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Regional greenhouse gas mitigation targets based on equity principles: update of IPCC AR4

24 October 2013 |
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Equity Workshop, Stockholm

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Content

1. Categorization of effort sharing proposals
2. Assessment of regional reduction targets
3. Conclusion

Back ground paper for IPCC AR5 (Chapter 6)

Höhne, N., den Elzen, M.G.J., Escalante, D., 2013. Regional greenhouse gas mitigation targets based on equity principles – a comparison of studies. Climate Policy (in press), http://dx.doi.org/10.1080/14693062.2014.849452

Paper was discussed in MAPS Workshop on Equity (March 2013)

Categorization of effort sharing approaches

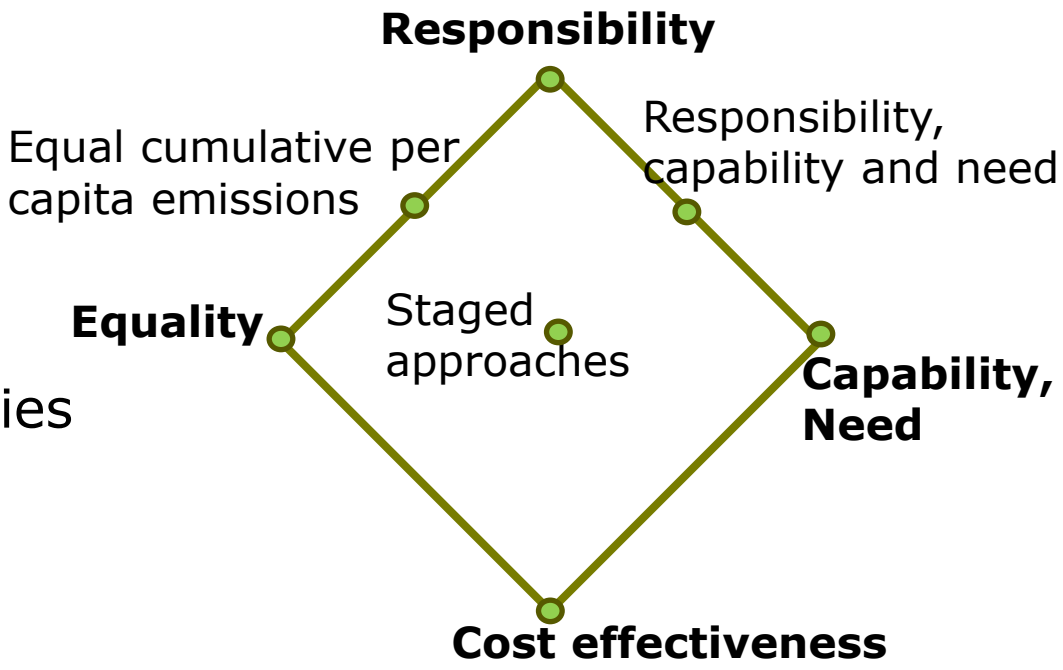
- Basic dimensions

1. Responsibility
2. Capability
3. Equality
4. Cost effectiveness

First 3 are equity principles

- In addition, three categories (combinations):

5. Equal cumulative per capita emissions
6. Responsibility, capability and need
7. Staged approaches



History of effort sharing approaches

- Run-up to Kyoto
  - „Contraction and Convergence"
  - Historical responsibility „Brazilian Proposal"
  - Mitigation potential (Triptych)
  - Multi-criteria formula
- Run-up to Copenhagen
  - Basic needs principle
  - Capability (GDP/capita)
  - Equal marginal abatement costs
  - Staged approaches
  - Greenhouse Development Rights
- Recently
  - Equal cumulative per capita emission rights (BASIC experts)

