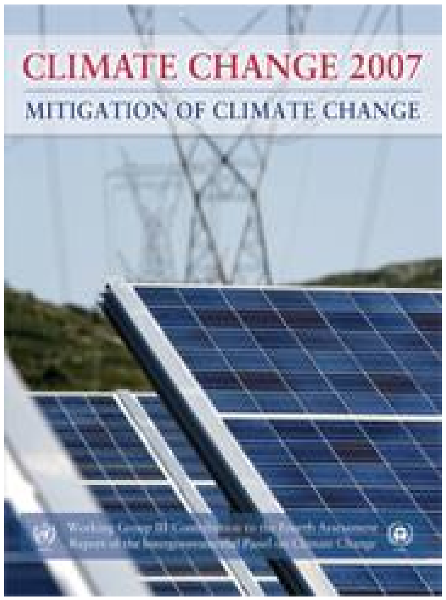
Controlling Climate Change and Fostering (sustainable) Development in an Economic Crisis – Can we have it all?



CENTER FOR CLIMATE CHANGE AND SUSTAINABLE ENERGY POLICY

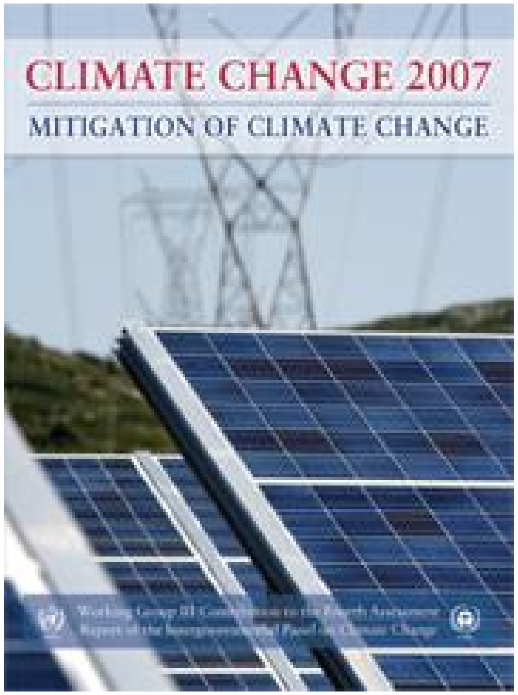
CENTRAL EUROPEAN UNIVERSITY

Diana Ürge-Vorsatz

Climate Change and Higher Education, Feb 26,2009, CEU

Outline

- CC science: CC is here and can be attributed to humans
- Stabilisation is a Herculean task, but doable
- Choice of stabilisation pathway determines SD implications
- The free lunch you are paid to eat
- Your potential role in helping the world to eat the free lunches



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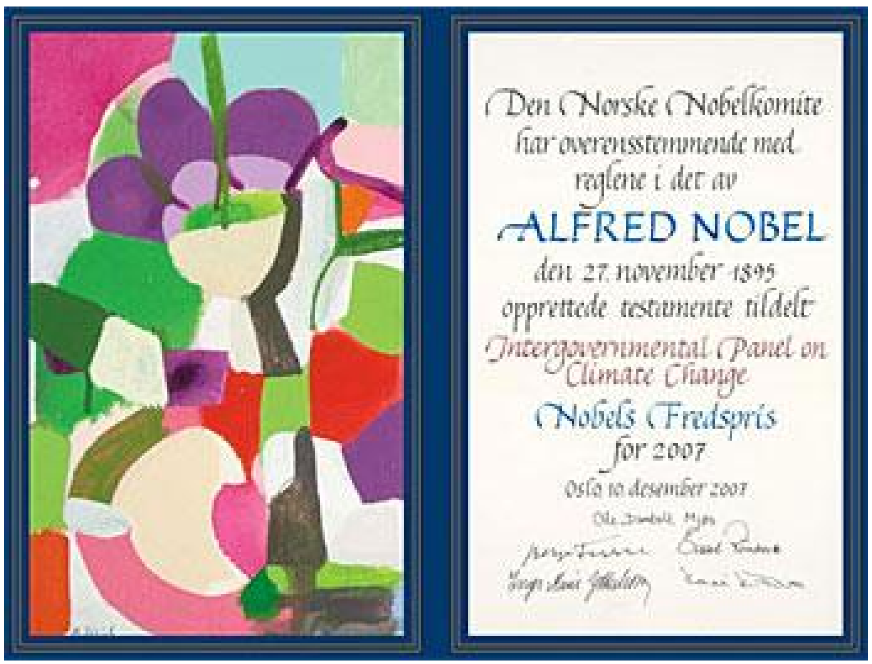
IPCC was honored by the Nobel Peace Prize of 2007



Oslo, 10 December 07

The Intergovernmental Panel on Climate Change

and Albert Arnold (Al) Gore Jr.

were awarded of the Nobel Peace Prize

"for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change".

Acknowledged to contribute to the Prize from CEU:

Aleksandra Novikova

Diana Urge-Vorsatz

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Climate change: background from the IPCC AR4

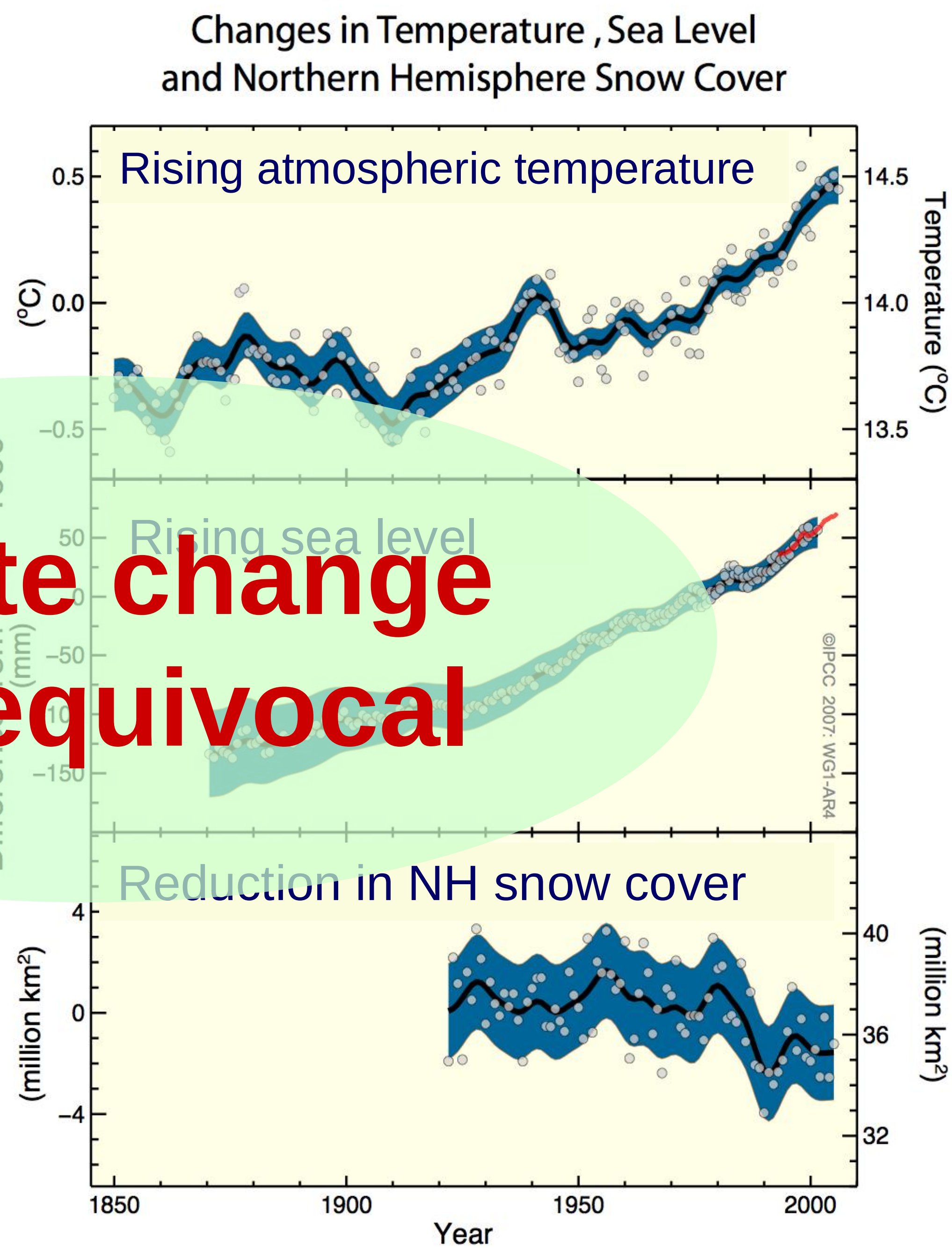
Center for Climate Change and Sustainable Energy Policy

