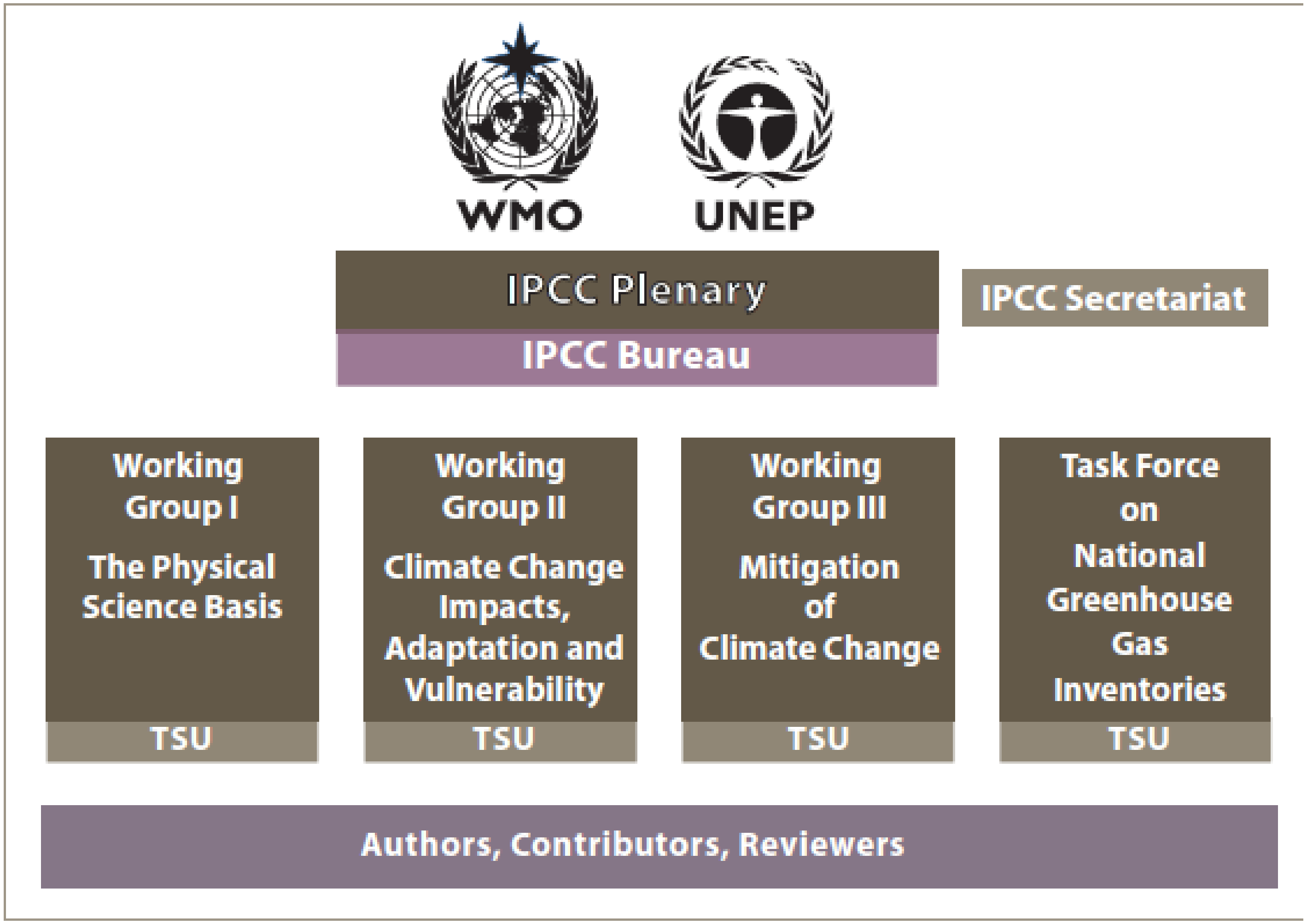
Through the IPCC lens – what we need for a reasonable assessment

21 March 2012, Wellington

Prof. Dr. Ottmar Edenhofer, Co-chair WG III

WMO UNEP

The Structure of the IPCC



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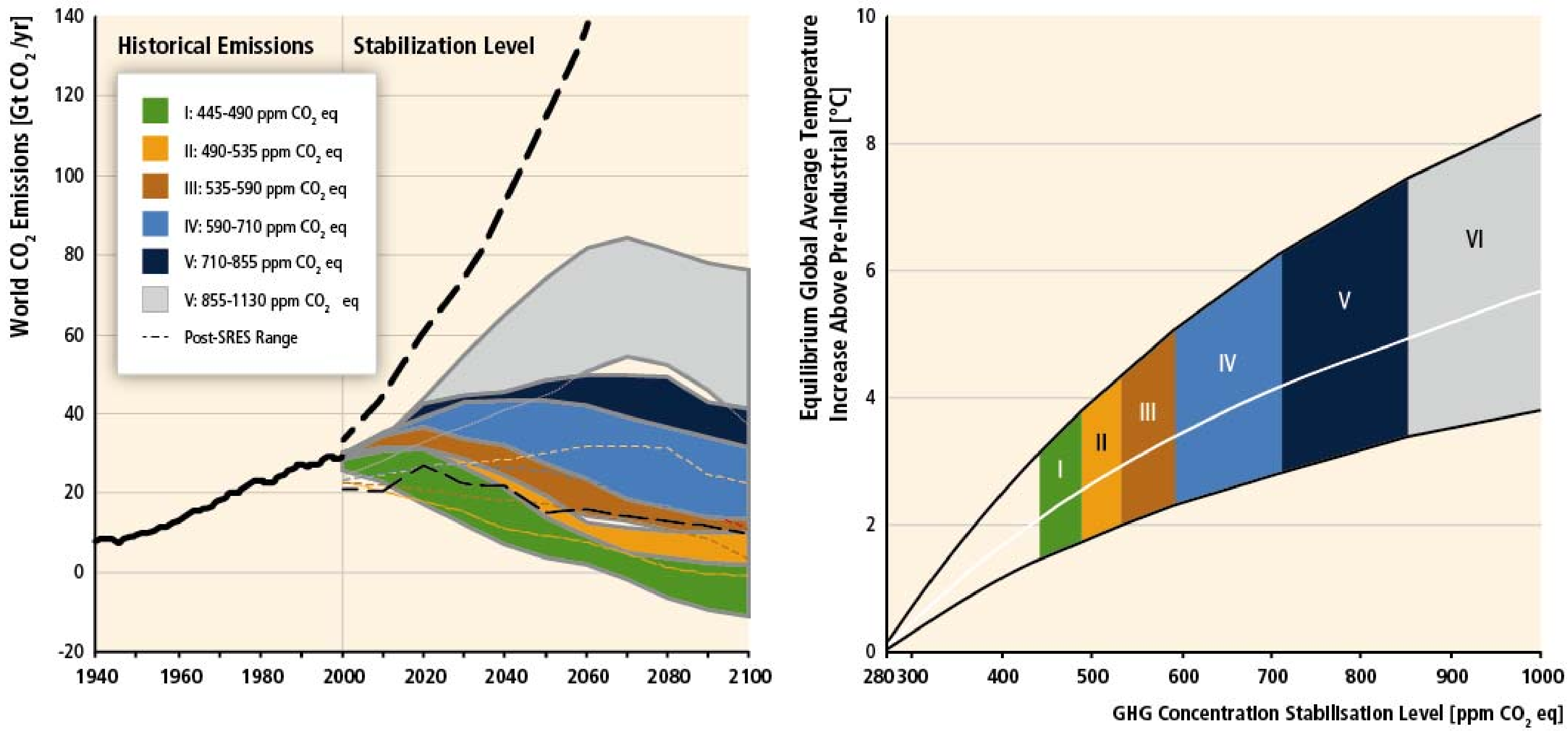
Demand for energy services is increasing



GHG emissions resulting from the provision of energy services contribute significantly to the increase in atmospheric GHG concentrations.

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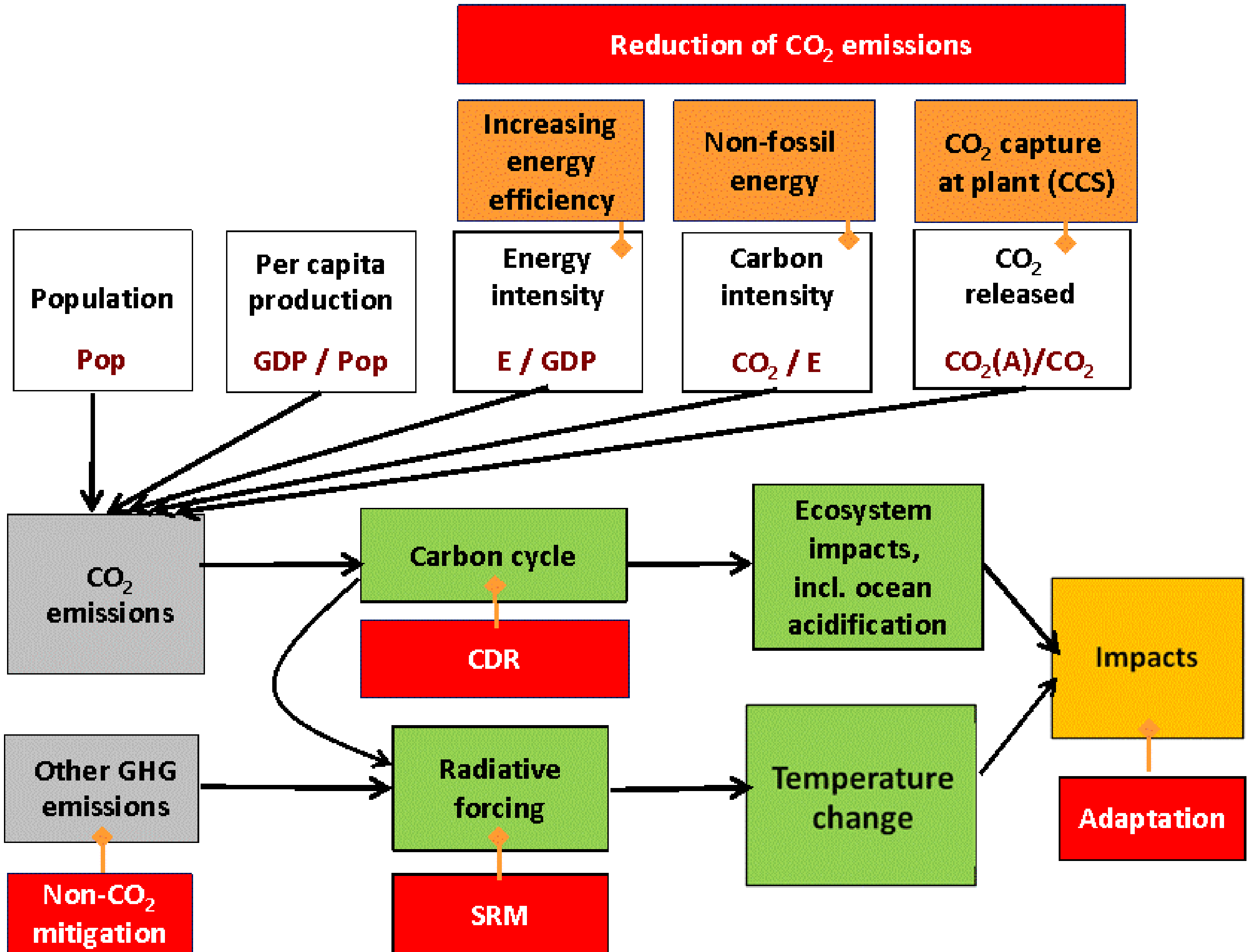
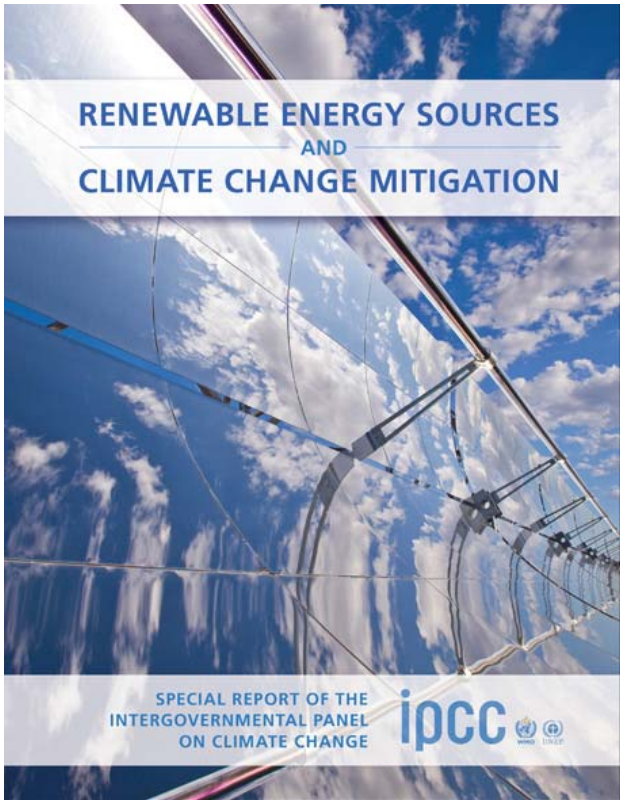
AR5: Exploring the whole solution space