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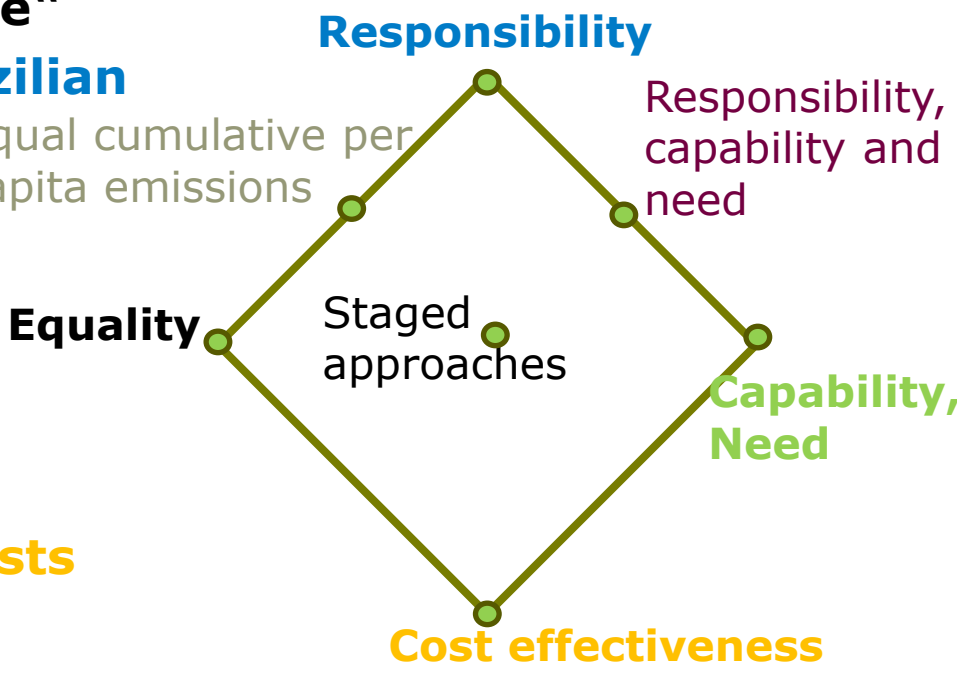

Data collection

Equality and 4 concentration stabilisation levels

Harmonisation of data

Categories	Description	Studies				
		Stabilization level (ppm CO_2e)				References
		400	450	550	650	
Equality	A multitude of studies provide allocations based on immediate or converging per capita emissions (e.g. Agarwal and Narain, 1991; Meyer, 2000). Later studies refine the approach using also per capita distributions within countries (e.g. Chakravarty et al., 2009).			X		Berk and den Elzen (2001)*
					X	Böhringer and Welsch (2006)
			X			Bows and Anderson (2008)
		X	X	X	X	Chakravarty et al. (2009)
				X	X	Criqui et al. (2003)
				X	X	Den Elzen and Lucas (2005)
				X		Den Elzen et al. (2005)
		X	X	X		Den Elzen and Meinshausen (2006)
			X	X		Den Elzen et al. (2008b)
		X		X		Edenhofer et al. (2010)
				X	X	Hof et al. (2010)
			X	X	X	Höhne and Moltmann (2008)
		X				Höhne and Moltmann (2009)
		X		X		Knopf et al. (2009)
			X			Knopf et al. (2012)*
				X		Kuntsi-Reunanen and Luukkanen (2006)
				X		Miketa and Schrattenholzer (2006)
				X		Peterson and Klepper (2007)
			X			Onigkeit et al. (2009)
			X			Van Vuuren et al. (2009)
			X	X		Van Vuuren et al. (2010)
			X			Kriegler et al. (2013) and Tavoni et al. (2013)**

