The role of the building sector in the climate change mitigation challenge

CENTER FOR CLIMATE CHANGE AND SUSTAINABLE ENERGY POLICY

CENTRAL EUROPEAN UNIVERSITY

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Mainstreaming Building Energy Efficiency Codes in Developing Countries

Nov 19, 2009, World Bank, Washington DC

Overview

- Introduction: the CC mitigation challenge
- The global and regional importance of the buildings sector in CC
- How far can buildings take us?
- the risk of the lock-in effect
- Summary – recommendations for codes worldwide

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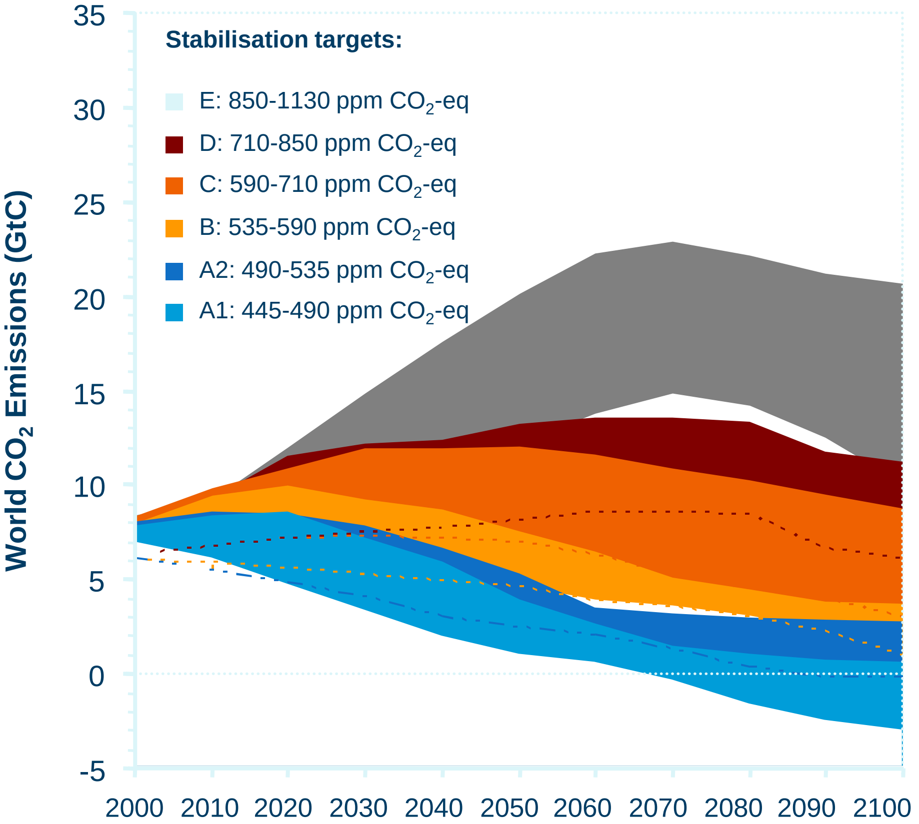
The climate change mitigation challenge