Edenhofer/Seyboth 2012

One important component of the solution space



http://srren.ipcc-wg3.de/report

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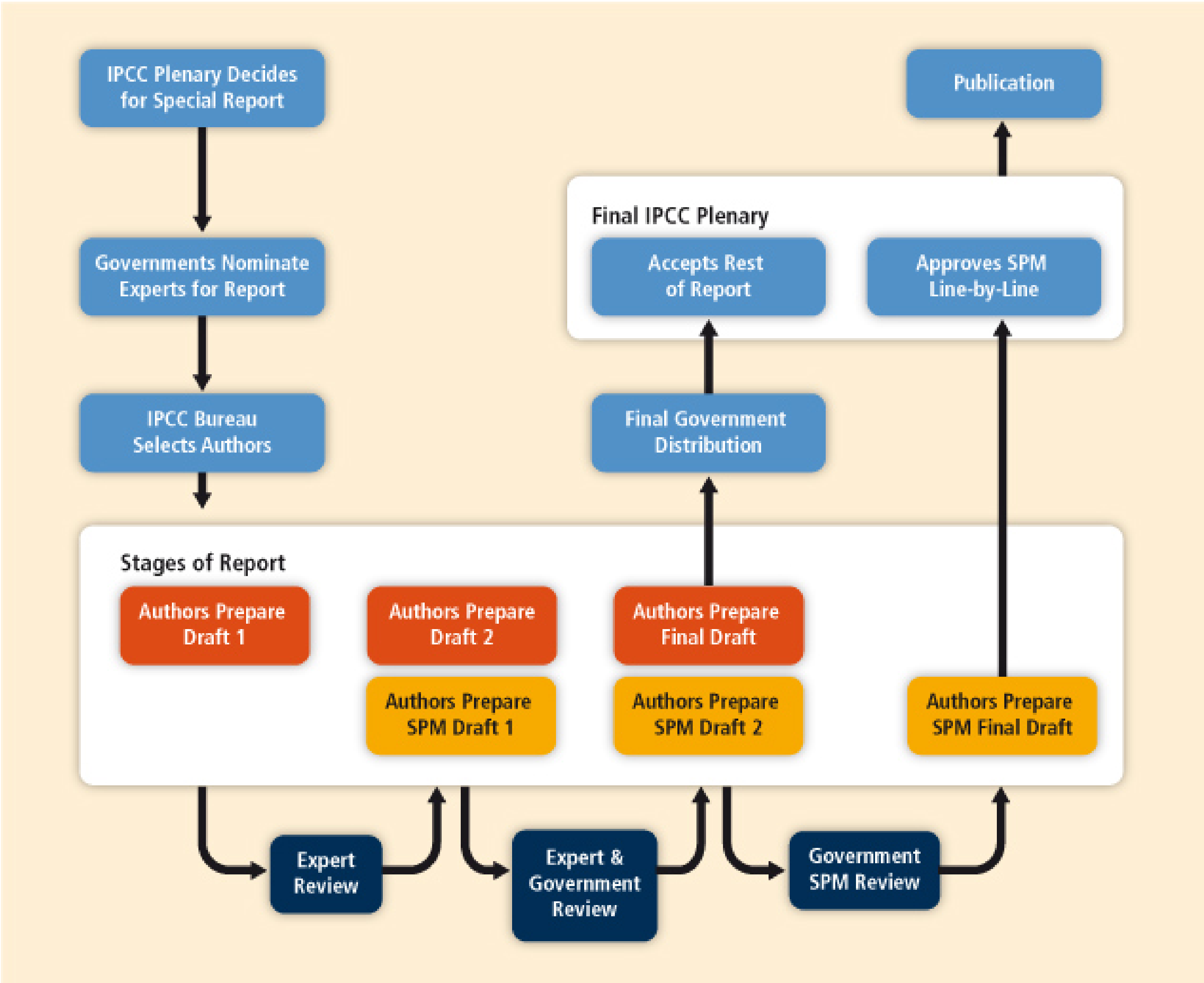
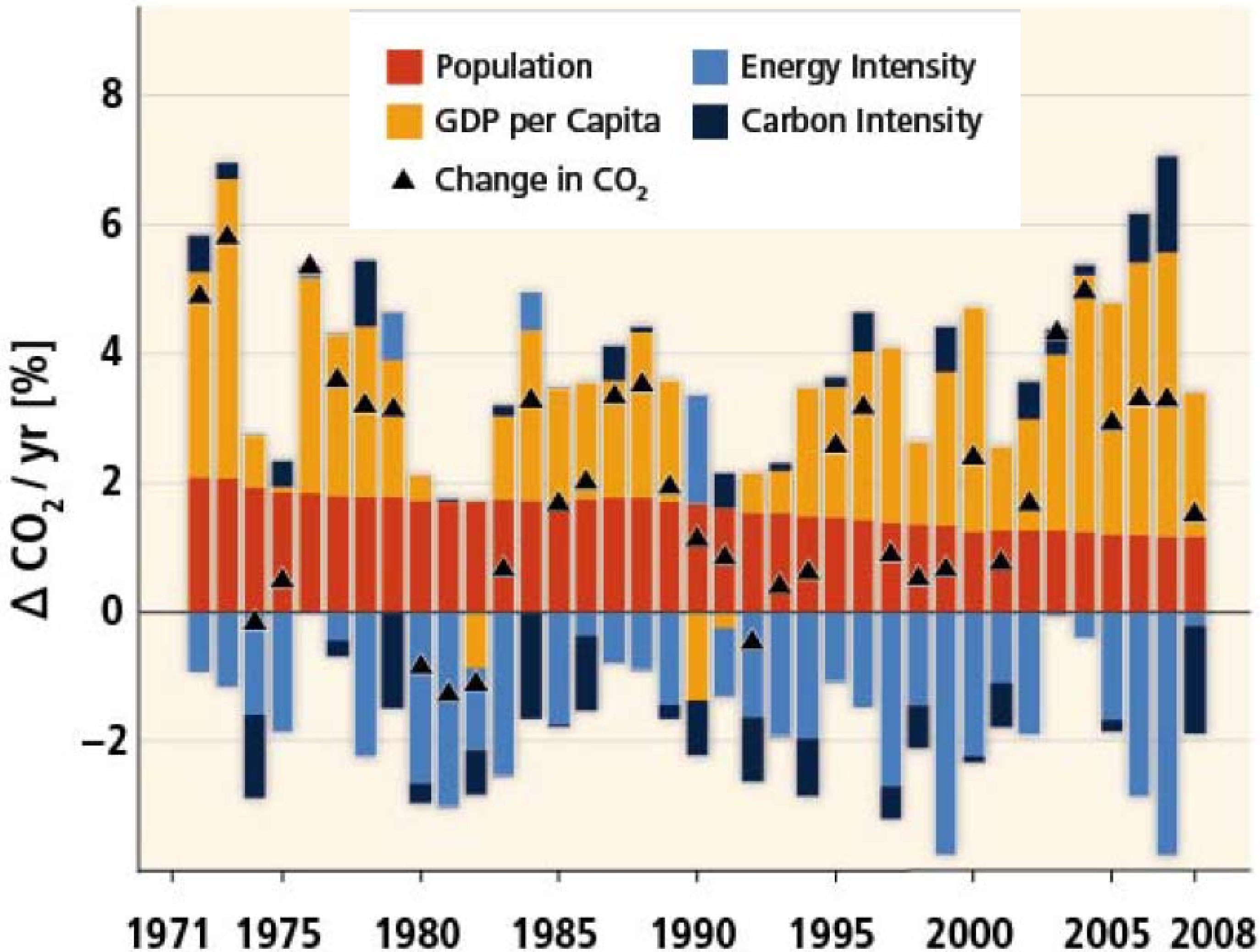
The assessment process of IPCC