Central European University

Many changes signal a warming world

- ➢Atmospheric water vapor increasing
- ➢Glaciers retreating
- ➢Arctic sea ice extent decreasing
- ➢Extreme temperatures increasing

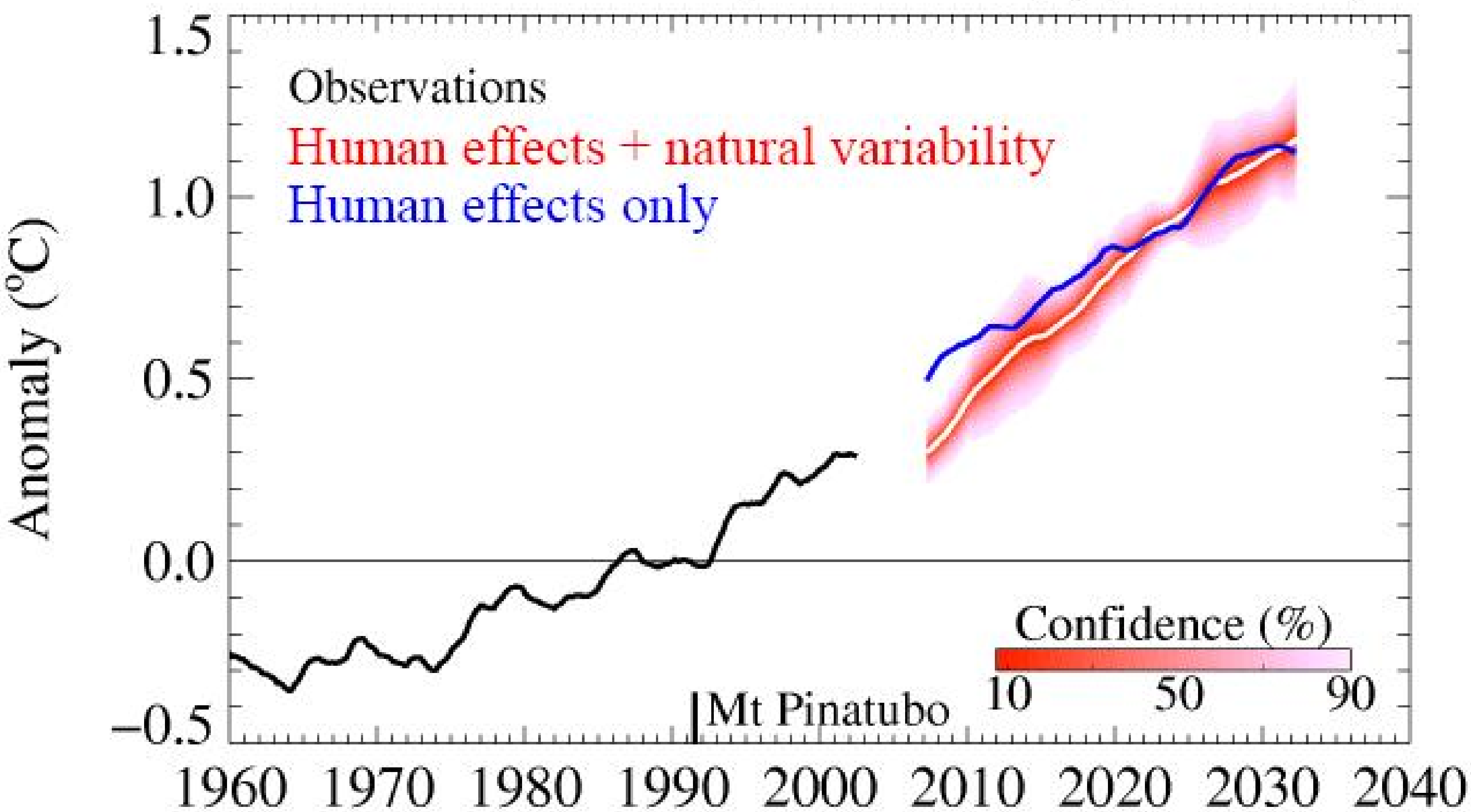
Climate change is unequivocal



Source: Susan Solomon, April 10, CEU

30 year forecasts from March 2007

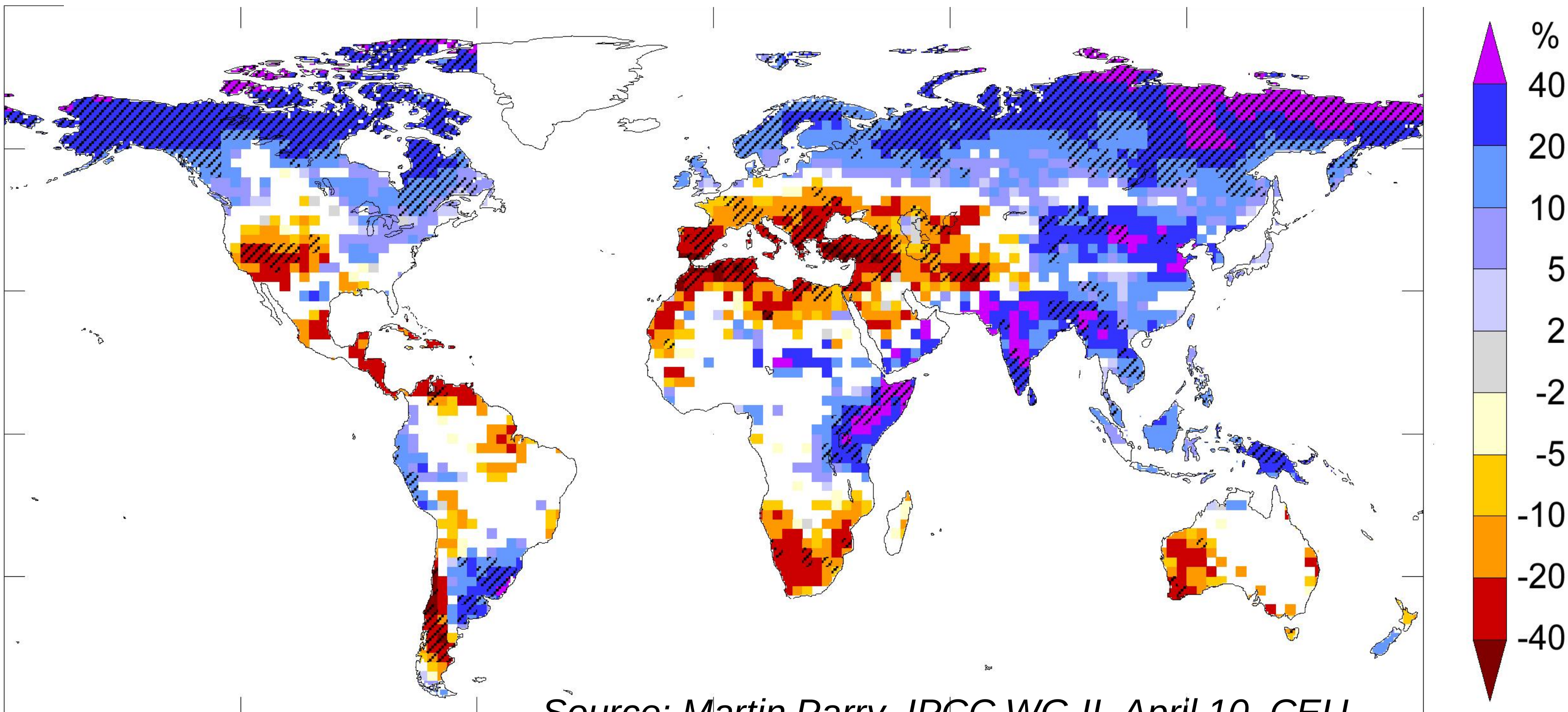
Global mean surface temperature anomaly (5 years means)



Effects of climate change

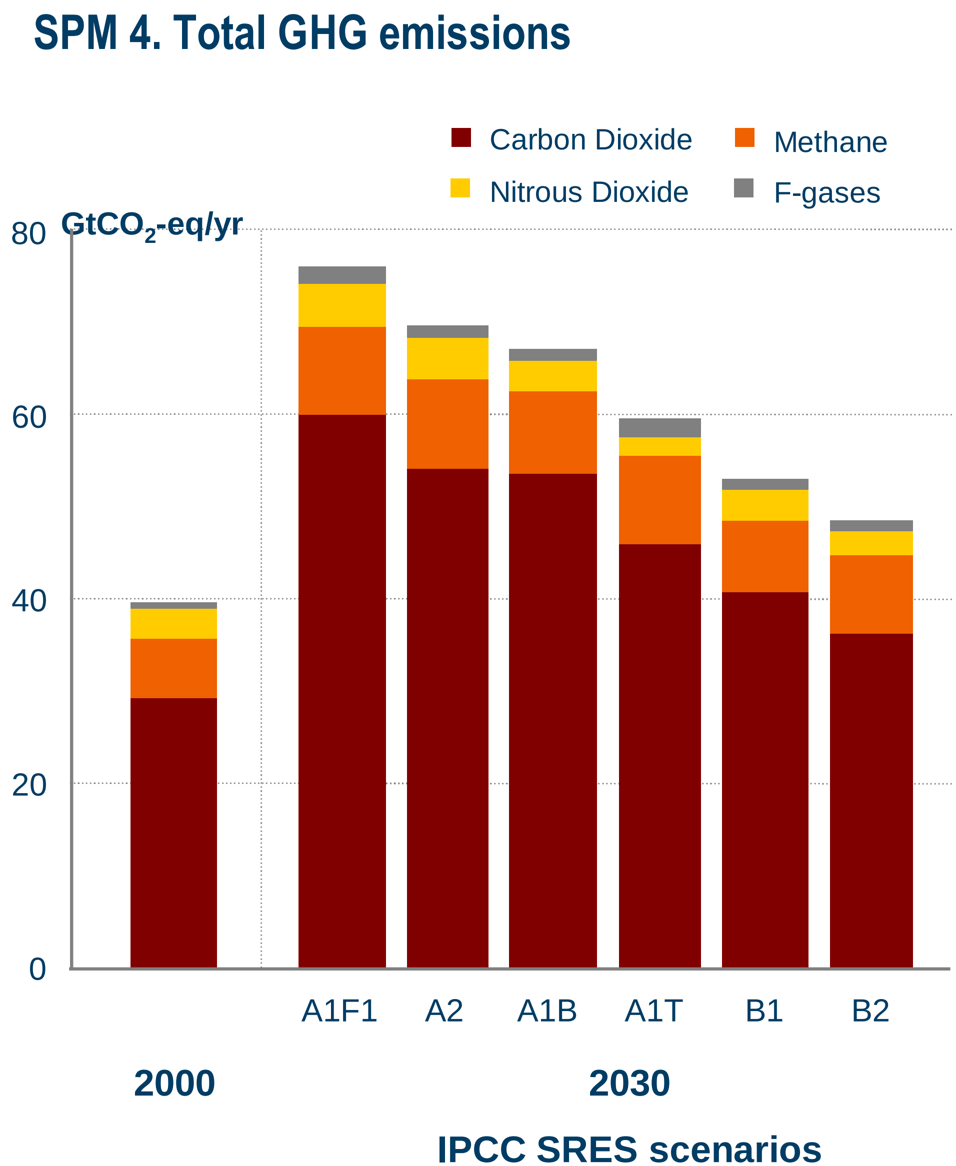
- The trends are observed on every continent, i.e. are global
- ***Most key impacts stem from reduced water availability***

Fig 3.4.WG II: Change in annual runoff by 2041-60 relative to 1900-70 (under the SRES A1B emissions scenario, based on 12 models)



Source: Martin Parry, IPCC WG II, April 10, CEU

The challenge



- Most of the T increase since the mid-20th century is *very likely* due to the increase in anthropogenic GHG concentrations (SPM WG I)
- Global GHG emissions have increased by 70% in 1970 – 2004 (SPM.2 WG III)
- By 2030 there will be a 25-90% increase in GHG emissions compared with 2000 unless additional policy measures are put in place (SPM.3 WG III)