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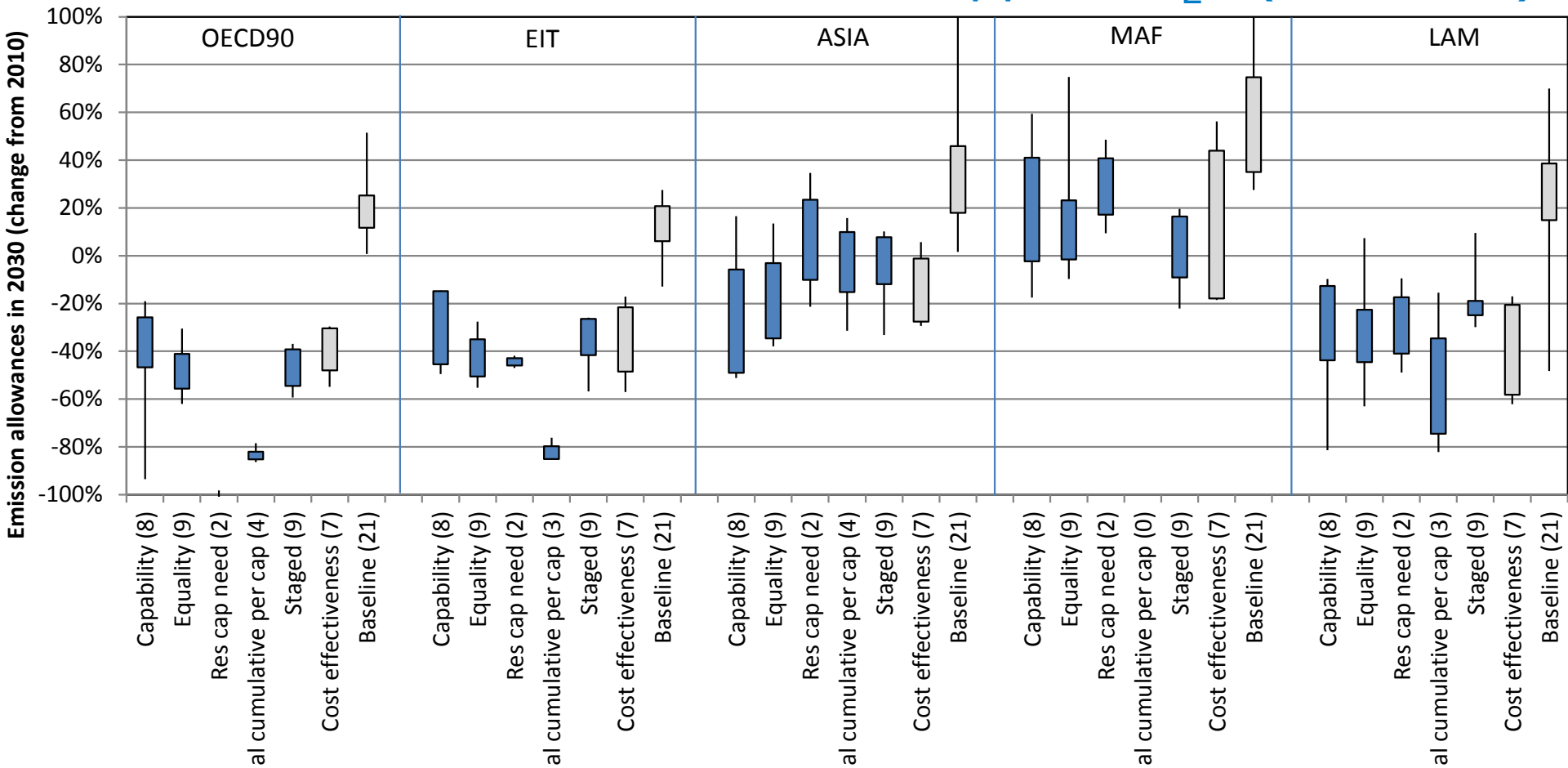
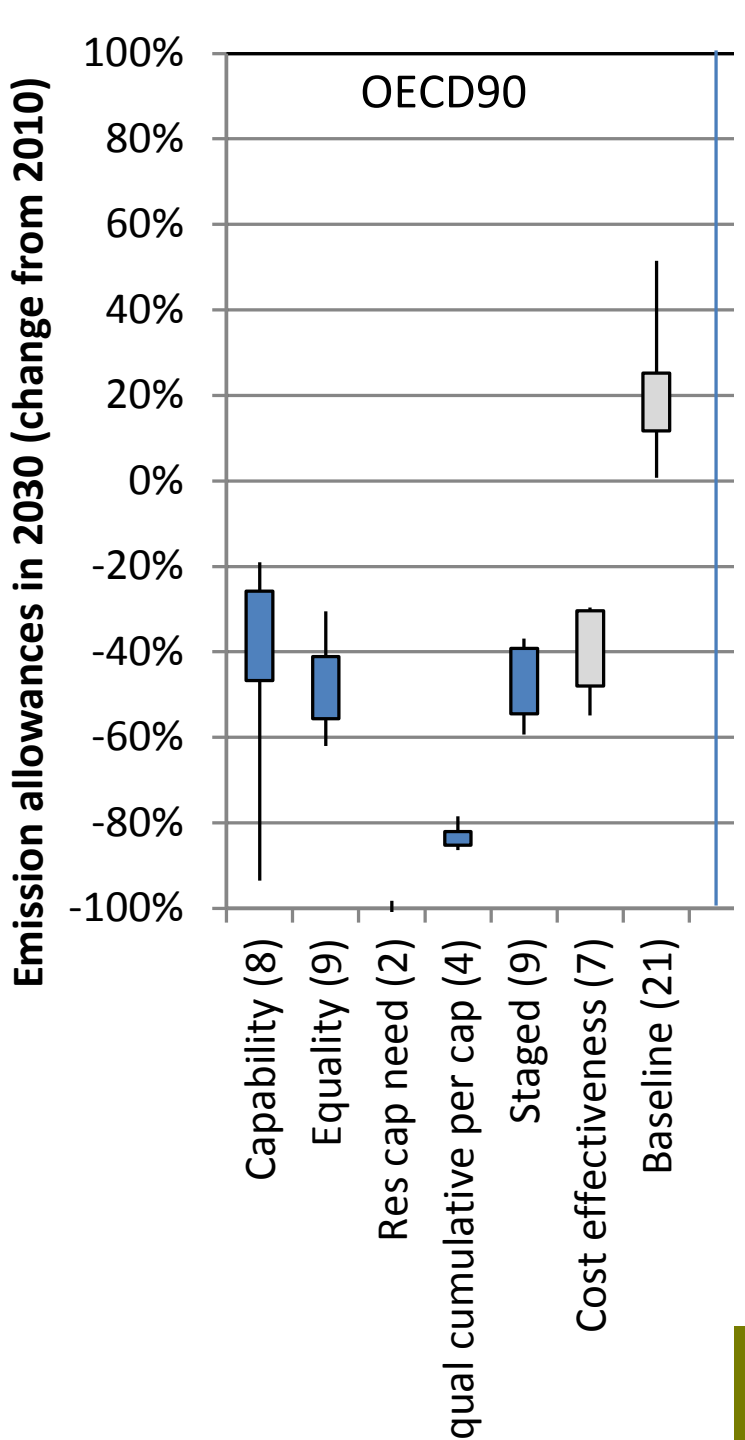
Emission allowances in 2030 for 450ppm CO_2e (rel. 2010)