Economic growth drives global emissions



SRREN IPCC 2011

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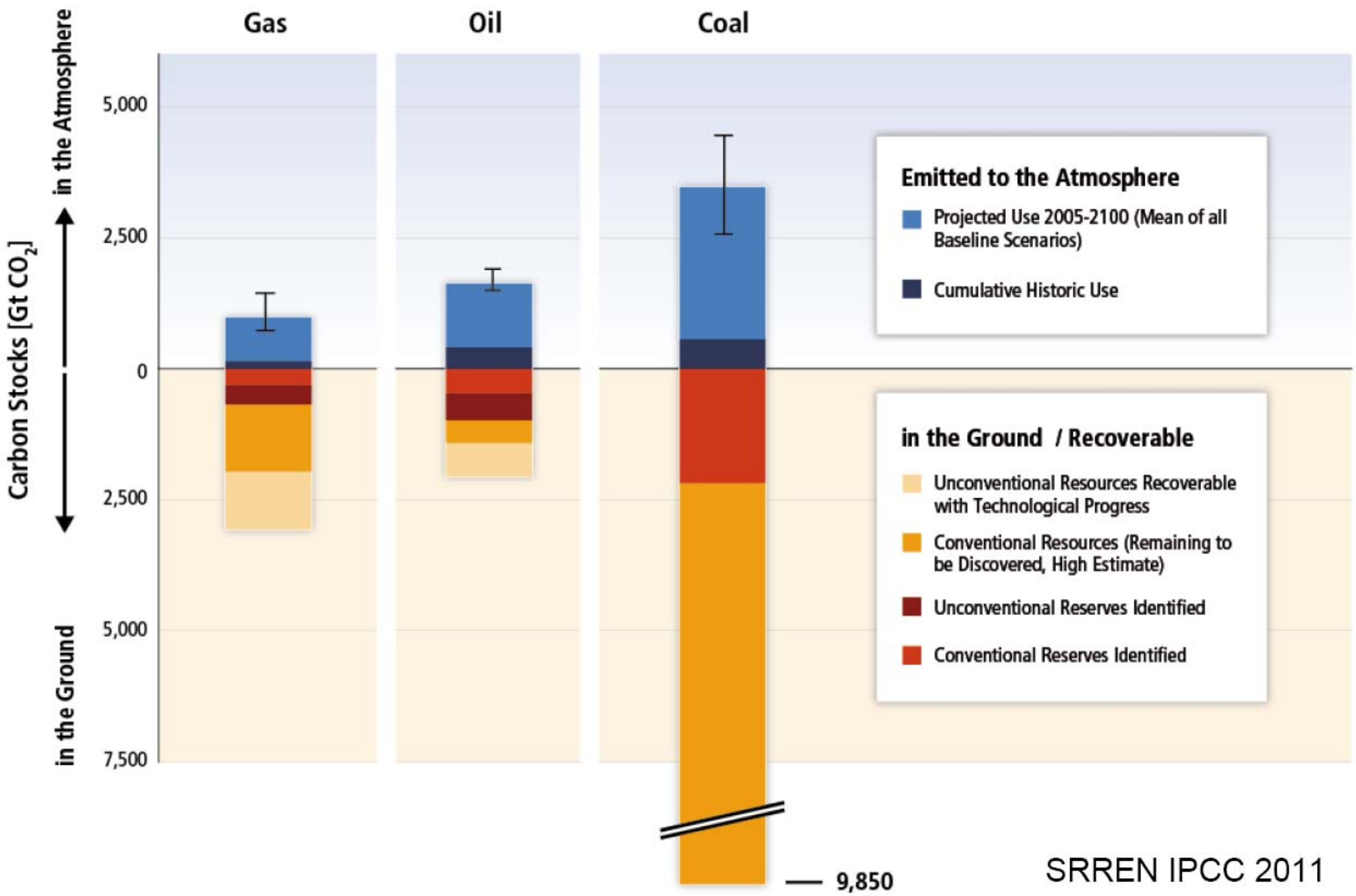
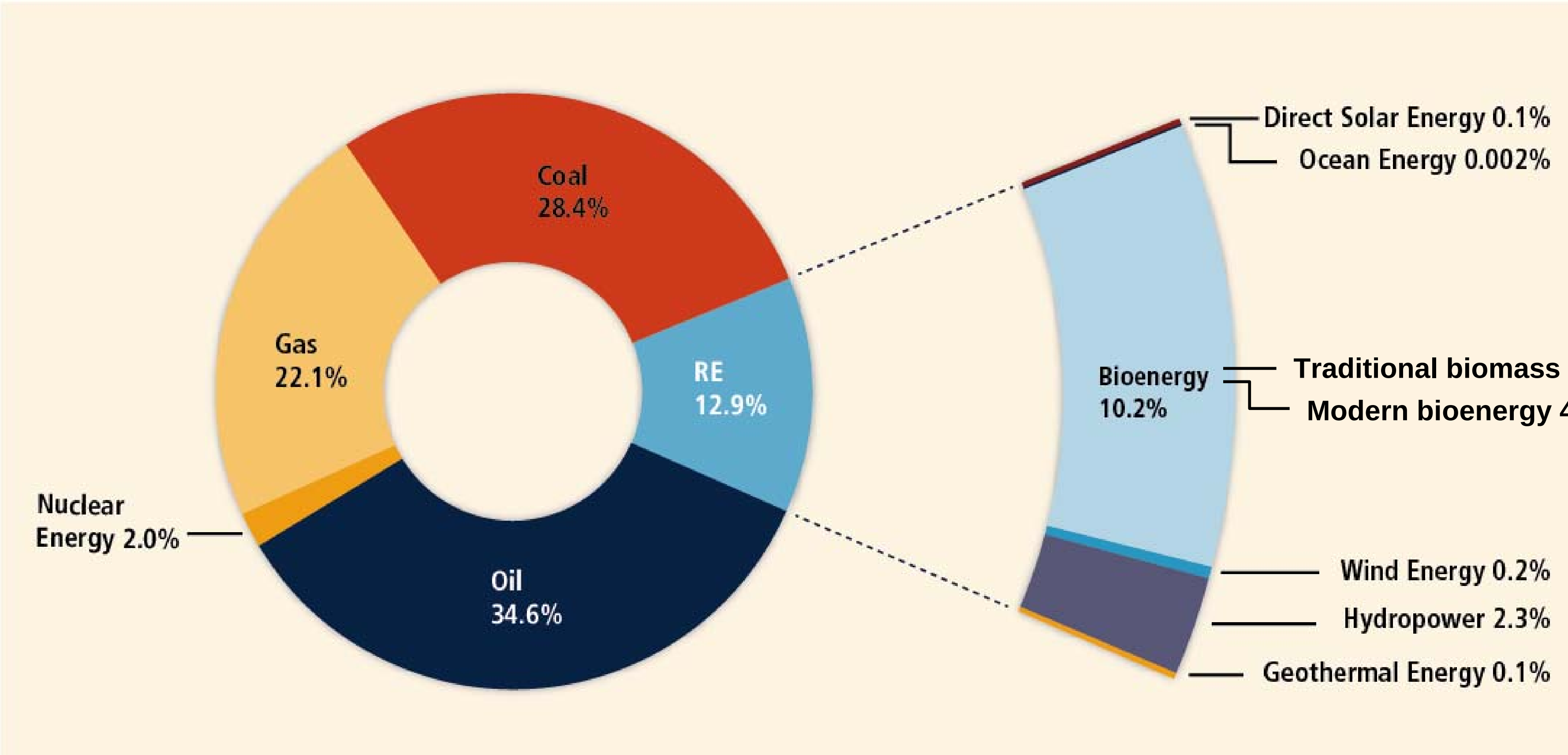
Conventional reserves alone exceed 1000 Gt CO2



SRREN IPCC 2011

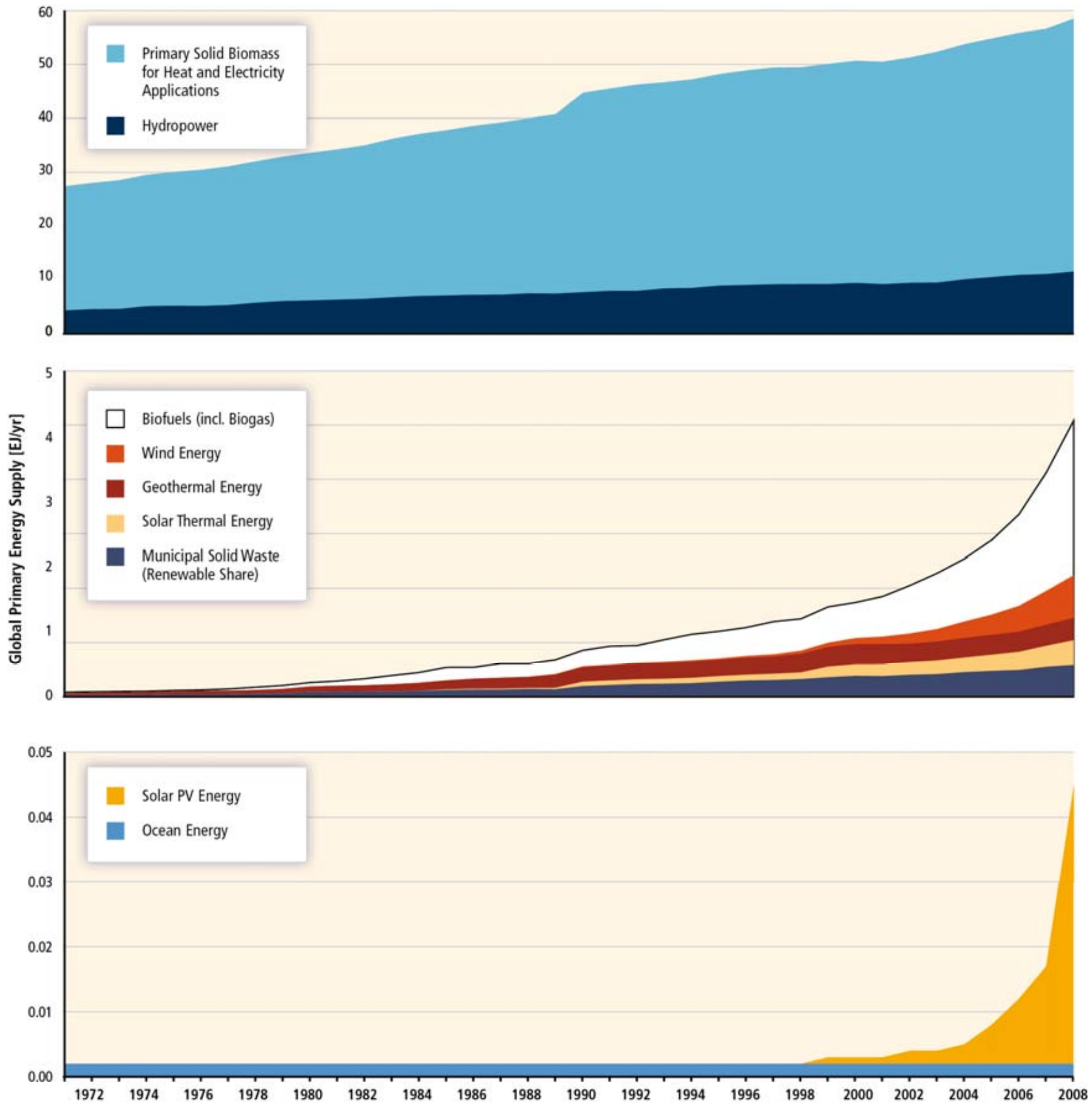
Current energy system is dominated by fossil fuels