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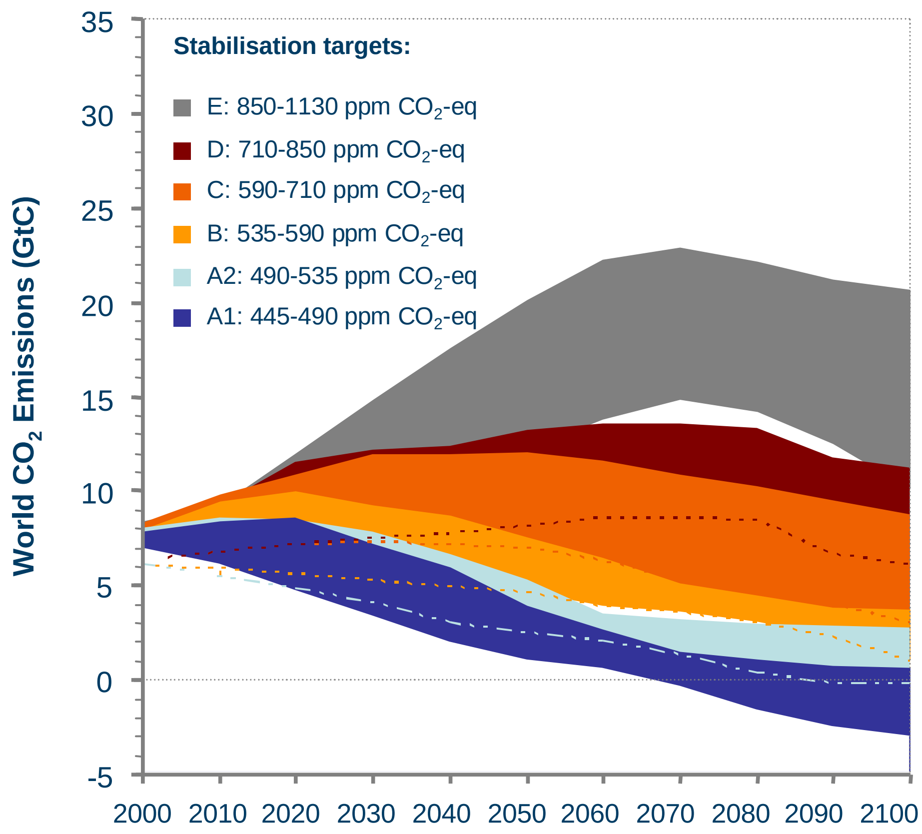
In order to limit the impacts of CC, GHG emissions have to be reduced significantly

- Stabilizing global mean temperature requires a stabilization of GHG concentrations in the atmosphere -> GHG emissions would need to peak and decline thereafter
- The lower the target stabilisation level limit, the earlier global emissions have to peak.
- Limiting increase to 3.2 – 4°C requires emissions to peak within the next 55 years.
- Limiting increase to 2.8 – 3.2°C requires global emissions to peak within 25 years.
- Limiting global mean temperature increases to 2 – 2.4°C above pre-industrial levels requires global emissions to peak within 15 years and then fall to about **50 to 85% of current levels by 2050**.

Based on SPM 7, WG III. Emission pathways to mitigation scenarios



Multigas and CO_2 only studies combined

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Stabilising climate change in a period of economic crisis?

- Stabilising climate change at a low T increase (such as 2C) is a Herculean challenge
- However, the IPCC has stated that it is feasible
  - *"The range of stabilization levels assessed can be achieved by deployment of a portfolio of technologies that are currently available and those that are expected to be commercialised in coming decades."*
- The stabilisation path we choose determines the impact of mitigation efforts on (sustainable) development
- Some options are more challenging to implement in a financial/economic crisis than others
- There are important synergistic opportunities among CC mitigation, SD and mitigating the impact of the global economic crisis – energy efficiency is a key climate lever

Having it all: (sustainable) development, CC mitigation and crisis impact alleviation

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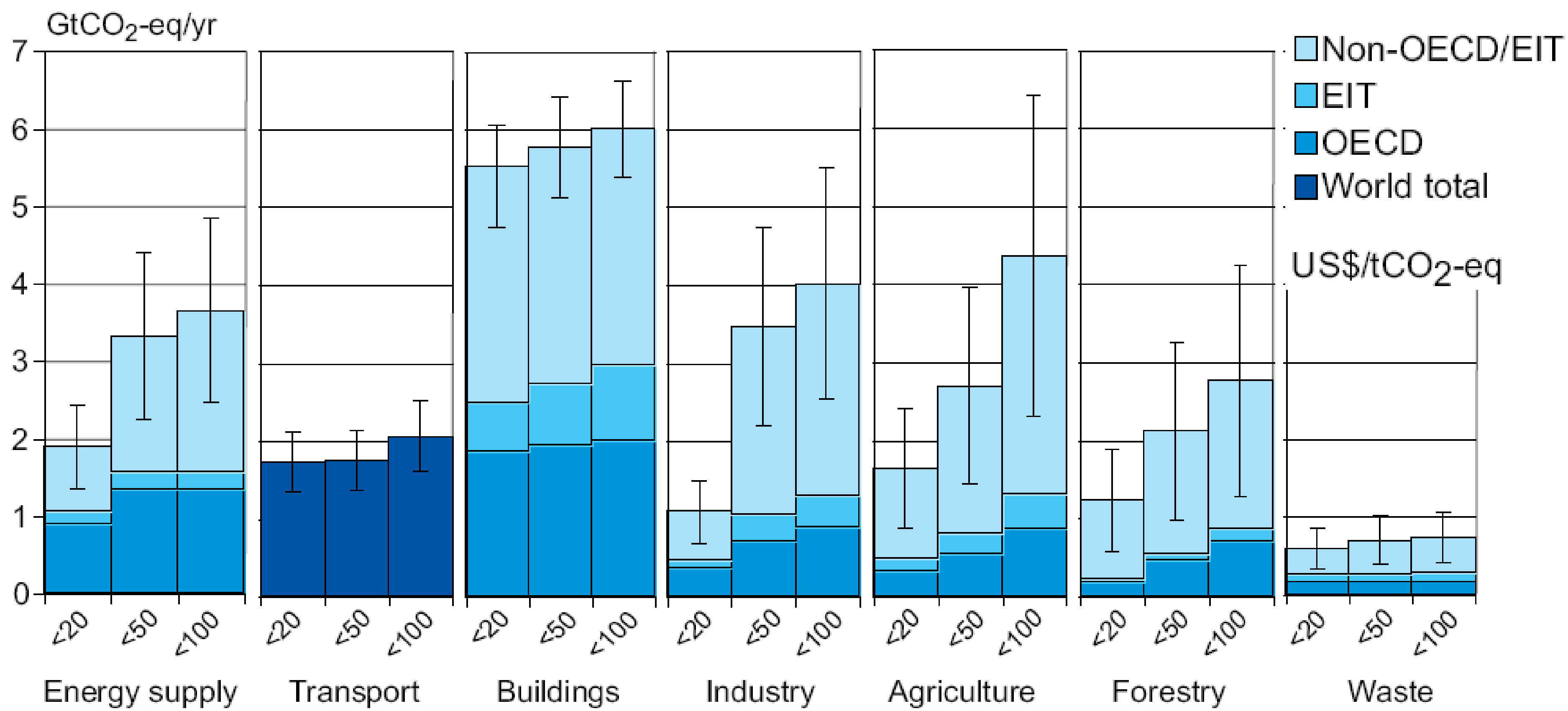
The role and benefits of improved energy efficiency