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 (SPM 18 WG III)
- 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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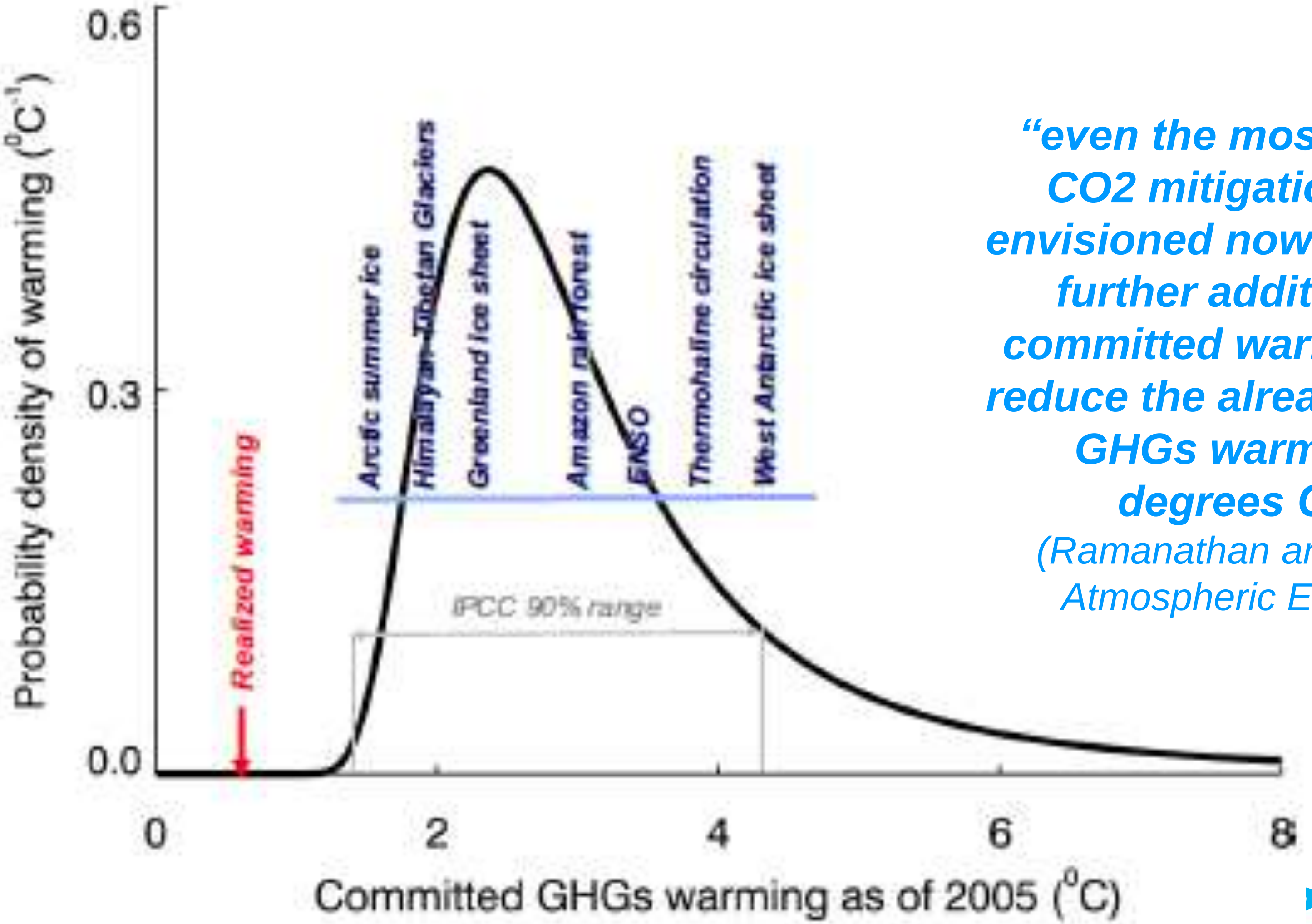
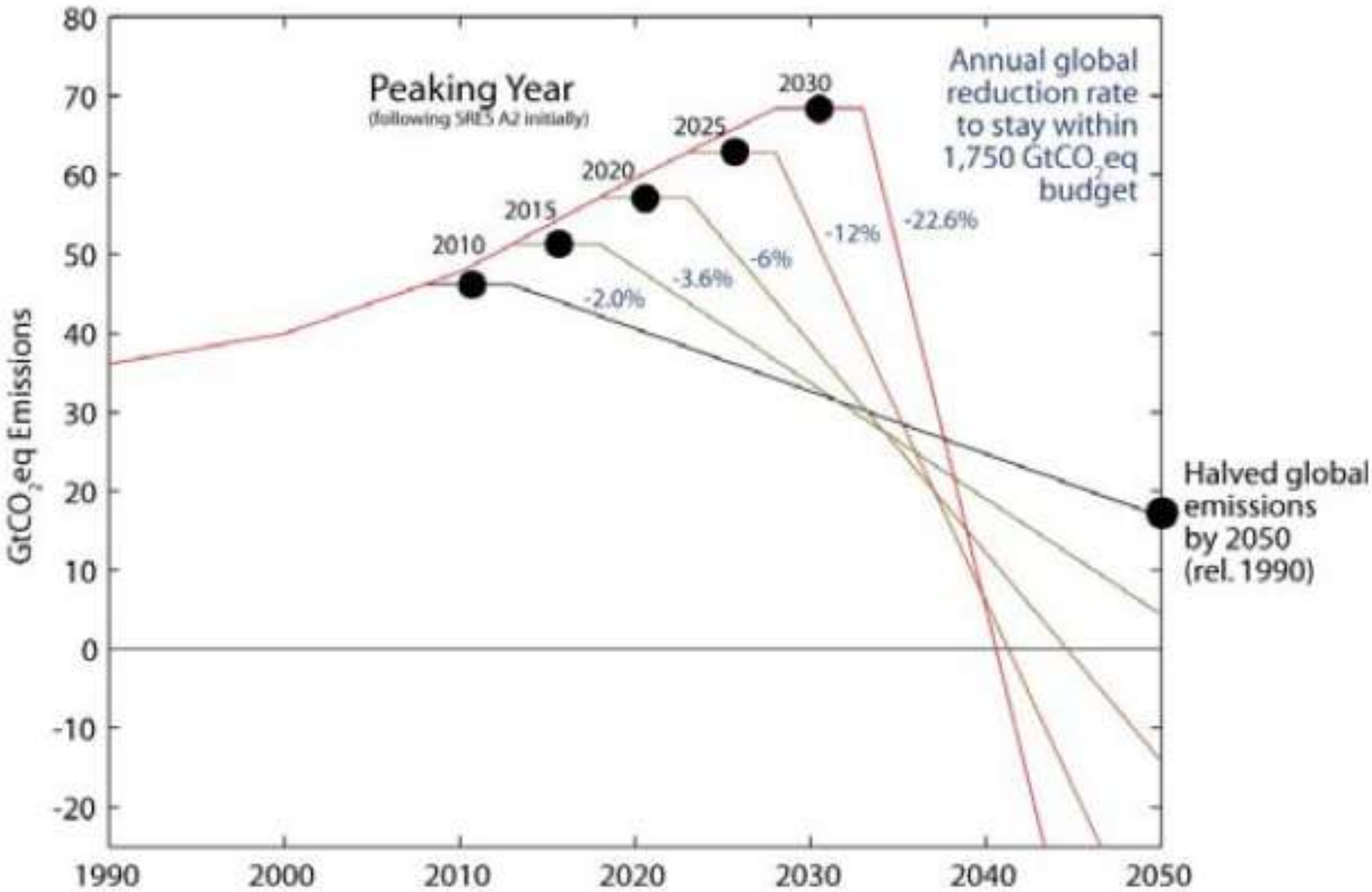
Probability distribution for the committed warming by GHGs between 1750 and 2005.
Shown are climate tipping elements and the temperature threshold range.



"even the most aggressive CO2 mitigation steps as envisioned now can only limit further additions to the committed warming, but not reduce the already committed GHGs warming of 2.4 degrees Celsius"

(Ramanathan and Feng 2008, Atmospheric Environment).

The later emissions peak, the more ambitious reductions needed



Source: Meinshausen et al 2009

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The role of the buildings sector in CC mitigation: global and regional importance