SRREN, IPCC (2011)



Shares of different energy carriers in total primary energy supply in 2008

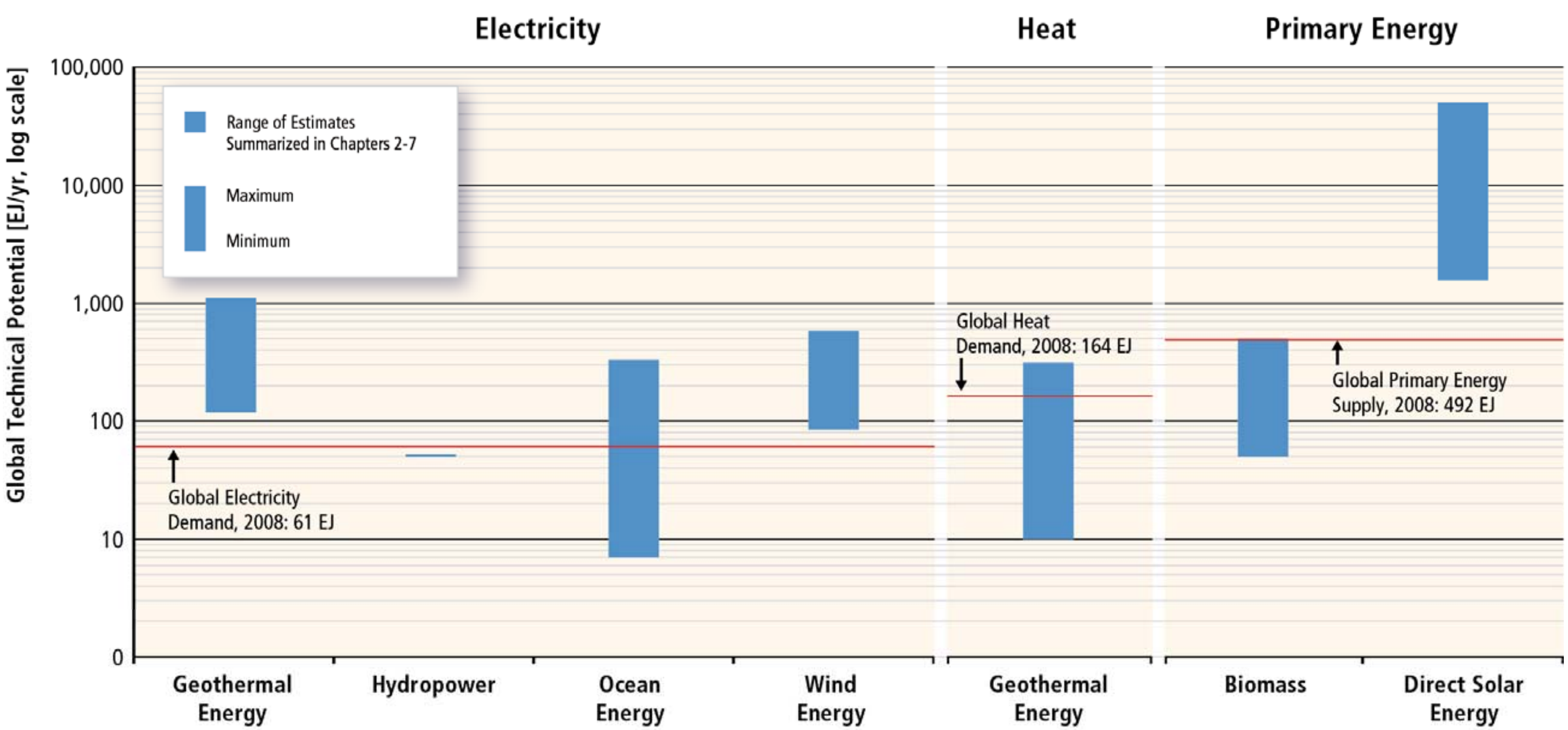
RE growth rate accelerating in recent years



150 GW of new RE power plant capacity was built in 2008-2009.

This equals 50% of all power plants built during that period.

Technical potential of renewable energy

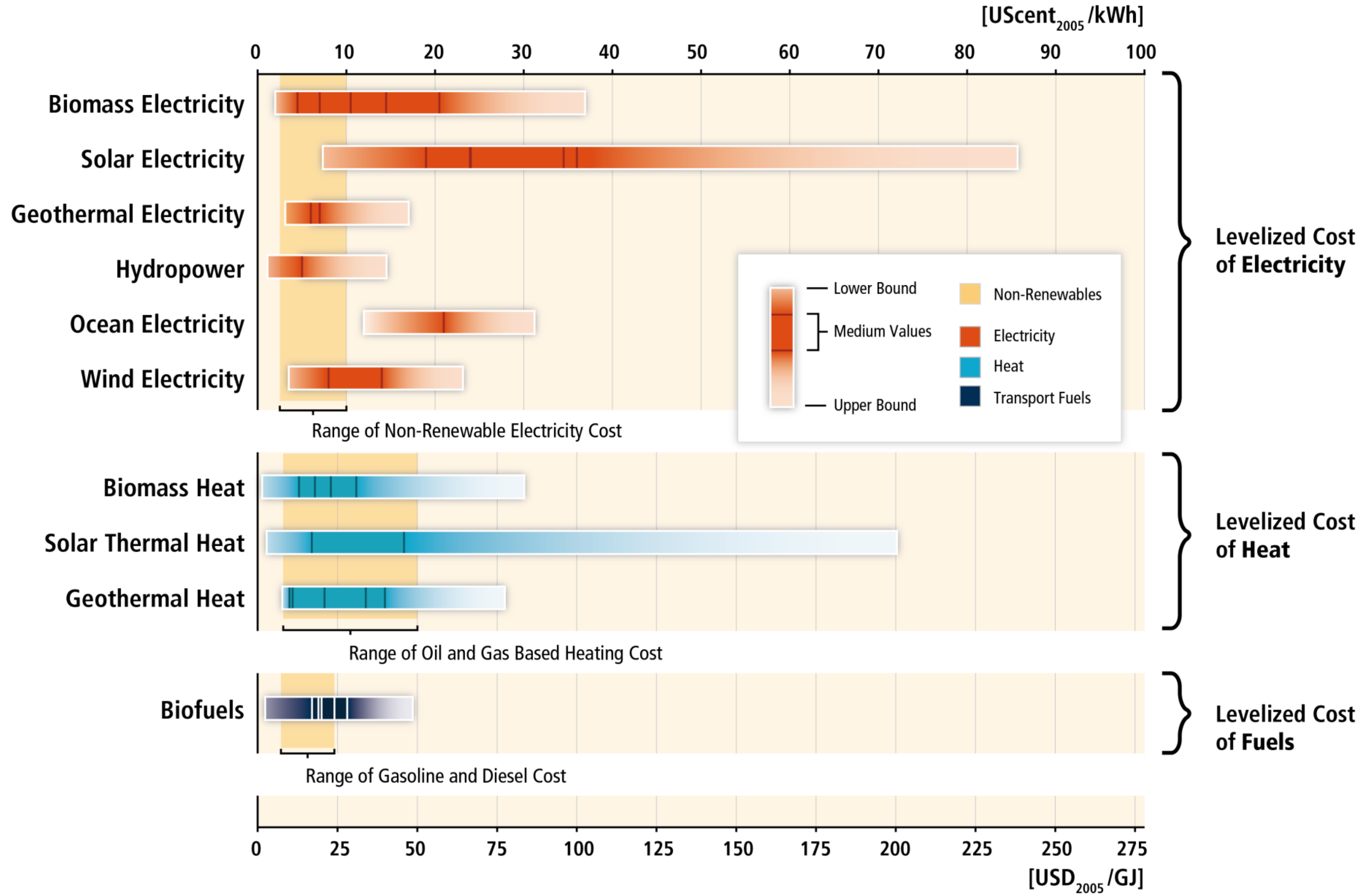


Range of Estimates of Global Technical Potentials

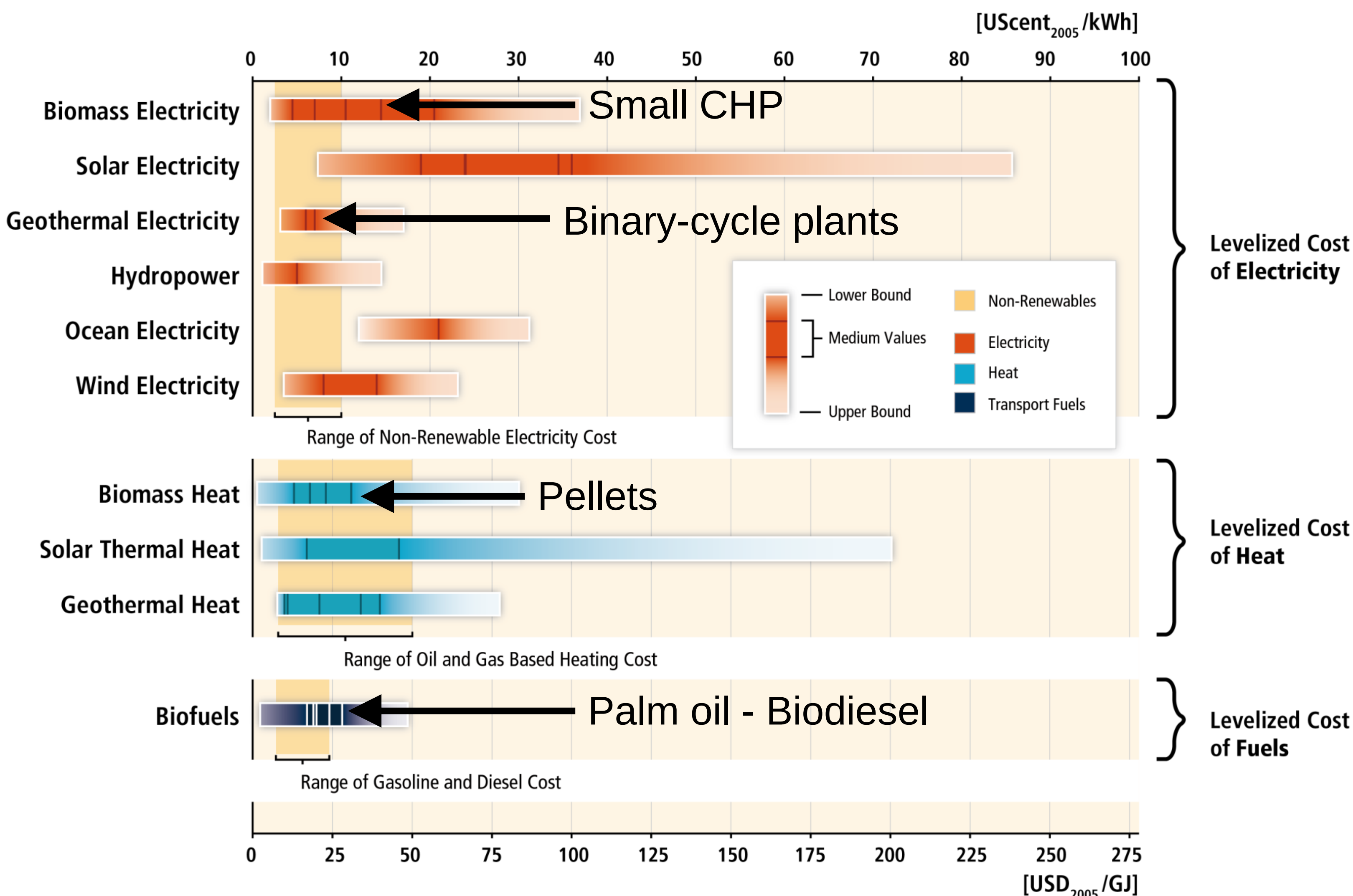
Max (in EJ/yr)	1109	52	331	580	312	500	49837
Min (in EJ/yr)	118	50	7	85	10	50	1575