Sectoral economic potential for global mitigation for different regions as a function of carbon price, 2030



(potential at <US$100/ tCO_2-eq: 2.4 - 4.7 Gt CO_2-eq/yr)	*(potential at <US$100/ tCO_2-eq: 1.6 - 2.5 Gt CO_2-eq/yr)*	*(potential at <US$100/ tCO_2-eq: 5.3 -6.7 Gt CO_2-eq/yr)*	*(potential at <US$100/ tCO_2-eq: 2.5 - 5.5 Gt CO_2-eq/yr)*	*(potential at <US$100/ tCO_2-eq: 2.3 -6.4 Gt CO_2-eq/yr)*	*(potential at <US$100/ tCO_2-eq: 1.3 - 4.2 Gt CO_2-eq/yr)*	*(potential at <US$100/ tCO_2-eq: 0.4 - 1 Gt CO_2-eq/yr)*

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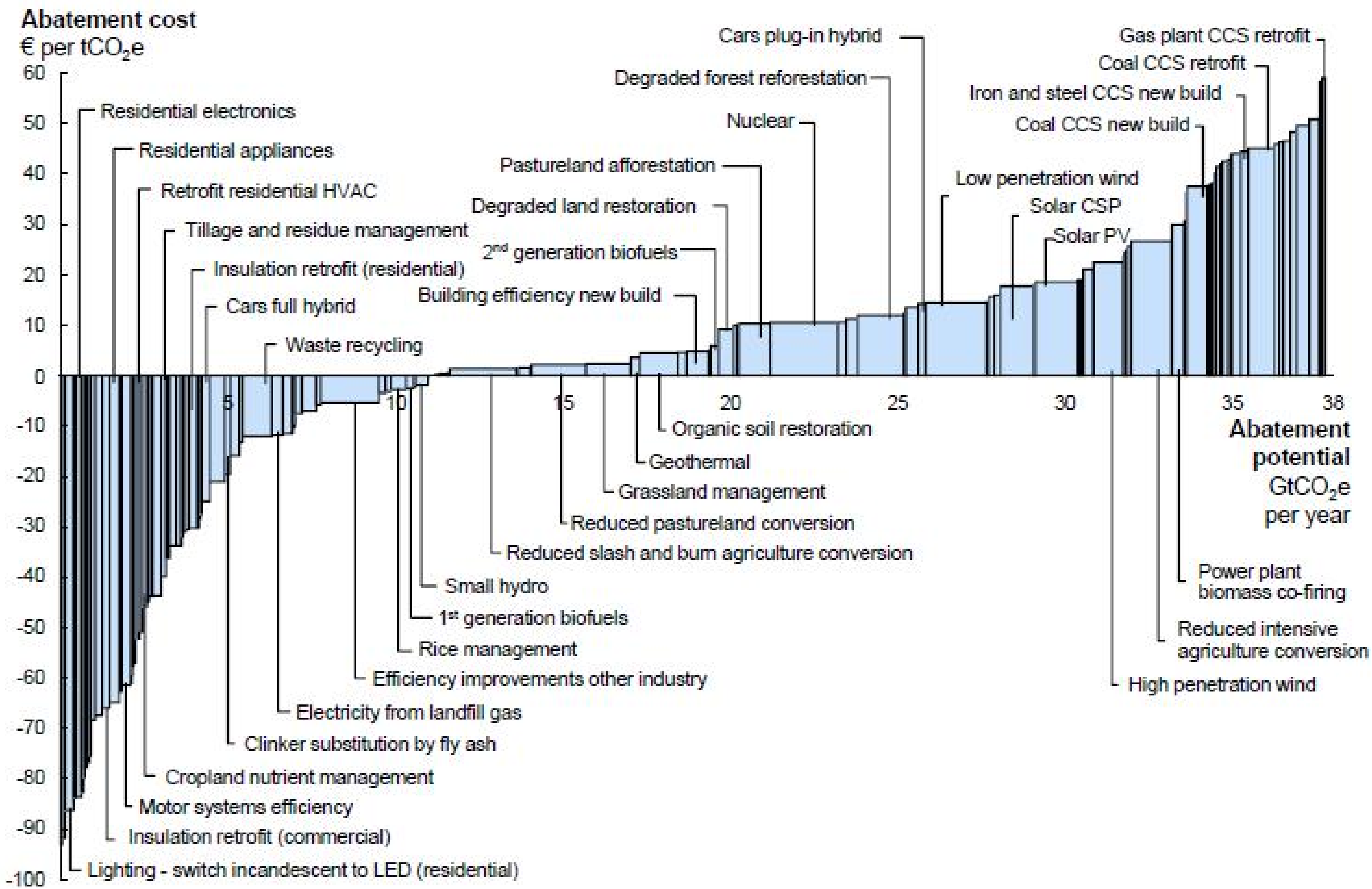
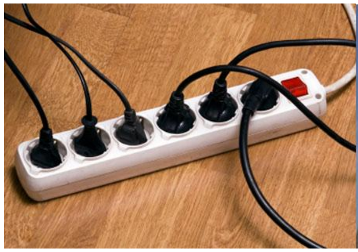
Global GHG abatement cost curve by McKinsey

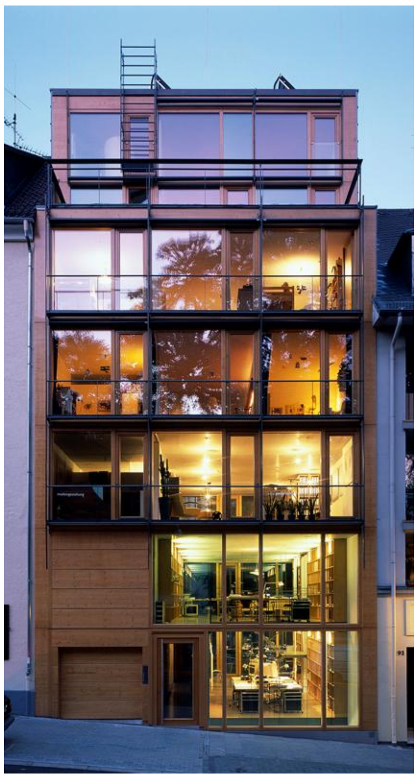


Mitigation through improved efficiency: global importance

- Capturing *only the cost-effective potential in buildings* can supply app. 38% of total reduction needed in 2030 to keep us on a trajectory capping warming at 3˚C
- As much as 80% of the operational emissions of standard new and existing buildings can be saved through integrated design principles and renovation
  - Often at no or little extra cost