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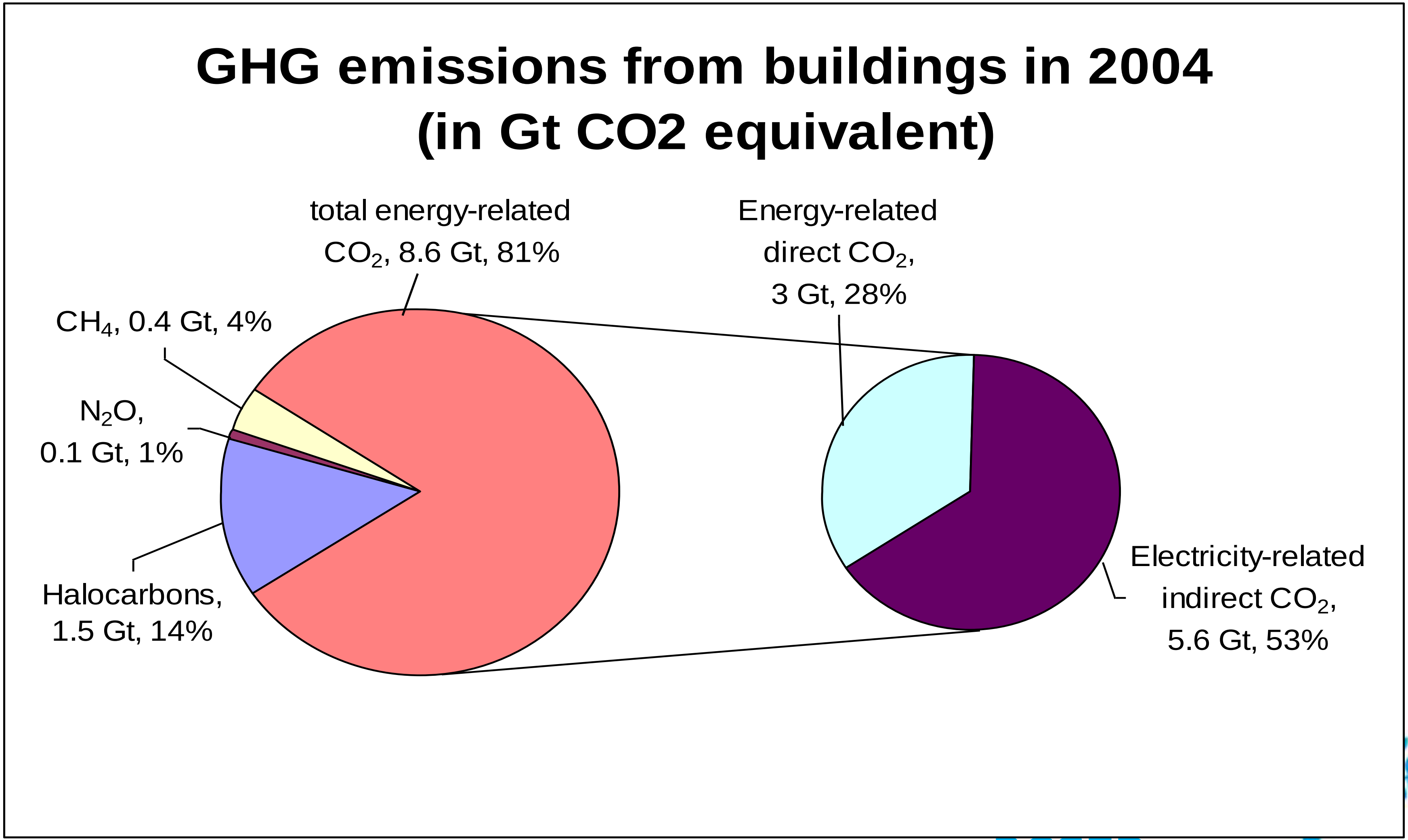
Building sector: global importance

In 2004, in buildings were responsible for app. 1/3 of global energy-related CO_2 (incl. indirect) and 2/3 of halocarbon emissions



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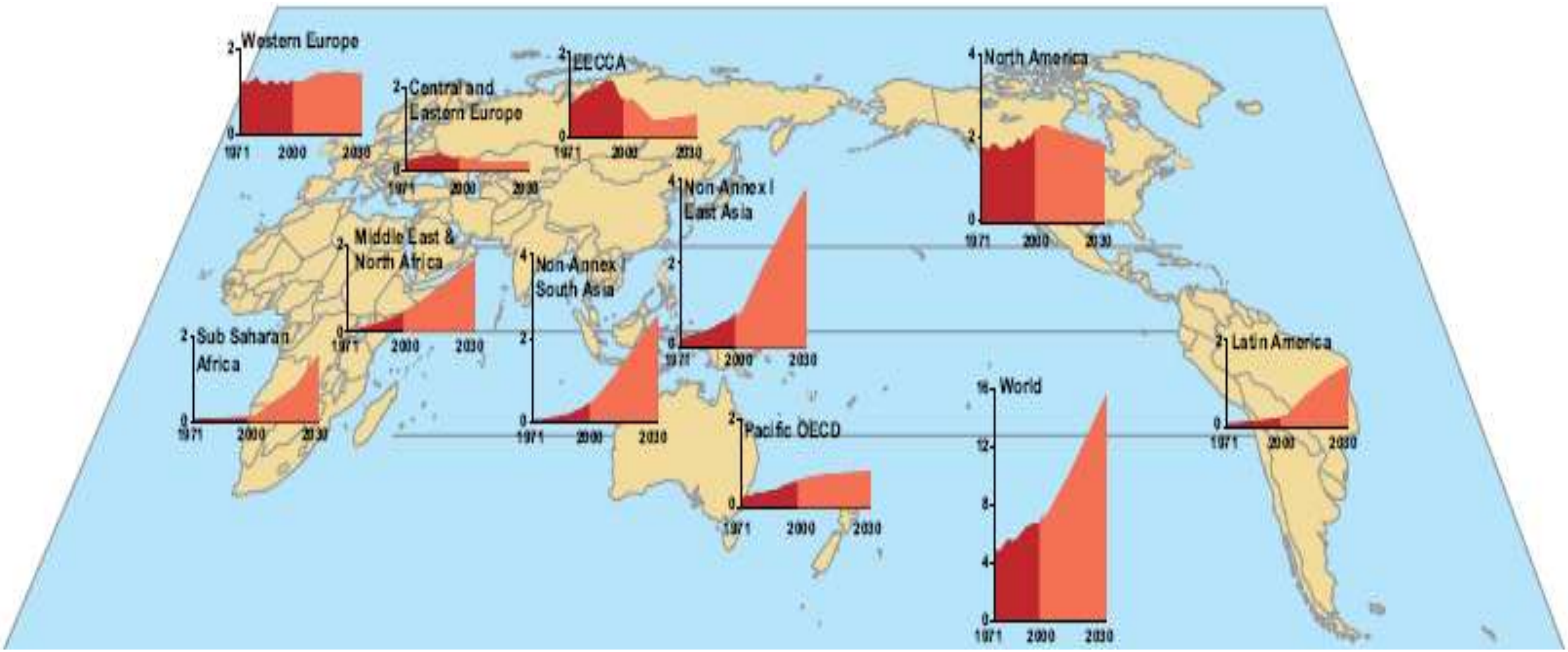
Buildings sector: regional importance

In 2030: the share of building-related emissions in global will stay at approximately 1/3 of energy-related CO_2