IPCC SRREN 2011

Levelized costs of renewable energy sources

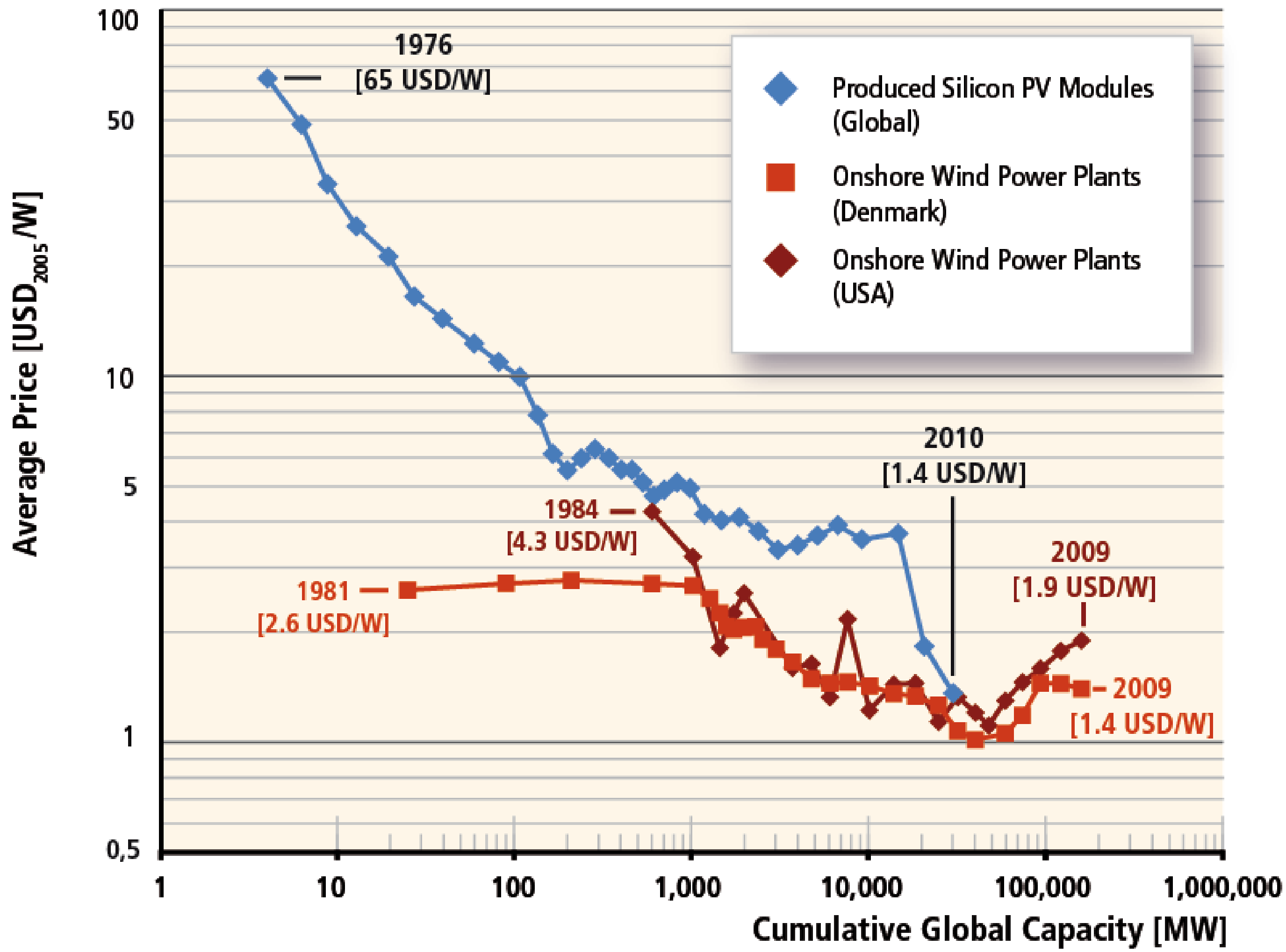


... some technologies are competitive today



SRREN, Edenhofer et al. (2011)

The role of technologies



Costs of renewable energy technologies shrinking

Objectives of AR5 Scenario Process

Explore adaptation and mitigation options

Explore benefits, costs, and risks of adaptation and mitigation

WG II

Differential impacts:

$\Delta(2^{\circ}C/3^{\circ}C)$

$\Delta(3^{\circ}C/4^{\circ}C)$

Iteration

WG III

Marginal mitigation costs:

$\Delta(2^{\circ}C/3^{\circ}C)$

$\Delta(3^{\circ}C/4^{\circ}C)$

$\Delta(2^{\circ}/3^{\circ})$, $\Delta(3^{\circ}/4^{\circ})$ policies:
Consistent understanding of costs of impacts and of mitigating impacts

Establish smallest common denominator between both communities

AR5 WG III Outline

I: Introduction	1. Introductory Chapter
II: Framing Issues	2. Integrated Risk and Uncertainty Assessment of Climate Change Response Policies 3. Social, Economic and Ethical Concepts and Methods 4. Sustainable Development and Equity
III: Pathways for Mitigating Climate Change	5. Drivers, Trends and Mitigation 6. Assessing Transformation Pathways 7. Energy Systems 8. Transport 9. Buildings 10. Industry 11. Agriculture, Forestry and Other Land Use (AFOLU) 12. Human Settlements, Infrastructure and Spatial Planning
IV: Assessment of Policies, Institutions and Finance	13. International Cooperation: Agreements and Instruments 14. Regional Development and Cooperation 15. National and Sub-national Policies and Institutions 16. Cross-cutting Investment and Finance Issues

The Scientific Arena

Table 3.10: *Properties of emissions pathways for alternative ranges of CO_2 and CO_2-eq stabilization targets. Post-TAR stabilization scenarios in the scenario database (see also Sections 3.2 and 3.3); data source: after Nakicenovic et al., 2006 and Hanaoka et al., 2006)*

Class	Anthropogenic addition to radiative forcing at stabilization (W/m²)	Multi-gas concentration level (ppmv CO_2-eq)	Stabilization level for CO_2 only, consistent with multi-gas level (ppmv CO_2)	Number of scenario studies	Global mean temperature C increase above pre-industrial at equilibrium, using best estimate of climate sensitivity[c)]	Likely range of global mean temperature C increase above pre-industrial at equilibrium[a)]	Peaking year for CO_2 emissions[b)]	Change in global emissions in 2050 (% of 2000 emissions)[b)]
I	2.5-3.0	445-490	350-400	6	2.0-2.4	1.4-3.6	2000-2015	-85 to -50
II	3.0-3.5	490-535	400-440	18	2.4-2.8	1.6-4.2	2000-2020	-60 to -30
III	3.5-4.0	535-590	440-485	21	2.8-3.2	1.9-4.9	2010-2030	-30 to +5
IV	4.0-5.0	590-710	485-570	118	3.2-4.0	2.2-6.1	2020-2060	+10 to +60
V	5.0-6.0	710-855	570-660	9	4.0-4.9	2.7-7.3	2050-2080	+25 to +85
VI	6.0-7.5	855-1130	660-790	5	4.9-6.1	3.2-8.5	2060-2090	+90 to +140

Notes:

a. Warming for each stabilization class is calculated based on the variation of climate sensitivity between 2°C –4.5°C, which corresponds to the likely range of climate sensitivity as defined by Meehl *et al.* (2007,Chapter 10).

b. Ranges correspond to the 70% percentile of the post-TAR scenario distribution.

c. 'Best estimate' refers to the most likely value of climate sensitivity, i.e. the mode (see Meehl *et al.* (2007,Chapter 10) and Table 3.9