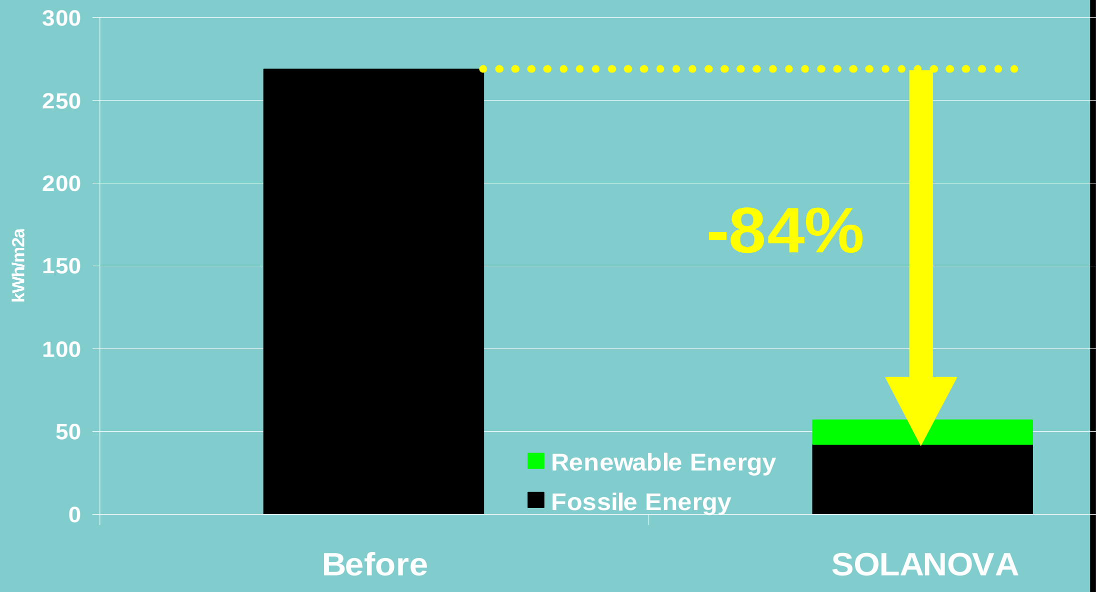

Buildings utilising passive solar construction



Source: Jan Barta, Center for Passive Buildings, www.pasivnidomy.cz, EEBW2006

“EU buildings – a goldmine

for CO2 reductions, energy security, job creation and addressing low income population problems”



Source: Claude Turmes (MEP), Amsterdam Forum, 2006

More on Solanova: www.solanova.eu

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Example of savings by reconstruction

Before reconstruction

Reconstruction according to the passive house principle

over 150 kWh/(m²a)

-90%

15 kWh/(m²a)

Source: Jan Barta, Center for Passive Buildings, www.pasivnidomy.cz, EEBW2006

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Mitigation in the buildings sector: global importance

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  - Often at no or little extra cost
- Net zero energy/emission, or even negative energy buildings are dynamically growing

Low and zero-net energy buildings already exist

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Mitigation in the buildings sector: global importance

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- As much as 80% of the operational emissions of standard new and existing buildings can be saved through integrated design principles and renovation
  - Often at no or little extra cost
- Net zero energy/emission, or even negative energy buildings are dynamically growing
- A large share of these options have “negative costs” – i.e. represent profitable investment opportunities

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The free lunch you are paid to eat: the co-benefits of mitigation through EE 1.

- Co-benefits are often not quantified, monetized, or identified
- Overall value of co-benefits may be higher than value of energy savings
- A wide range of co-benefits, including:
- Reduced morbidity and mortality
  - **App. 2.2 million deaths attributable to indoor air pollution each year from biomass** (wood, charcoal, crop residues and dung) and coal burning for household cooking and heating, in addition to acute respiratory infections in young children and chronic pulmonary disease in adults
  - Gender benefits: women and children also collect biomass fuel, they can work or go to school instead

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The free lunch you are paid to eat: the co-benefits of mitigation through EE 1.

- **Poverty alleviation and Improved social welfare**
  - Fuel poverty: In the UK, about 20% of all households live in fuel poverty. The number of annual excess winter deaths is estimated at around 30 thousand annually in the UK alone.
  - Energy-efficient household equipment and low-energy building design helps alleviate poverty and households cope with increasing energy tariffs
- **Employment creation**
  - “producing” energy through energy efficiency or renewables is more employment intensive than through traditional ways
  - a 20% reduction in EU energy consumption by 2020 can potentially create 1 mil new jobs in Europe
- **new business opportunities**
  - a market opportunity of € 5–10 billion in energy service markets in Europe
- **Reduced energy costs will make businesses more competitive**
- **Others:**
  - Improved energy security, reduced burden of constrained generation capacities, Increased value for real estate, Improved energy services (lighting, thermal comfort, etc) can improve productivity, Improved outdoor air quality, improved comfort, etc.

So why isn't everyone eating free lunches?

- There are significant market barriers that prevent markets to capture the energy-efficient solutions
  - Including agent/principal barriers and misplaced incentives, distorted energy tariffs and subsidies, lack of knowledge and awareness, lack of experts, etc.
- For an ambitious stabilisation pathway embarking on efficiency a complete rethink is needed how we conceptualise energy
  - Provide energy services rather than energy per se
- *How will YOU catalise the world to have access to these free lunches…?*

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Conclusions

- Climate change is unequivocal and can largely be attributed to human activities
- Stabilising CC is a Herculean task but doable
- Improving energy efficiency is a key mitigation lever that also has strong synergies with (sust) development agendas and economic crisis impact alleviation…
- …due to the strong and numerous co-benefits
- However, strong and concerted efforts are needed to unlock these potentials
- There is a wide variety of cutting-edge opportunities and needs in leveraging these potentials: *your career…?*
  - *Business (ESCO), academia, NGO, industry, government*

Thank you for your attention

hvg.hu hírek szünet nélkül

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For more information on the AR4: www.ipcc.ch

If you are interested in contributing to the Global Energy Assessment, visit Globalenergyassessment.org or write to me

Supplementary slides

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Characteristics of stabilisation scenarios and the emission reduction needs

Category	Radiative forcing (W/m^2)	CO_2 concentration[c)] (ppm)	CO_2-eq concentration[c)] (ppm)	Global mean temperature increase above pre-industrial at equilibrium, using "best estimate" climate sensitivity[b), c)] (°C)	Peaking year for CO_2 emissions[d)]	Change in global CO_2 emissions in 2050 (% of 2000 emissions)[d)]
I	2.5-3.0	350-400	445-490	2.0-2.4	2000-2015	-85 to -50
II	3.0-3.5	400-440	490-535	2.4-2.8	2000-2020	-60 to -30
III	3.5-4.0	440-485	535-590	2.8-3.2	2010-2030	-30 to +5
IV	4.0-5.0	485-570	590-710	3.2-4.0	2020-2060	+10 to +60
V	5.0-6.0	570-660	710-855	4.0-4.9	2050-2080	+25 to +85
VI	6.0-7.5	660-790	855-1130	4.9-6.1	2060-2090	+90 to +140
						Total