CO_2 emissions including through the use of electricity, A1B scenario

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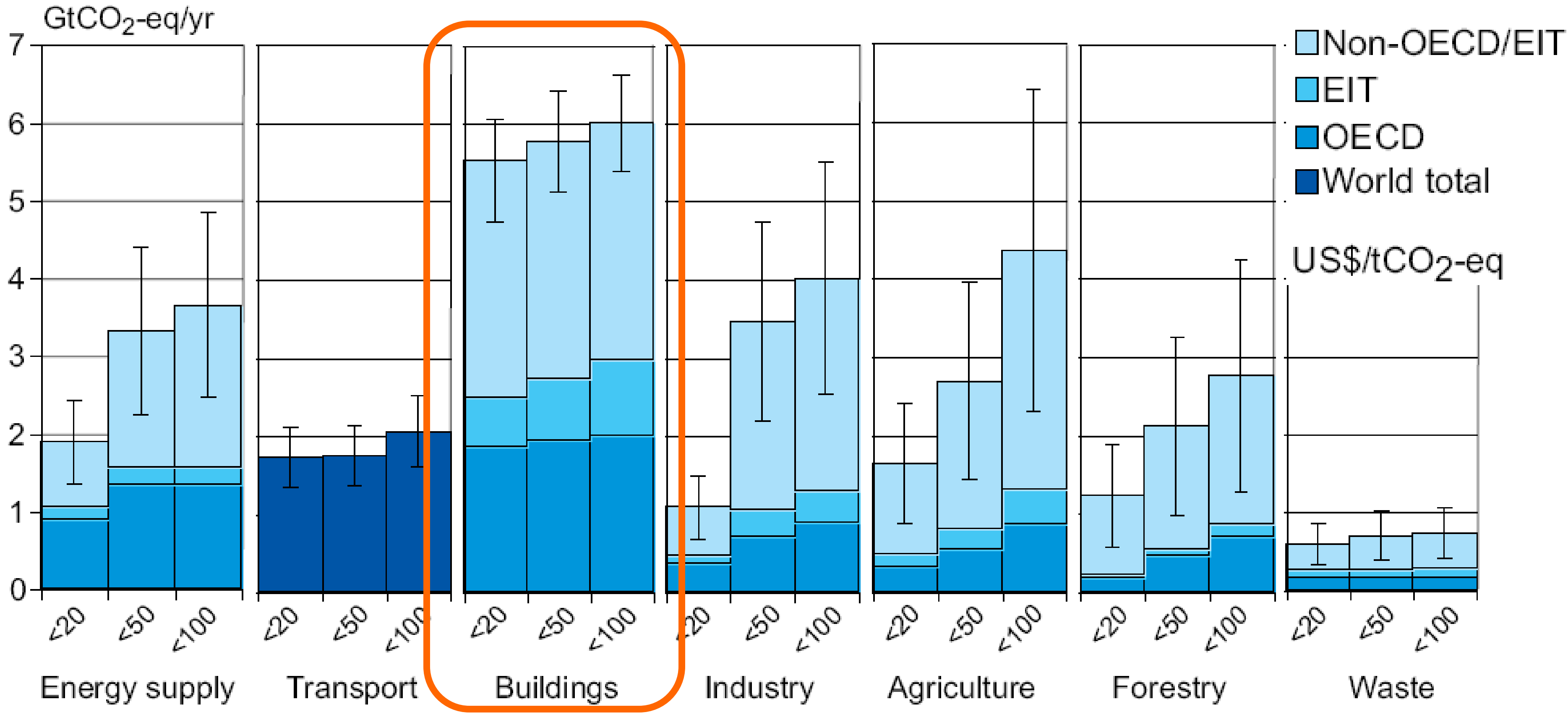
The buildings sector offers the largest low-cost potential in all world regions by 2030



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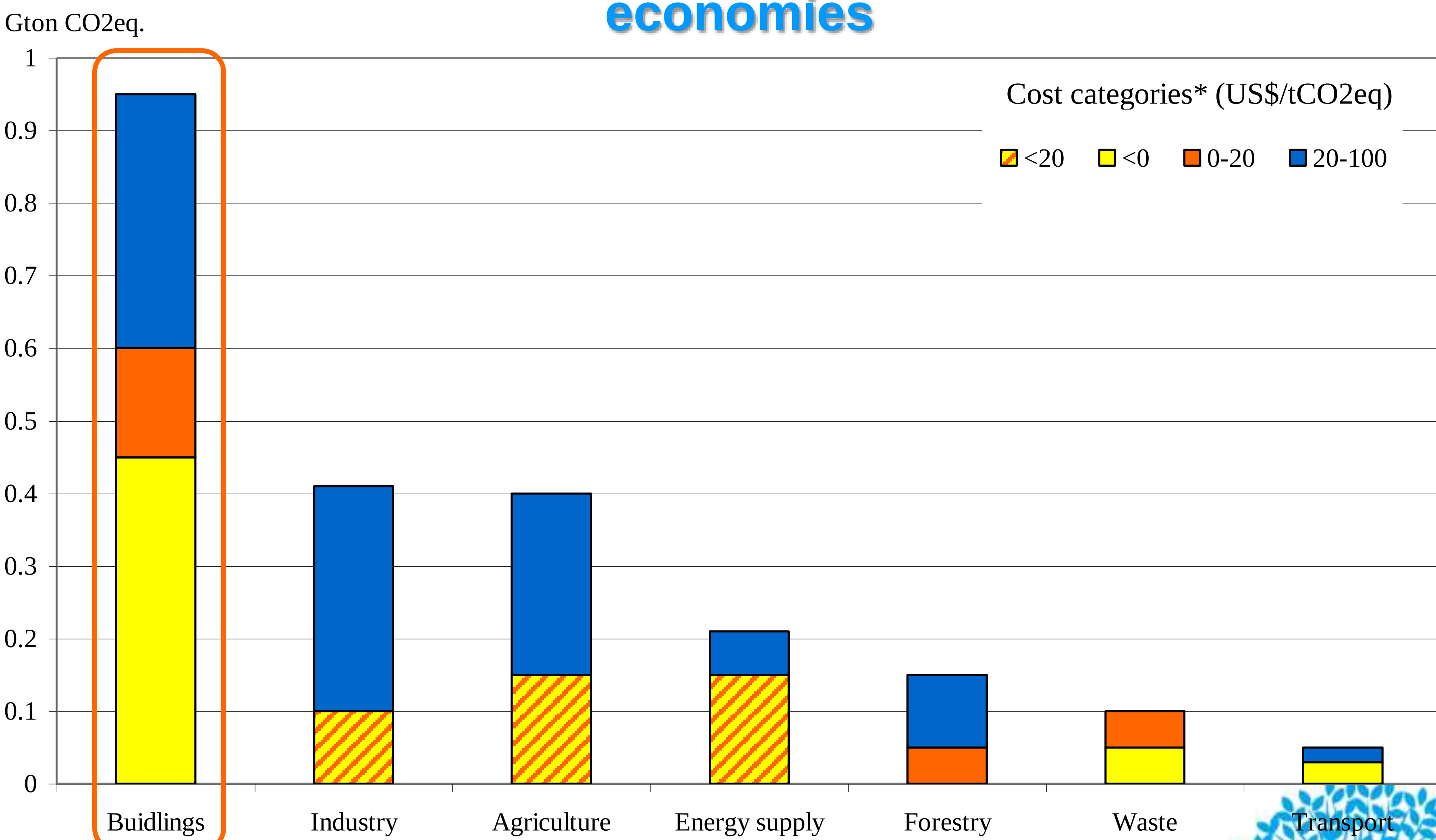
Estimated potential for GHG mitigation at a sectoral level in 2030 in different cost categories , transition economies