Fisher et al. (2007), AR4

Only 6 scenarios from 3 models in the lowest category…

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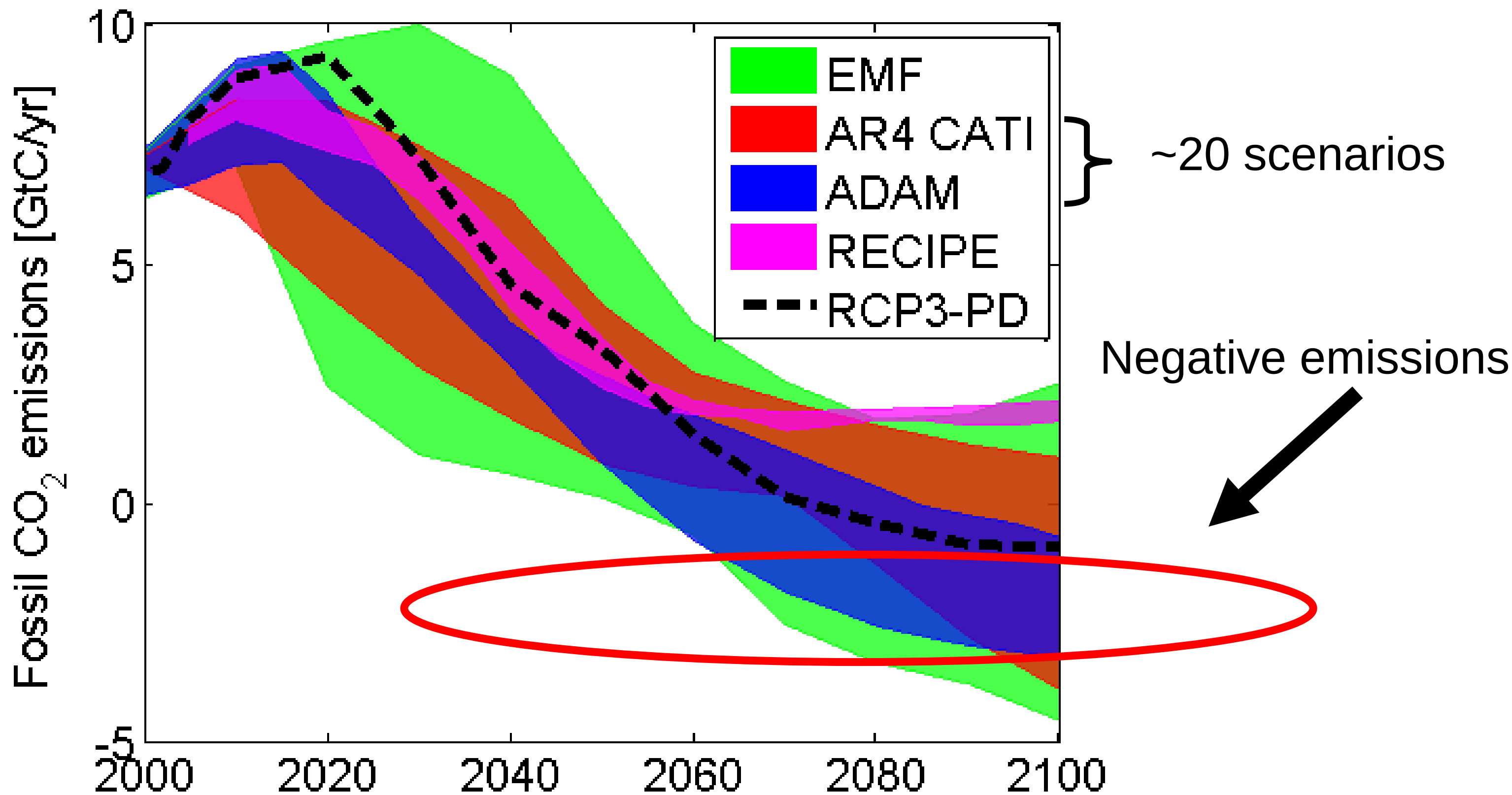
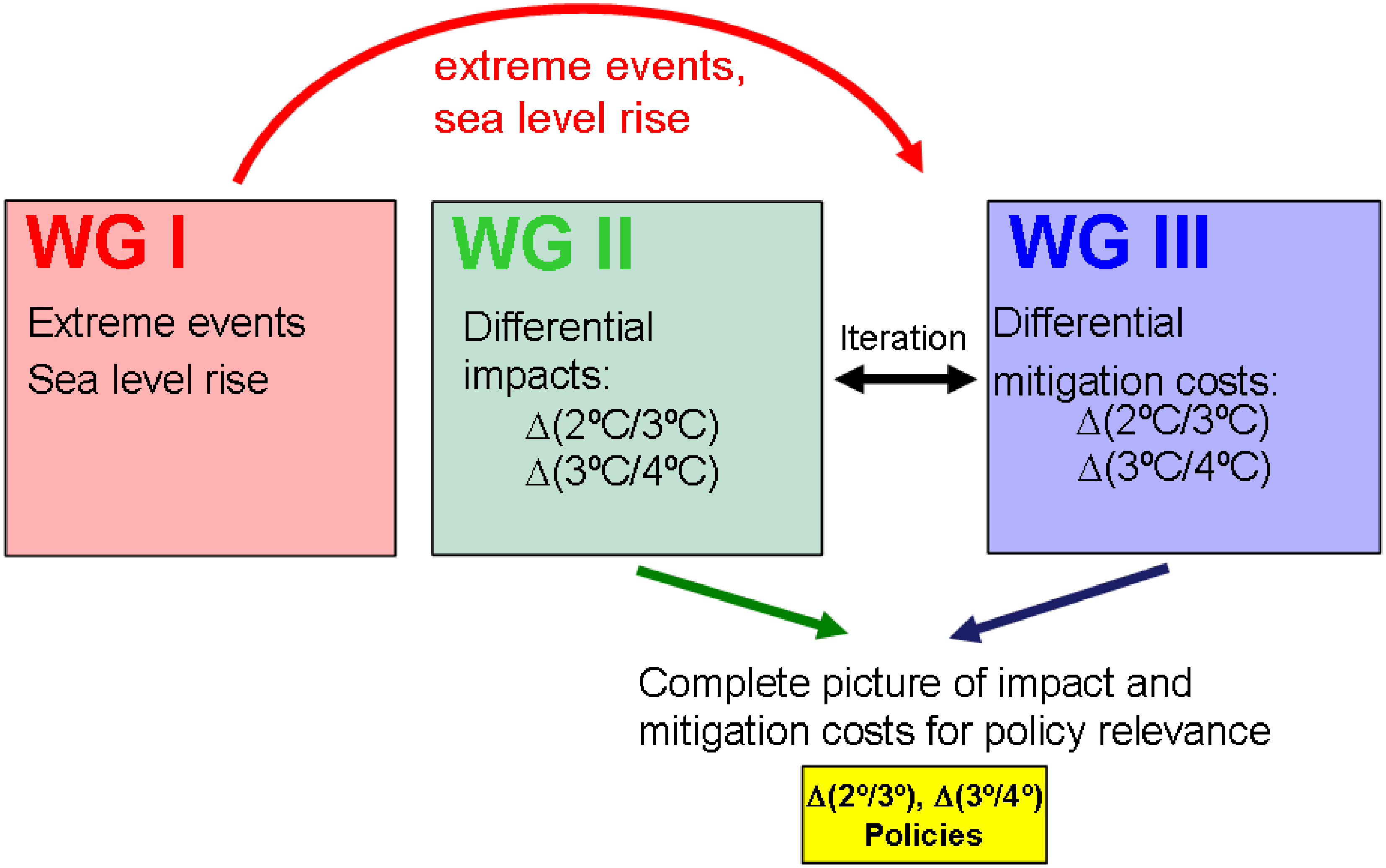
Low Stabilization Scenarios Beyond AR4

- …but already many more available for AR5
- Exploration of RCP3-PD within the scenario process

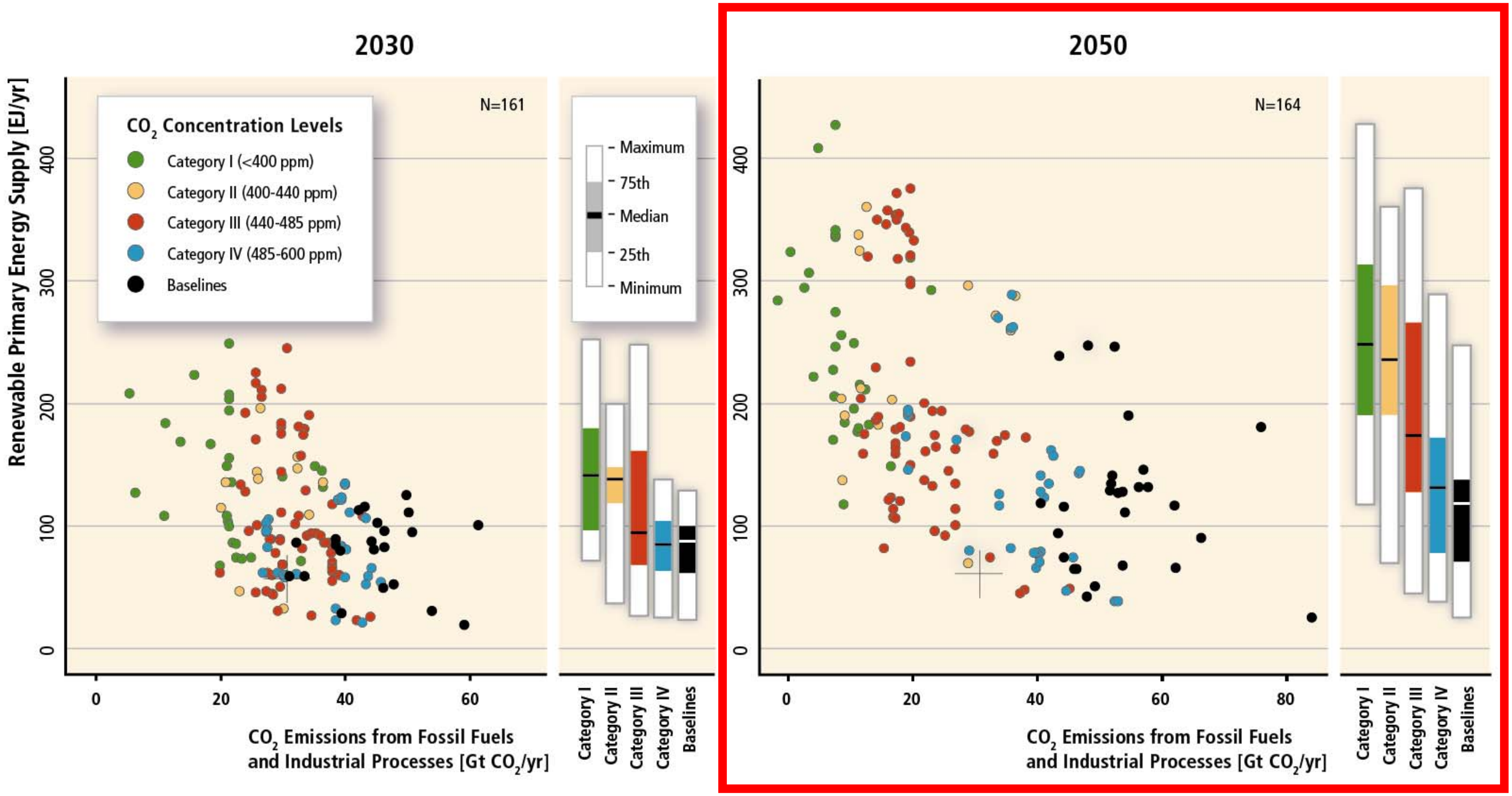


Knopf/Luderer/Edenhofer (2011).