Note: for reporting reasons we show the emission allowances compared to 2010 levels, but this does not imply a preference for a specific base-year, which could also be e.g. 1990 or 2005. EIT: Economies in Transition; MAF: Middle East and North Africa; LAM: Latin America and Caribbean



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- **On the short-term large differences in the reduction targets, depending on the effort-sharing scheme, in particular for the OECD region**
  - For example, for OECD the "Responsibility, capability, need" lead to negative emission allowances and "Equal per capita accumulative emissions" to low.
- **Main difference with AR4: larger ranges due to more 'extreme' approaches**
- **Implementation of the principle determines to a large extent the outcome** (CO2 only vs. all GHG etc.)

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Reduction target of OECD would be about 35-75% below 2010 levels (median: 50%). Similar reductions below 1990

Range	OECD1990		EIT		ASIA		MAF		LAM	
As change from 2010	-37%	-75%	-28%	-53%	7%	-33%	24%	-7%	-15%	-49%
As change from 1990	-33%	-74%	-52%	-69%	100%	25%	159%	95%	-3%	-41%

- Economies in Transition (**EIT**) about two-thirds
- **Asia** roughly at the 2010 emissions level or slightly below
- **Middle East and Africa** slightly above the 2010 level
- **Latin America** well below 2010 levels

- Including the studies for cost-effectiveness change OECD range 32% to 60% relative to 2010

Effort sharing – generic conclusions

- **Effort sharing approach:**
  - Not so important for countries that are close to (or determine) the average (e.g. USA/China), except a country is close to a participation threshold
  - Important for countries with particular circumstances (New Zealand, Brazil, Iceland)
- **Starting point of the calculation** (early action, Kyoto, 2020 pledges): important for only some countries
- **Financial transfers**. Especially for low stabilization levels, the effort sharing approaches differ in the extent by which they incentivize financial transfers between countries
  - High financial flows for "Responsibility, capability, need" and "Equal per capita accumulative emissions", and low stabilisation levels