* 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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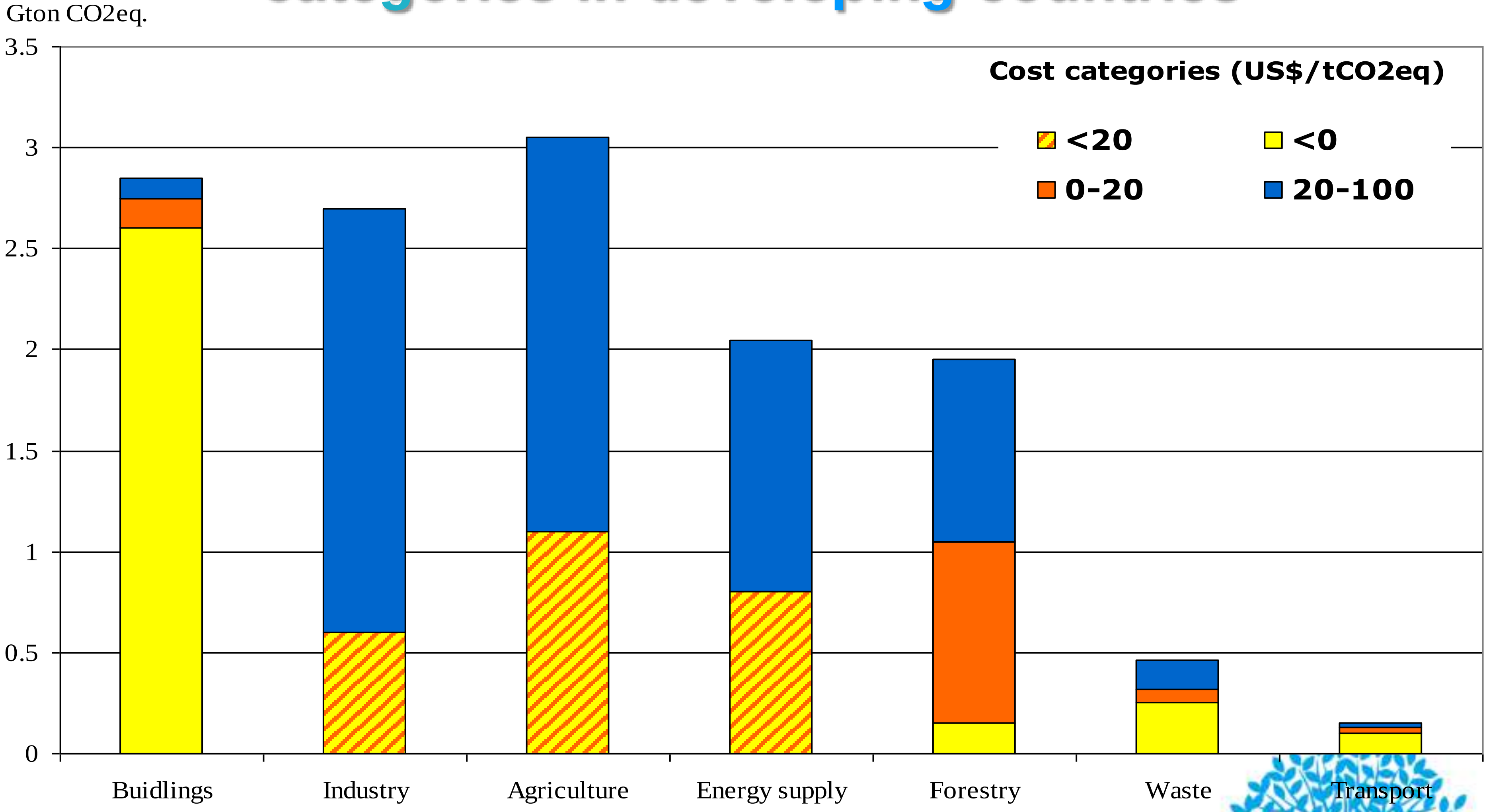
Estimated potential for GHG mitigation at a sectoral level in 2030 in different cost categories in developing countries



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Constructed based on Chapter 11 results

How far can buildings take us?

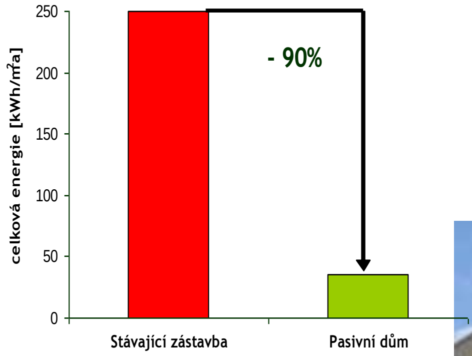
Few sectors can deliver the magnitude of emission reduction needed

- know-how has recently developed that we can build and retrofit buildings to achieve 60 – 90% savings as compared to standard practice in all climate zones (providing similar or increased service levels)