Implications for the Scenario Process



Global RE Primary Energy Supply from 164 Long-Term Scenarios versus Fossil and Industrial CO_2 Emissions



SRREN, Edenhofer et al. (2011)

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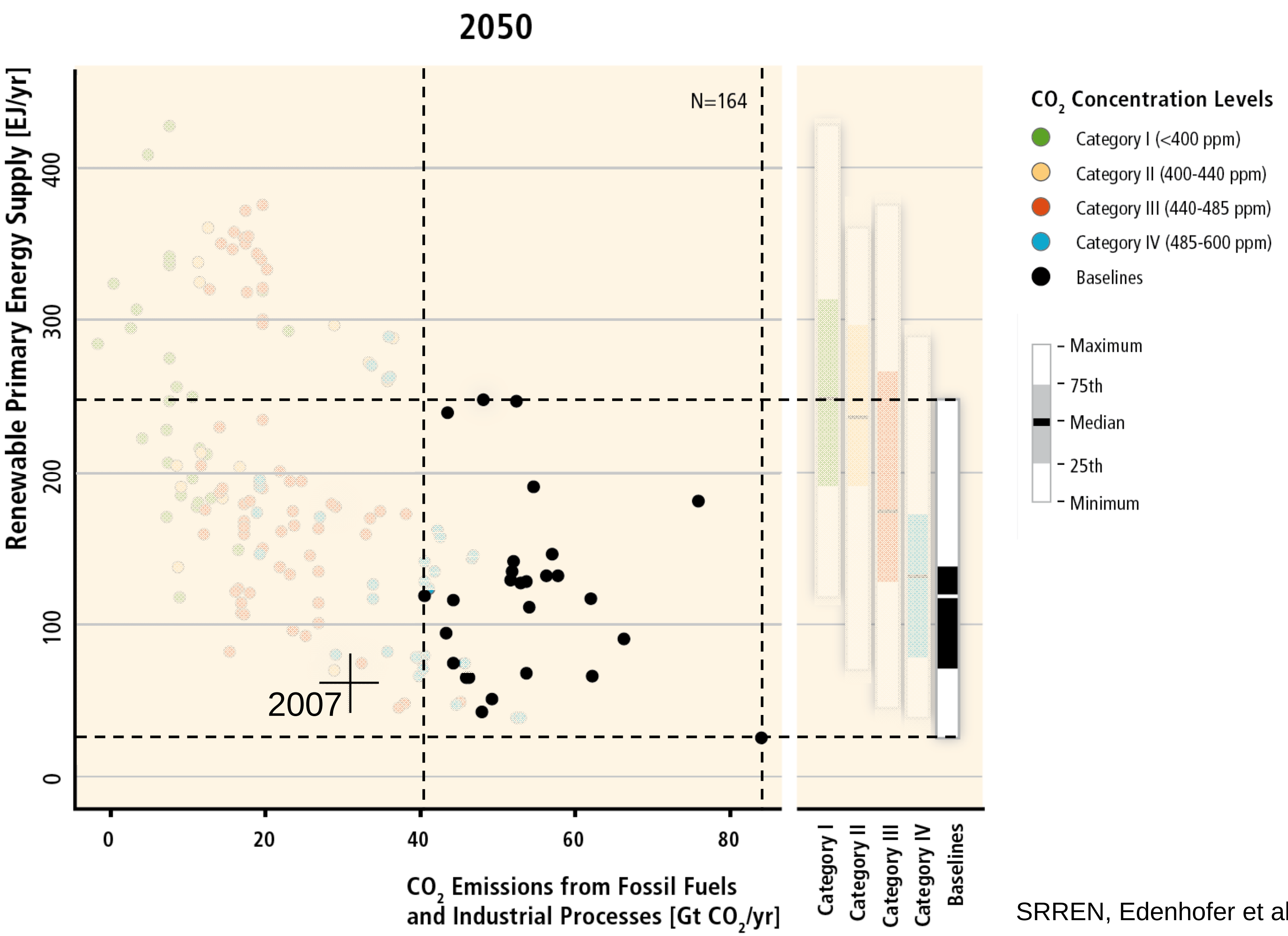

SRREN, Edenhofer et al. (2011)

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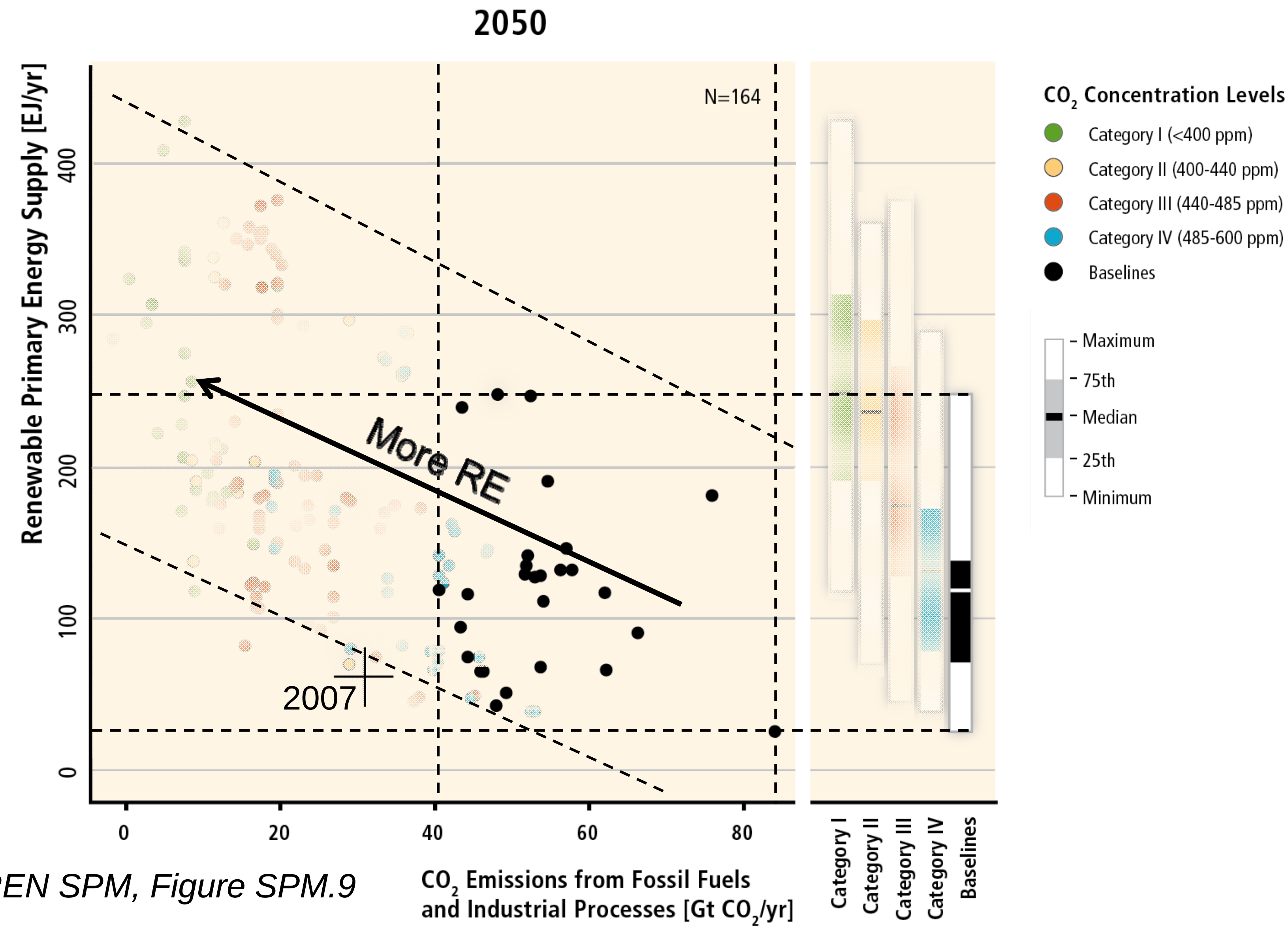
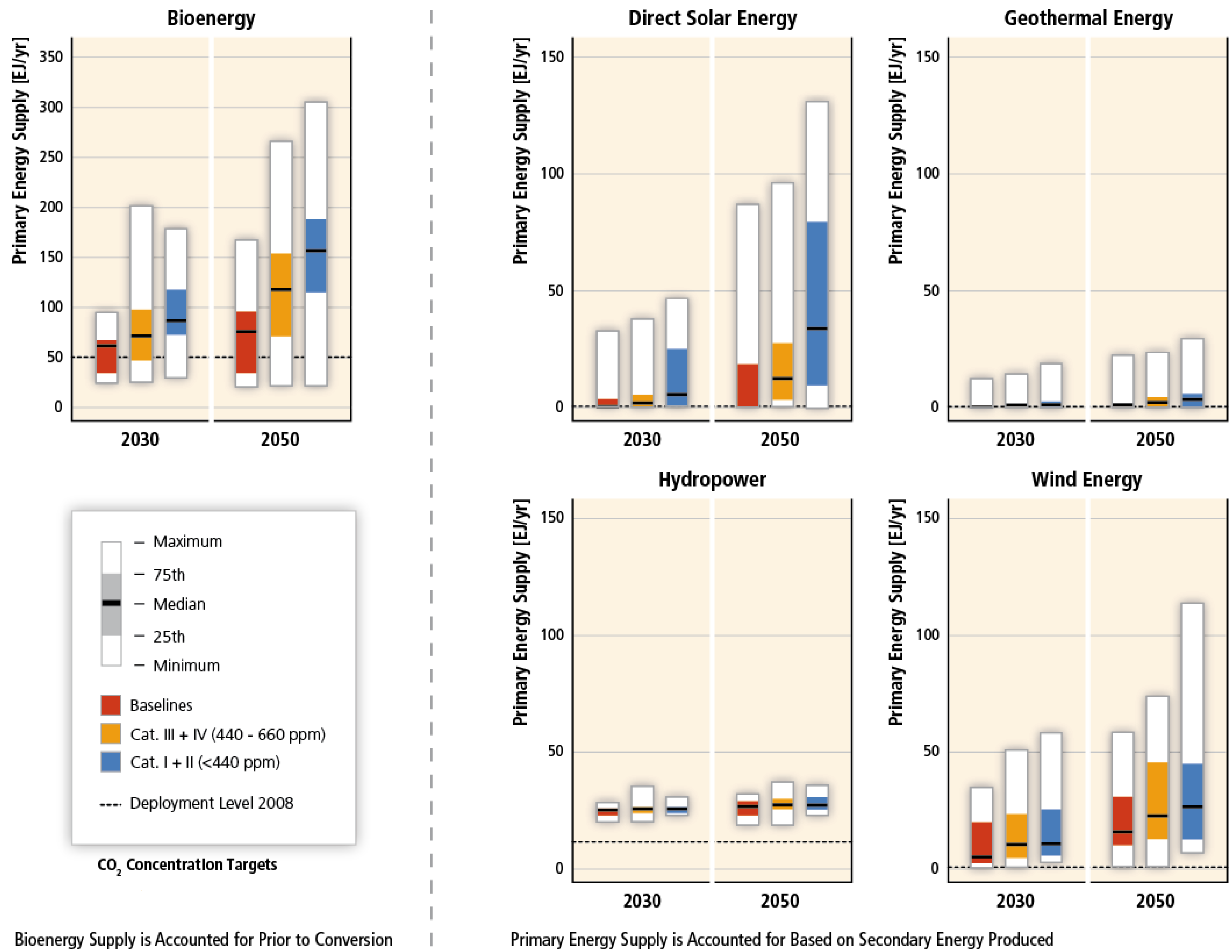
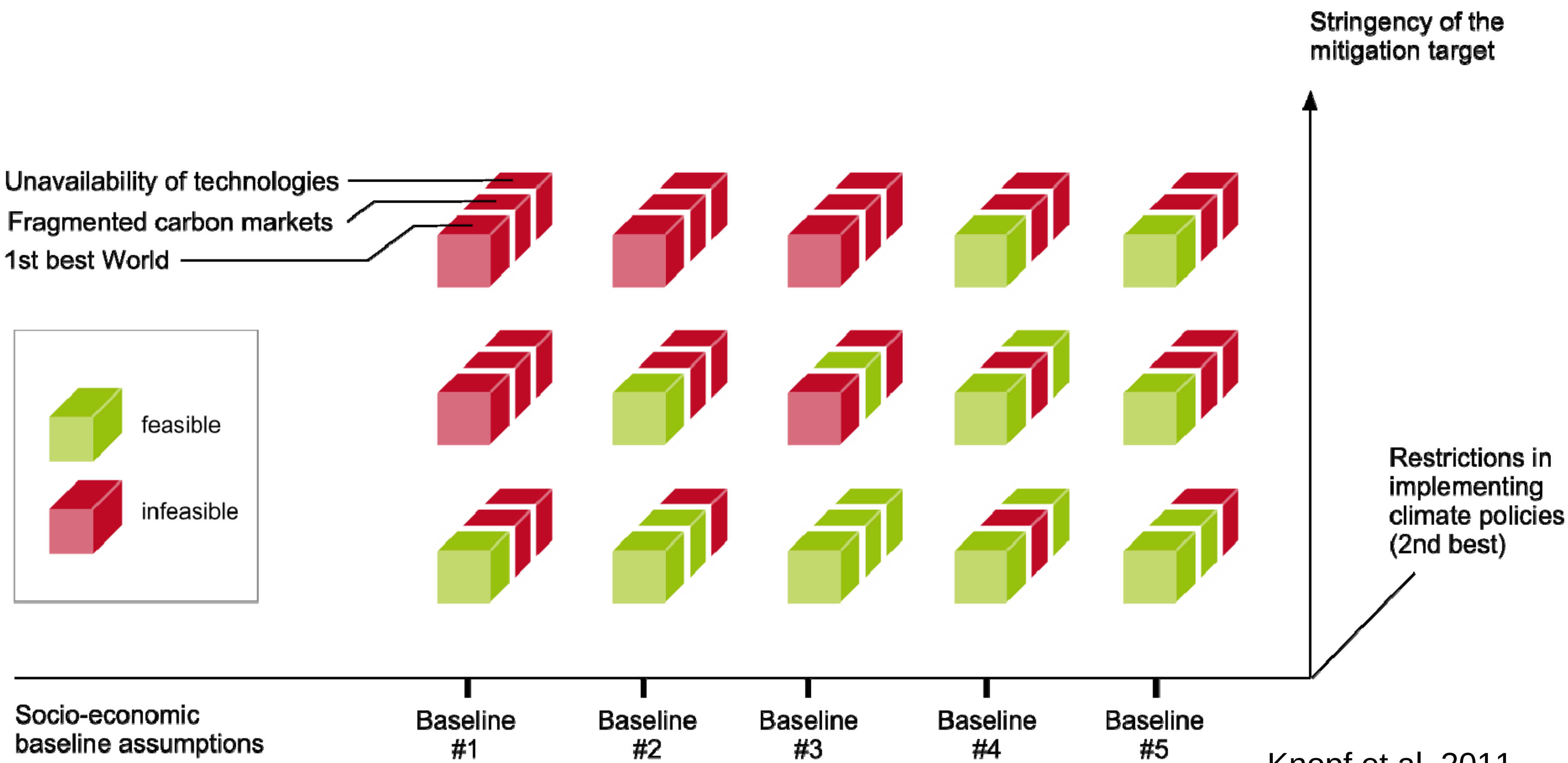