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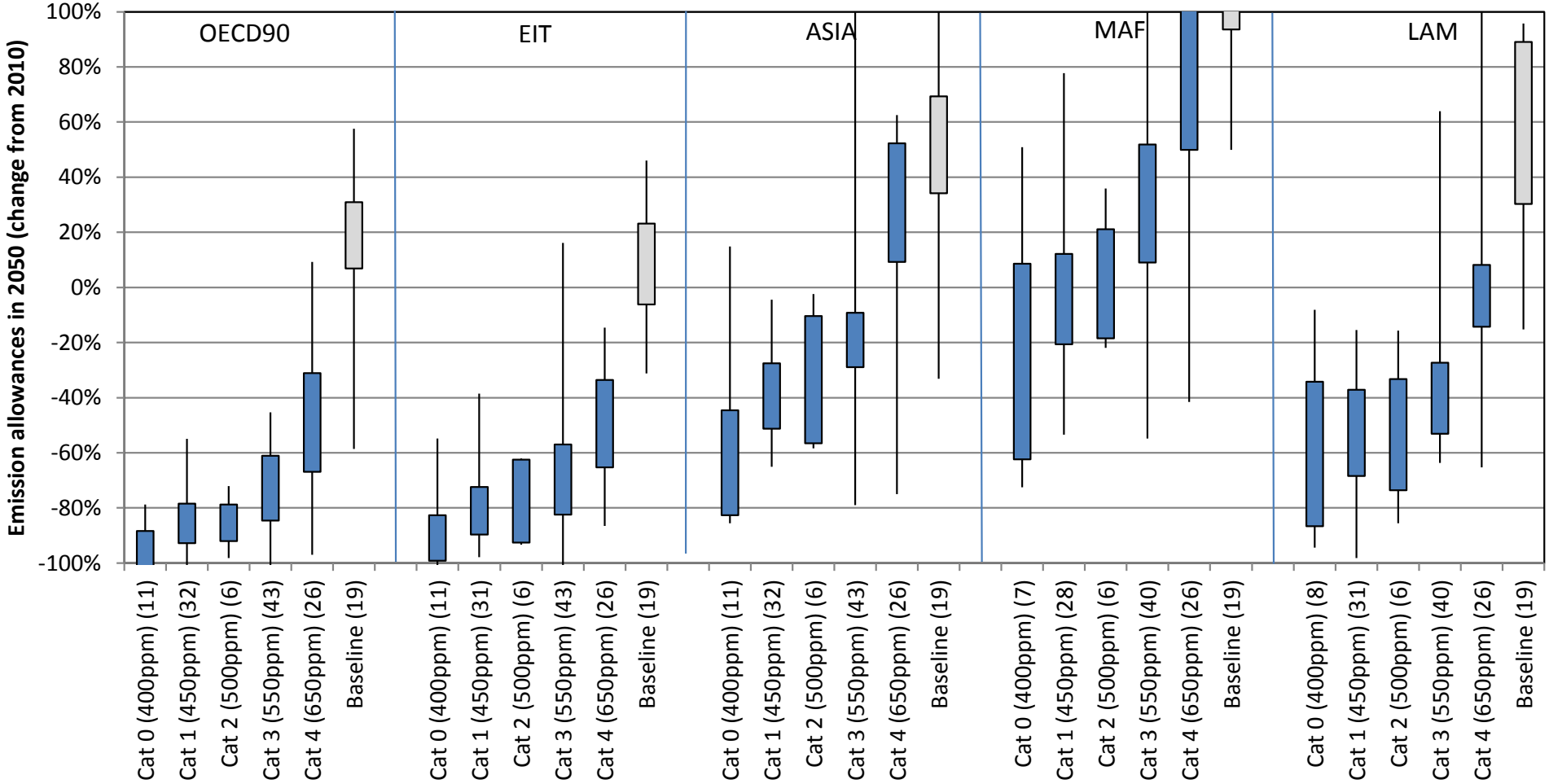
Emission allowances in 2050 (rel.2010) for stabilisation levels