Photos from Gunter Lang

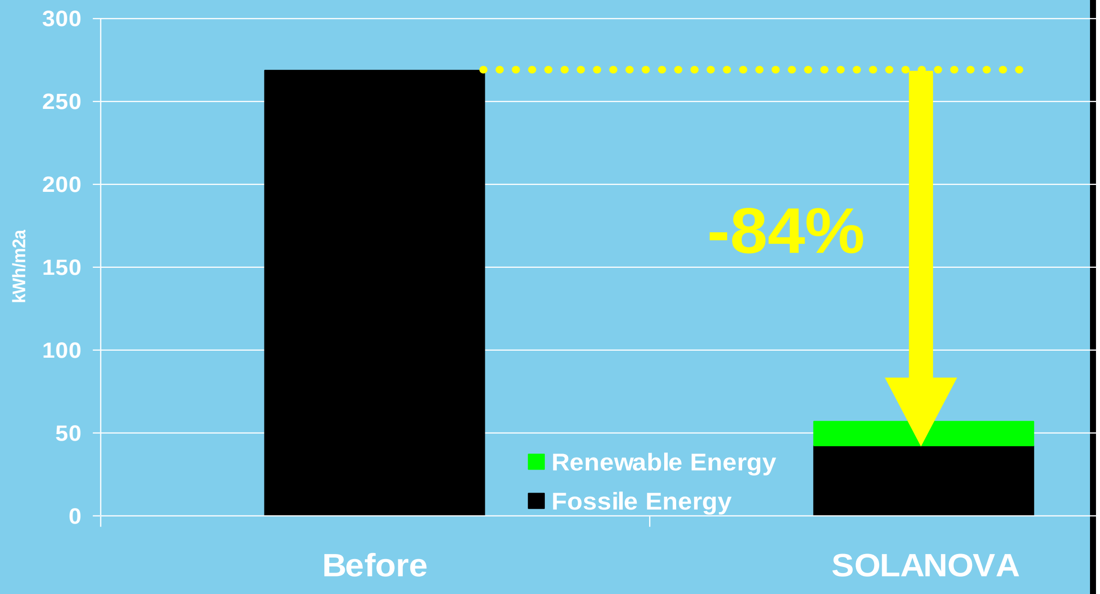


Buildings utilising passive solar construction (“PassivHaus”)



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

“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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The Global Energy Assessment: Background and purpose

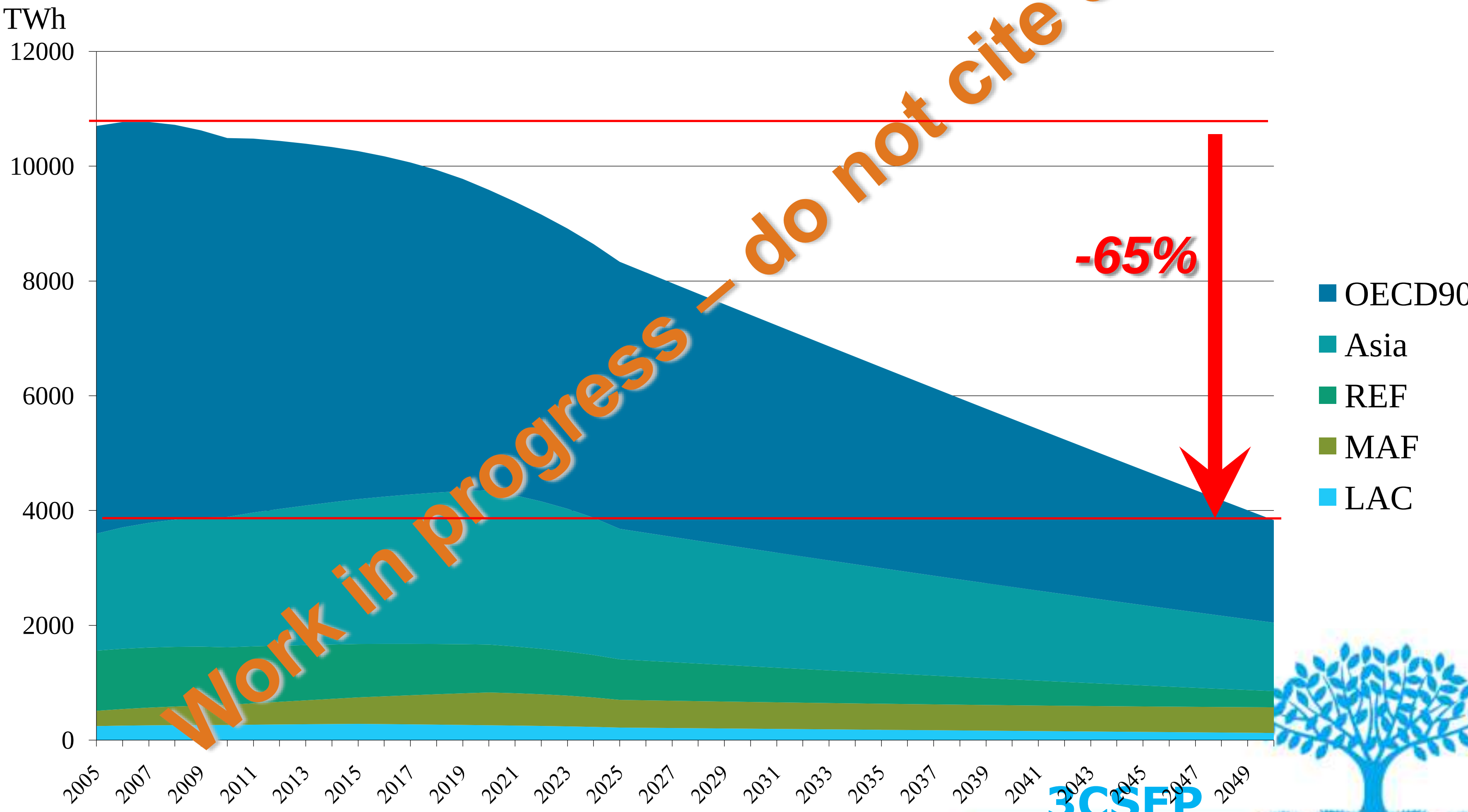
- The Global Energy Assessment aims at providing (a) blueprint(s) for the world how energy-related social, environmental, geopolitical and other challenges can be addressed this century
- We all know that buildings are the key pillar to such a future, but **how much?**
- GEA constructs new scenarios (complementing IPCC-type scenarios) that attempt to take advantage of the really large and novel opportunities in buildings, hard-to-model by existing modeling frameworks
- UNEP SBCI is a partner to further GEA efforts in the buildings scenarios (and WB is partner in GEA)

Main philosophy and assumptions

- Assumes that the world's building stock will transform over to today's known (and built) cutting edge in architecture
  - At the most affordable cost
  - At the natural rate of building construction and retrofit
  - Taking into account capacity and other limitations, but assuming ambitious and supportive (not financially but legally) policy environment.
- The main pillars of the model are existing best practices
  - Best practice from and energy and INVESTMENT COST perspective as well
- The world's building stock is broken down by regions, climate zones and 3 building types
- Model eradicates energy poverty well before 2050, i.e. everyone has appropriate thermal comfort energy services by 2050
- several scenarios planned:
  - Very high efficiency with different modalities; +building-integrated renewables; +behavioural change

Final thermal energy consumption in the world's buildings by region, 2005-2050

2%/yr retrofit rate



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Opportunity or risk?