SRREN SPM, Figure SPM.9

Potential Role of Renewables

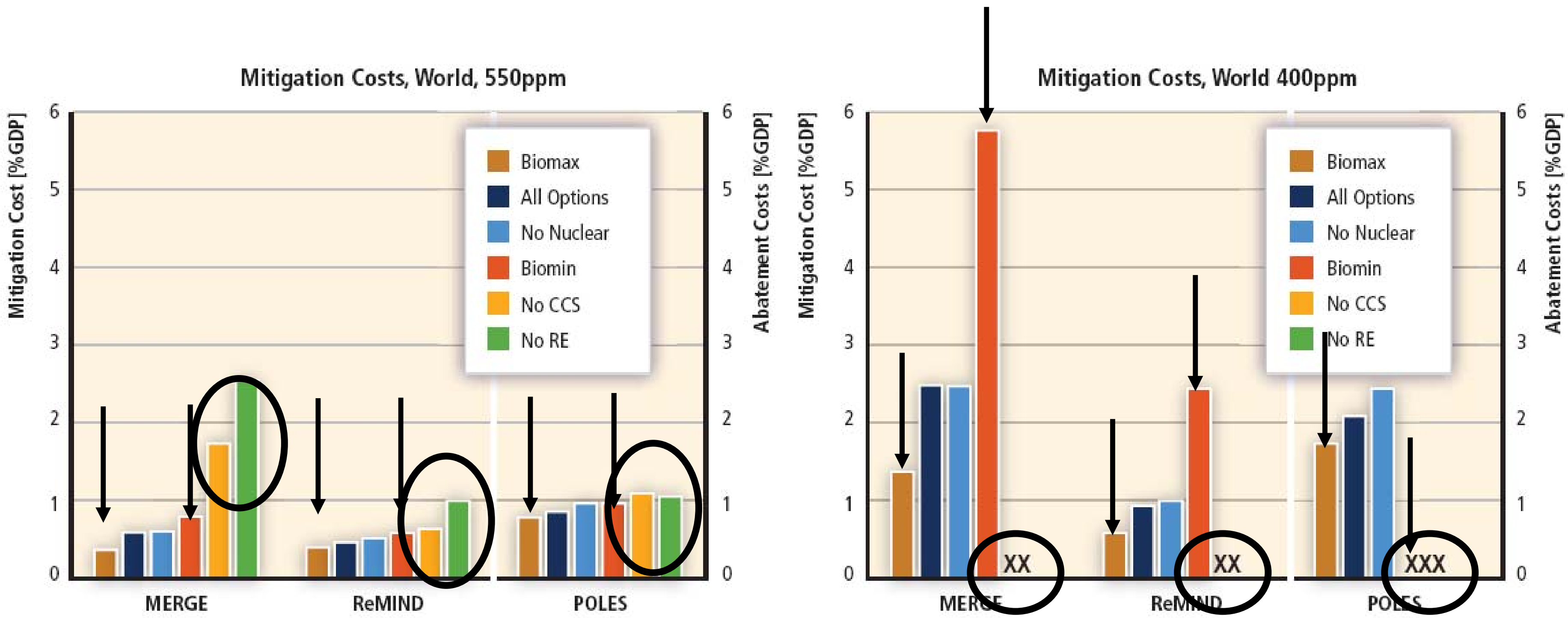


Exploring the feasibility frontier in „2nd best Worlds"



Knopf et al. 2011

Costs of mitigation



Costs hinge critically on:
- The stabilization target
- The biomass potential
- The availability of technologies, RE and CCS in particular

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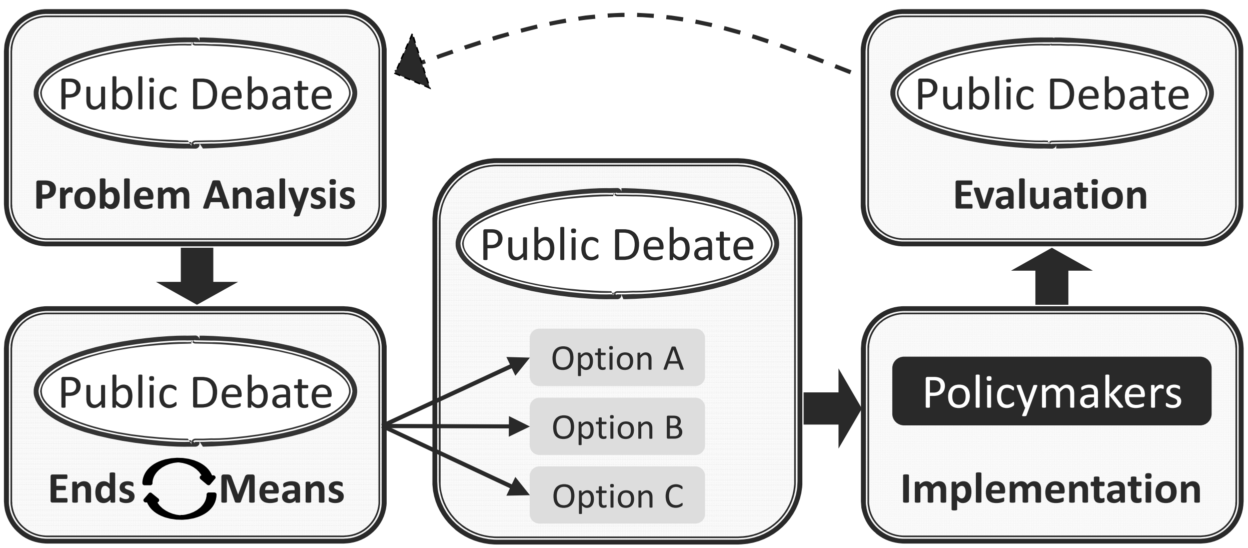
The Pragmatic Science/Policy Interface



Edenhofer/Kowarsch 2012

- While pursuing certain ends, unintended side-effects may require the reevaluation of means and ends
- Relies on continuous iteration between policy and science

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There is always more than one way…