Source: IPCC AR4, WGIII, Table SPM5

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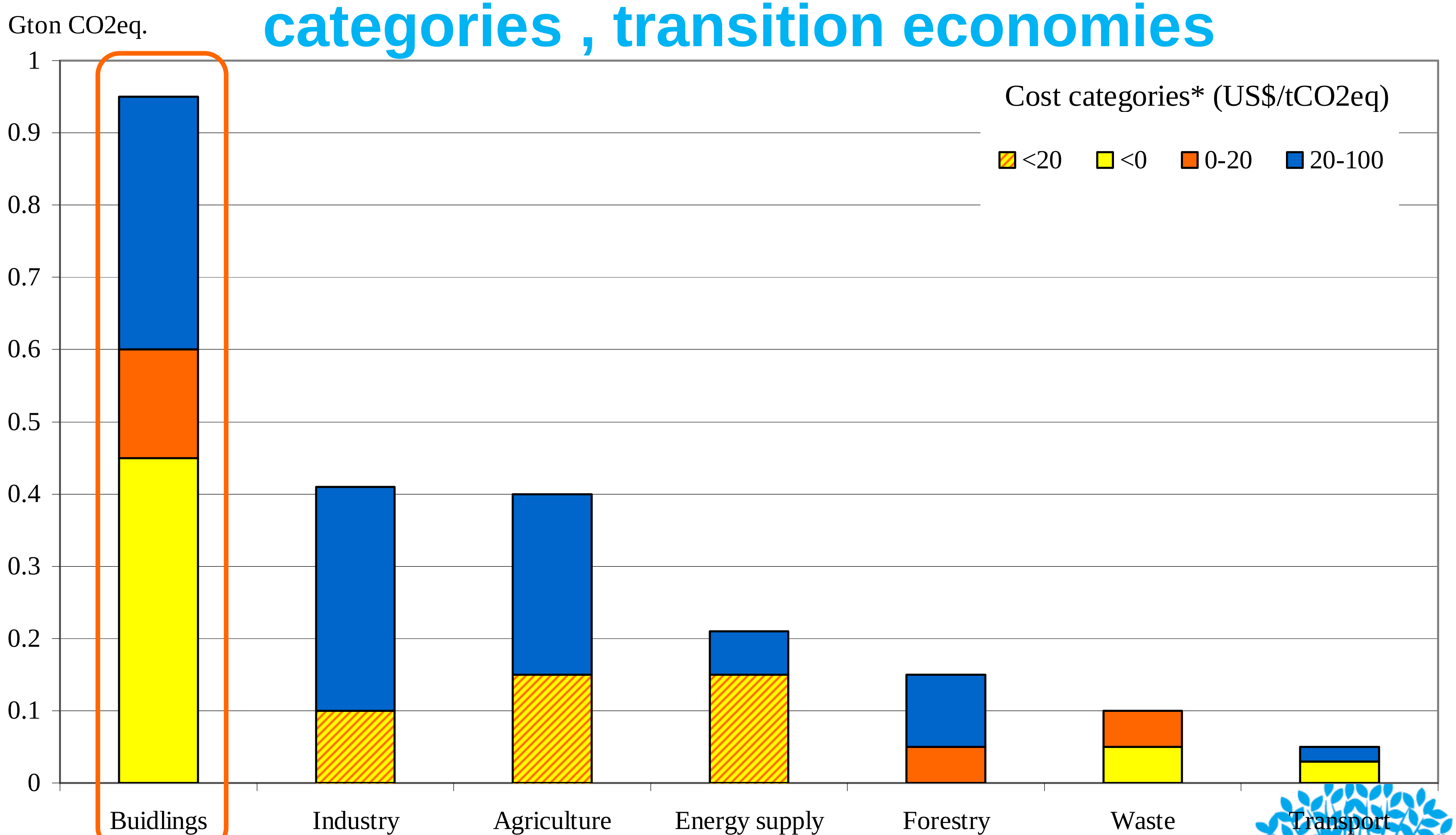
Estimated potential for GHG mitigation at a sectoral level in 2030 in different cost categories , transition economies



* For the buildings, forestry, waste and transport sectors, the potential is split into three cost categories: at net negative costs, at 0-20 US$/tCO2, and 20-100 US$/tCO2. For the industrial, forestry, and energy suppy sectors, the potential is split into two categories: at costs below 20 US$/tCO2 and at 20-100 US$/tCO2.

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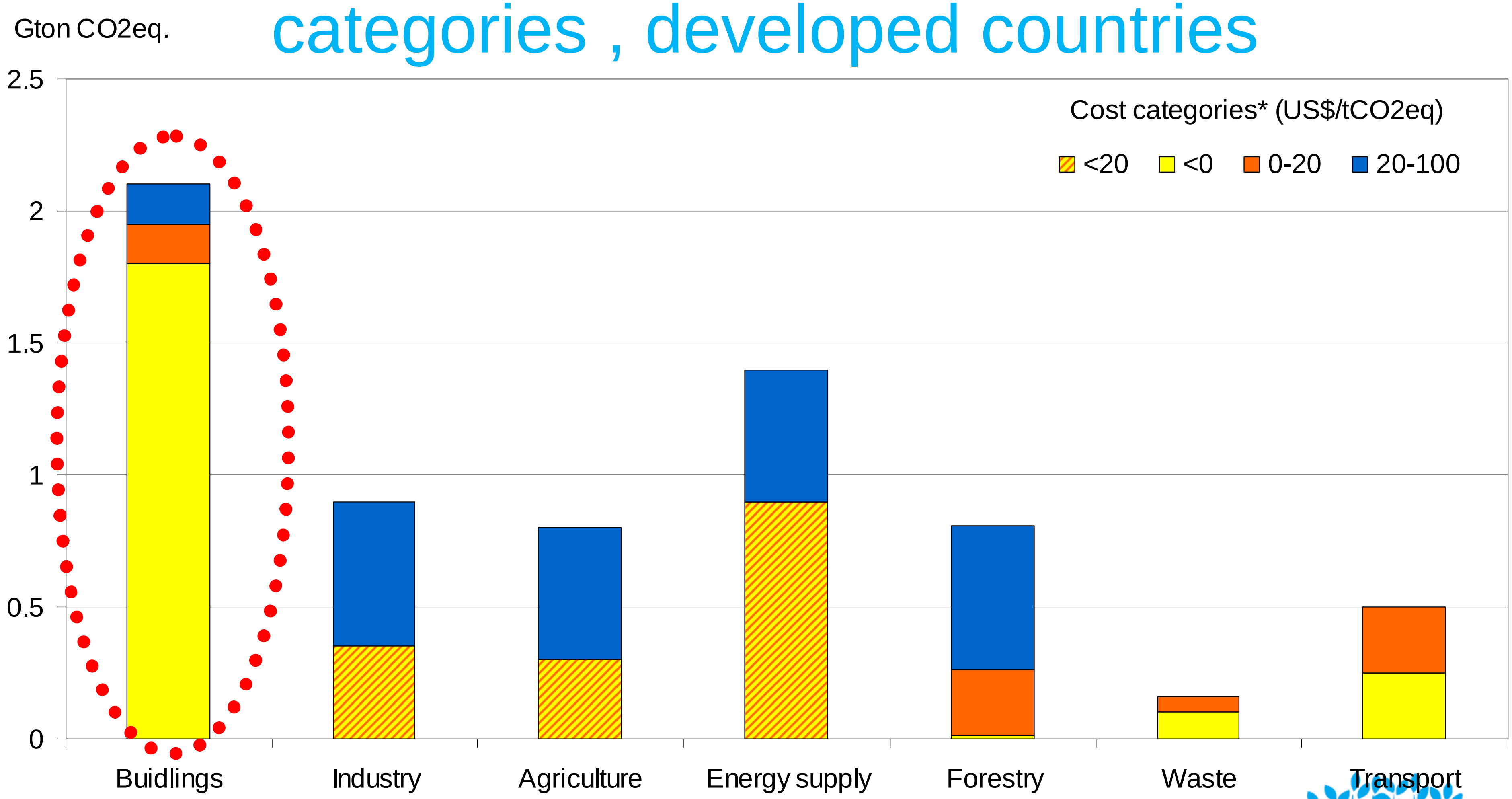
Estimated potential for GHG mitigation at a sectoral level in 2030 in different cost categories , developed countries