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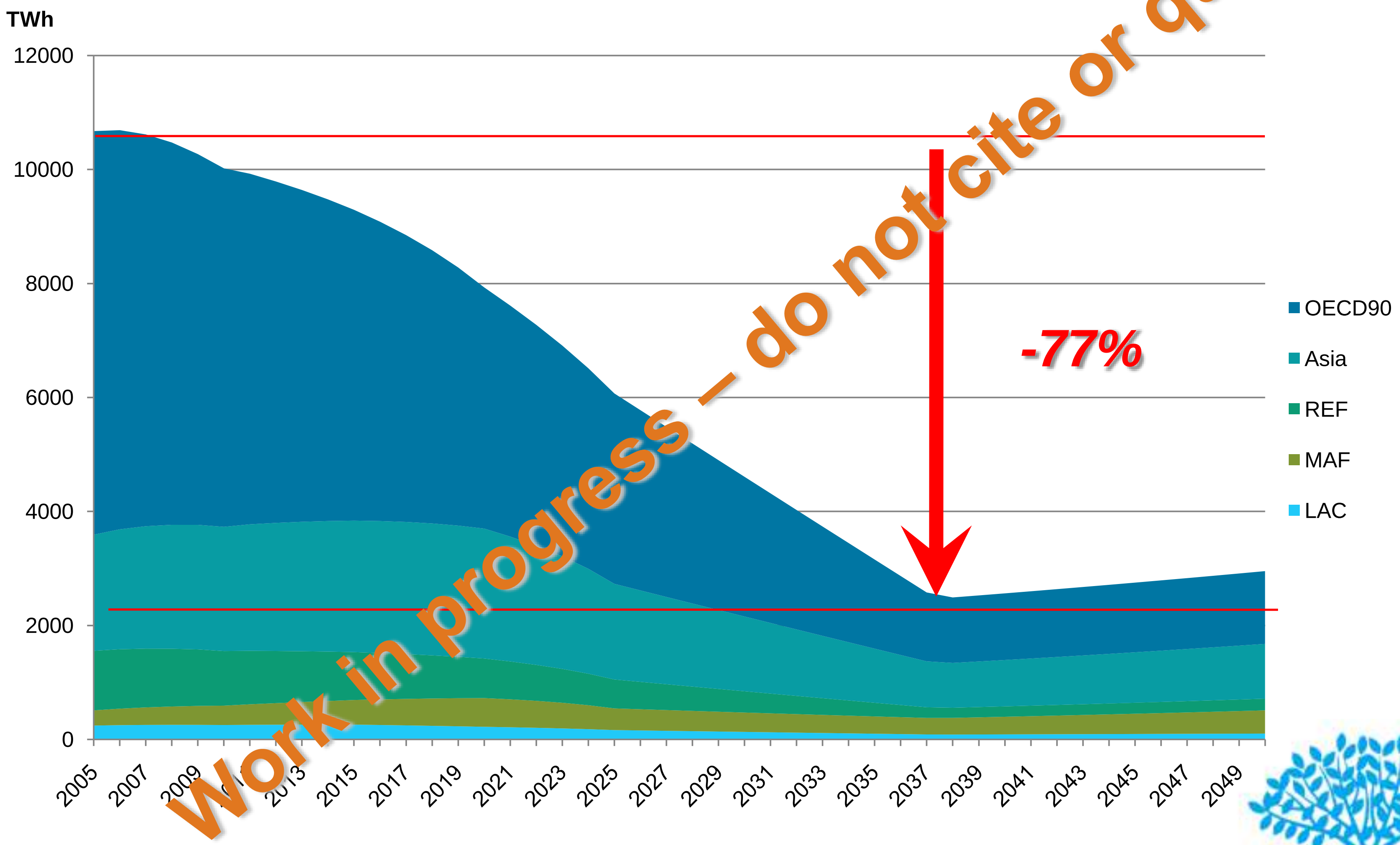
The size of the potential lock-in effect

Final thermal energy consumption in the world's buildings by region, 2005-2050

3%/yr retrofit rate



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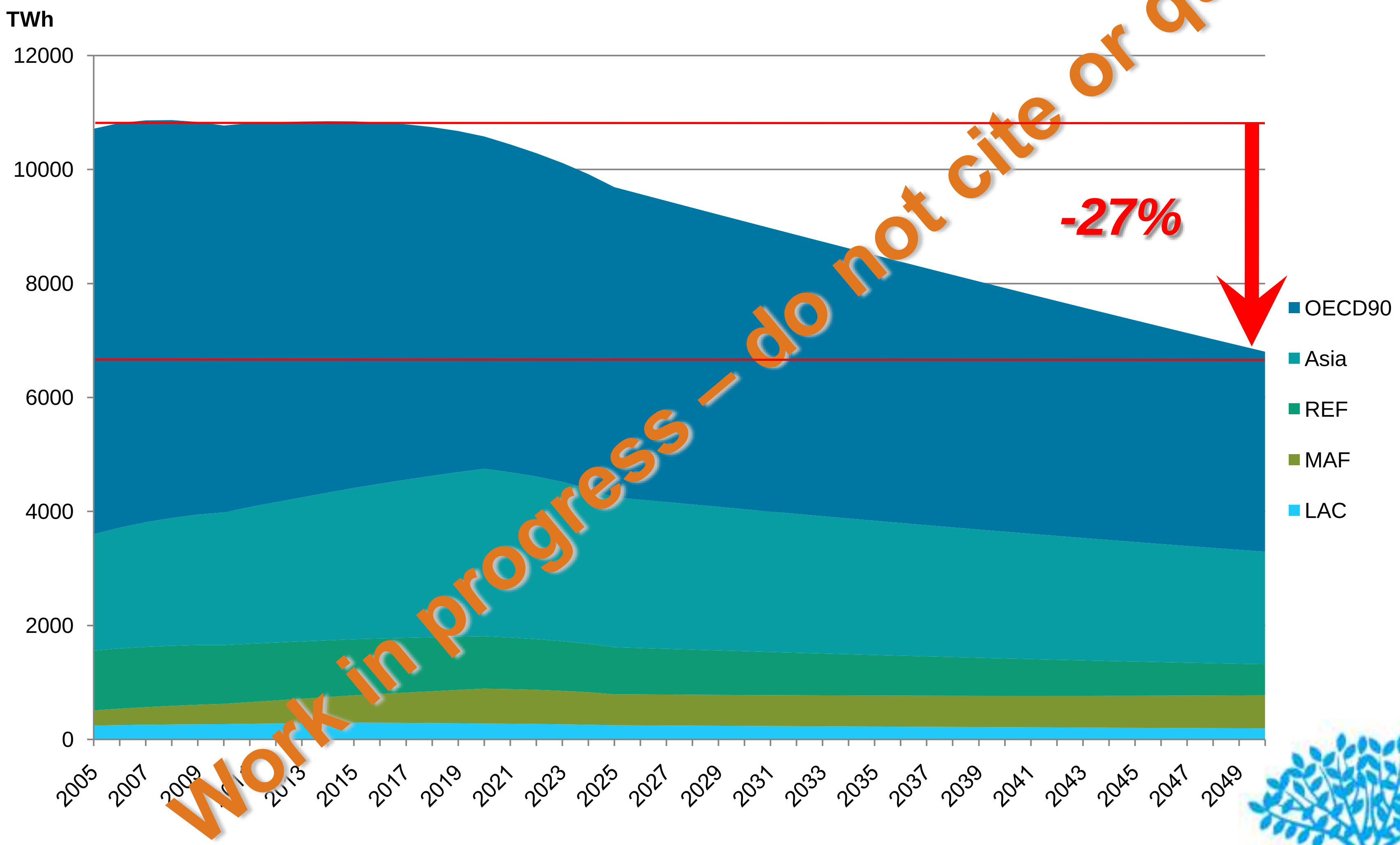
Final thermal energy consumption in the world's buildings by region, 2005-2050