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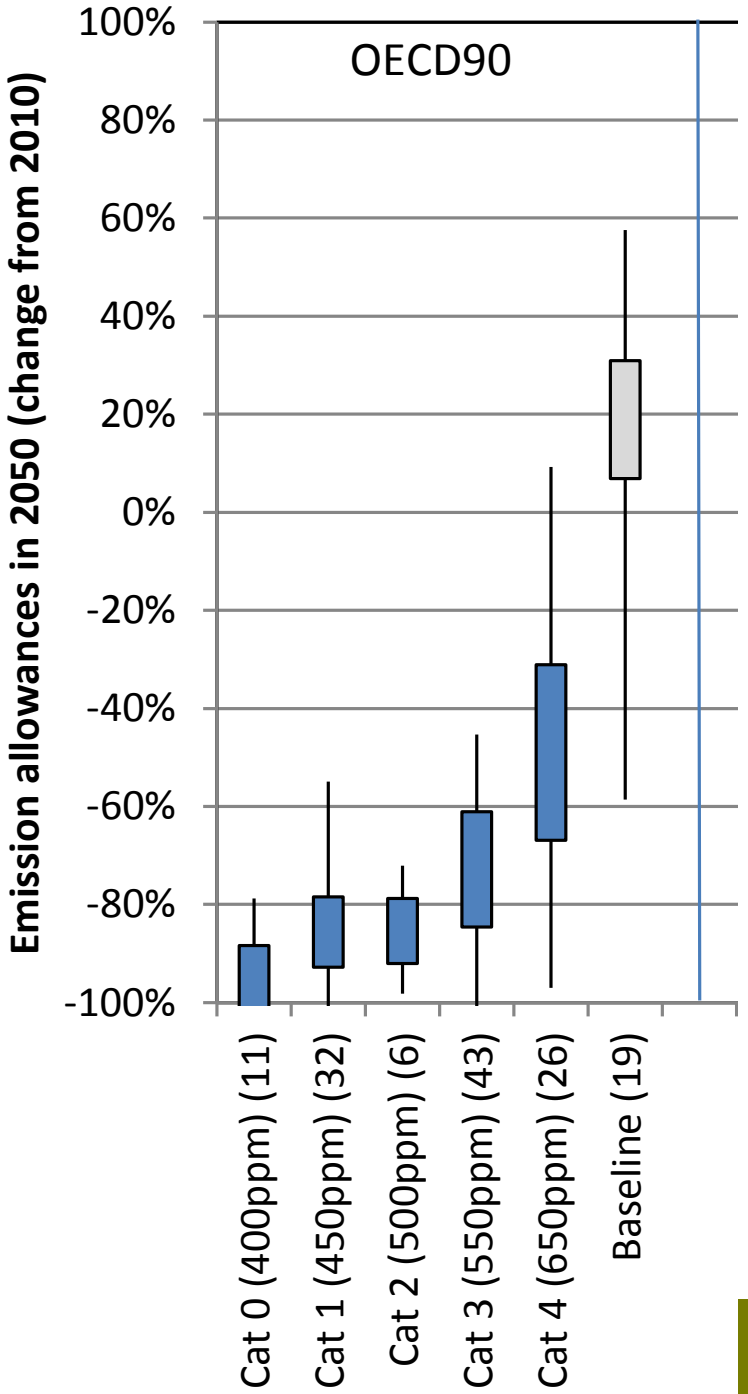

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Emission allowances in 2050 (rel. 2010) for stabilisation levels

- **On the long-term differences in the reduction targets decreases, and become less dependent on the effort-sharing scheme.**
- **Stabilisation goal itself is more important**

Effort sharing – generic conclusions

- **Stabilisation goal:** very important for all countries
- **For the low stabilisation levels under any effort sharing approach analysed here:**
  - allowances in OECD1990 and EIT are a fraction of 2010 emissions in 2050
  - for Asia approximately half of 2010 emission levels
  - for Latin America possibly also less than half of the 2010 level in 2050

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Key messages

- **Formula based effort sharing:**
  - Short term: outcomes highly depends on effort sharing approach, in particular for developed countries.
  - Long-term: outcomes less depends on effort sharing approach, but more on the final stabilization goal
  - Effort sharing approach: important, but the implementation matters
- **For reaching 450ppm CO_2e:**
  - **In 2030**
    - OECD1990 would receive initial allocations overall effort sharing categories half of the emissions of 2010, EIT roughly two thirds.
    - Allocations for group of ASIA in 2030 would be at about 2010 level
    - Allocations for MAF slightly above 2010 level, and LAM below 2010.
  - **For 2050**
    - allowances in OECD1990 and EIT would be a fraction of today's emissions, approximately half of 2010 emission levels in Asia, and possibly less than half of the 2010 level in Latin America.