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Source: constructed based on the IPCC (2007)

The impact and effectiveness of various policy instruments
Part 1: Control and regulatory mechanisms- normative instruments

Policy instrument	Country examples	Effectiveness	Energy or emission reductions for selected best practices	Cost-effectiveness	Cost of GHG emission reduction for selected best practices
Appliance standards	EU, US, JP, AUS, Br, Cn	High	Jp: 31 M tCO_2 in 2010; Cn: 250 Mt CO_2 in 10 yrs US: 1990-1997: 108 Mt CO2eq, in 2000: 65MtCO_2 = 2.5% of el.use, Can: 8 MtCO_2 in total by 2010, Br: 0.38 MtCO_2/year AUS: 7.9 MtCO_2 by 2010	High	AUS: -52 $/t$CO_2$ in 2020, US: -65 $/t$CO_2$ in 2020; EU: -194 $/t$CO_2$ in 2020 Mar: 0.008 $/kWh
Building codes	SG, Phil, Alg, Egy, US, UK, Cn, EU	High	HkG: 1% of total el.saved; US: 79.6 M tCO_2 in 2000; EU: 35-45 MtCO_2, up to 60% savings for new bdgs UK: 2.88 MtCO_2 by 2010, 7% less en use in houses 14% with grants& labelling Cn: 15-20% of energy saved in urban regions	Medium	NL: from -189 $/t$CO_2$ to -5 $/t$CO_2$ for end-users, 46-109 $/t$CO_2$ for Society
Procurement regulations	US, EU, Cn, Mex, Kor, Jp	High	Mex: 4 cities saved 3.3 ktCO_2eq. in 1year Ch: 3.6Mt CO_2 expected EU: 20-44MtCO_2 potential US:9-31Mt CO_2 in 2010	High/ Medium	Mex: $1Million in purchases saves $726,000/year; EU: <21$/tCO_2
Energy efficiency obligations and quotas	UK, Be, Fr, I, Dk, Ir	High	UK: 2.6 M tCO_2/yr	High	Flanders: -216$/t$CO_2$ for households, -60 $/t$CO_2$ for other sector in 2003. UK: -139 $ /tCO_2

The impact and effectiveness of various policy instruments
Part 2: Regulatory- informative instruments

Policy instrument	Country examples	Effec-tiveness	Energy or emission reductions for selected best practices	Cost-effectiveness	Cost of GHG emission reduction for selected best practices
Mandatory labelling and certification programs	US, Jp, CAN, Cn, AUS, Cr, EU, Mex, SA	**High**	AUS: 5 Mt CO_2 savings 1992-2000, 81Mt CO_2 2000-2015, SA: 480kt/yr Dk: 3.568Mt CO_2	**High**	AUS:-30$/t CO_2 abated
Mandatory audit programs	US; Fr, NZL, Egy, AUS, Cz	**High, variable**	US: Weatherisation program: 22% saved in weatherized households after audits (30% according to IEA)	**Medium/ High**	US Weatherisation program: BC-ratio: 2.4
Utility demand-side management programs	US, Sw, Dk, Nl, De, Aut	**High**	US : 36.7 MtCO2in 2000, Jamaica: 13 GWh/ year, 4.9% less el use = 10.8 ktCO2 Dk: 0.8 MtCO2 Tha: 5.2 % of annual el sales 1996-2006	**High**	EU: - 255$/tCO2 Dk: -209.3 $/tCO2 US: Average costs app. -35 $/tCO2 Tha: 0.013 $/kWh

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The impact and effectiveness of various policy instruments
Part 3: Economic and market-based instruments

Policy instrument	Country examples	Effec-tiveness	Energy or emission reductions for selected best practices	Cost-effectiveness	Cost of GHG emission reduction for selected best practices
Energy performance contracting/ ESCO support	De, Aut, Fr, Swe, Fi, US, Jp, Hu	High	Fr, S, US, Fi: 20-40% of buildings energy saved; EU:40-55MtCO_2 by 2010 US: 3.2 MtCO_2/yr Cn: 34 MtCO_2	Medium / High	EU: mostly at no cost, rest at <22$/t$CO_2$; US: Public sector: B/C ratio 1.6, Priv. sector: 2.1
Cooperative/ technology procurement	De, It, Sk, UK, Swe, Aut, Ir, US,Jp	High/Medium	US: 96 ktCO_2 German telecom company: up to 60% energy savings for specific units	Medium /High	US: - 118 $/ t$CO_2$ Swe: 0.11$/kWh (BELOK)
Energy efficiency certificate schemes	It, Fr	High	I: 1.3 MtCO_2 in 2006, 3.64 Mt CO_2 eq by 2009 expected	High	Fr: 0.011 $/t$CO_2$ estimated
Kyoto Protocol flexible mechanisms	Cn, Tha, CEE (JI &AIJ)	Low	CEE: 220 K tCO2 in 2000 Estonia: 3.8-4.6 kt CO_2 (3 projects) Latvia: 830-1430 tCO_2	Low	CEE: 63 $/t$CO_2$ Estonia: 41-57$/t$CO_2$ Latvia: -10$/t$CO_2$

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Early investment are important

Table 11.17: Observed and estimated lifetimes of major GHG-related capital stock

Typical lifetime of capital stock			**Structures with influence > 100 years**
less than 30 years	**30-60 years**	**60-100 years**	
Domestic appliances Water heating and HVAC systems Lighting Vehicles	Agriculture Mining Construction Food Paper Bulk chemicals Primary aluminium Other manufacturing	Glass manufacturing Cement manufacturing Steel manufacturing Metals-based durables	Roads Urban infrastructure Some buildings

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Our target is all buildings, everywhere

The EEB project will map out the transition to a 2050 world in which buildings use **zero net energy**. They must also be aesthetically pleasing and meet other sustainability criteria, especially for air quality, water use and economic viability.

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