1.4%/yr retrofit rate



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Panelfelújítási programban részt vevő épületek fűtési fajlagos hőfelhasználásának alakulása
Székesfehérvár

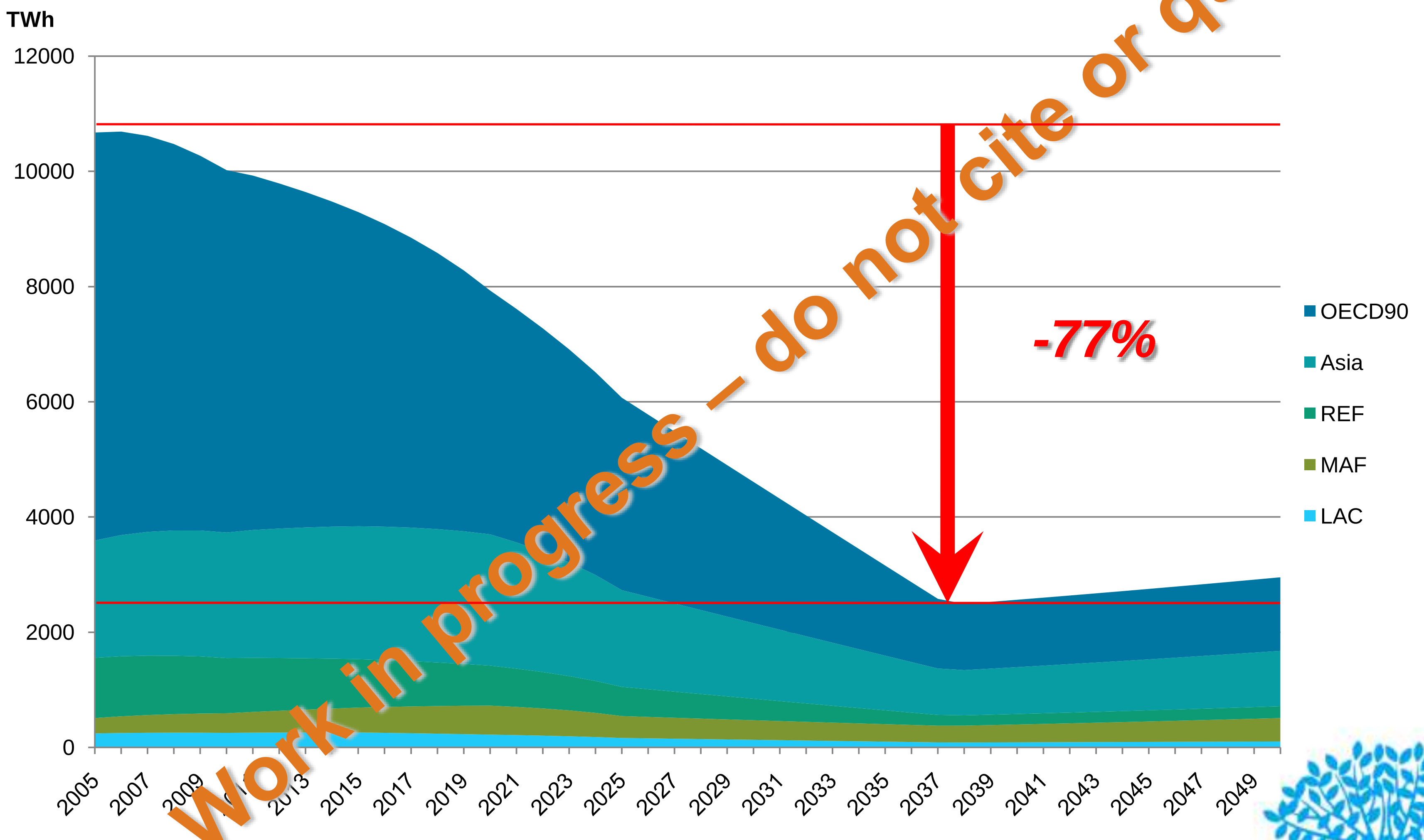
H: Homlokzati hőszigetelés
H: NY. Homlokzati hőszigetelés, nyílászáró csere
H: NY. F. Homlokzati hőszigetelés, nyílászáró csere, fűtéskorszerűsítés

3 éves átlag korrigált fajlagos
2007/2008. évi korrigált fajlagos

Source: Pájer Sándor, SZÉPHŐ Zrt., KLÍMAVÁLTOZÁS - ENERGIATUDATOSSÁG –ENERGIAHATÉKONYSÁG. V. Nemzetközi Konferencia, SZEGED, 2009. április 16-17.

Final thermal energy consumption in the world's buildings by region, 2005-2050

3%/yr retrofit rate



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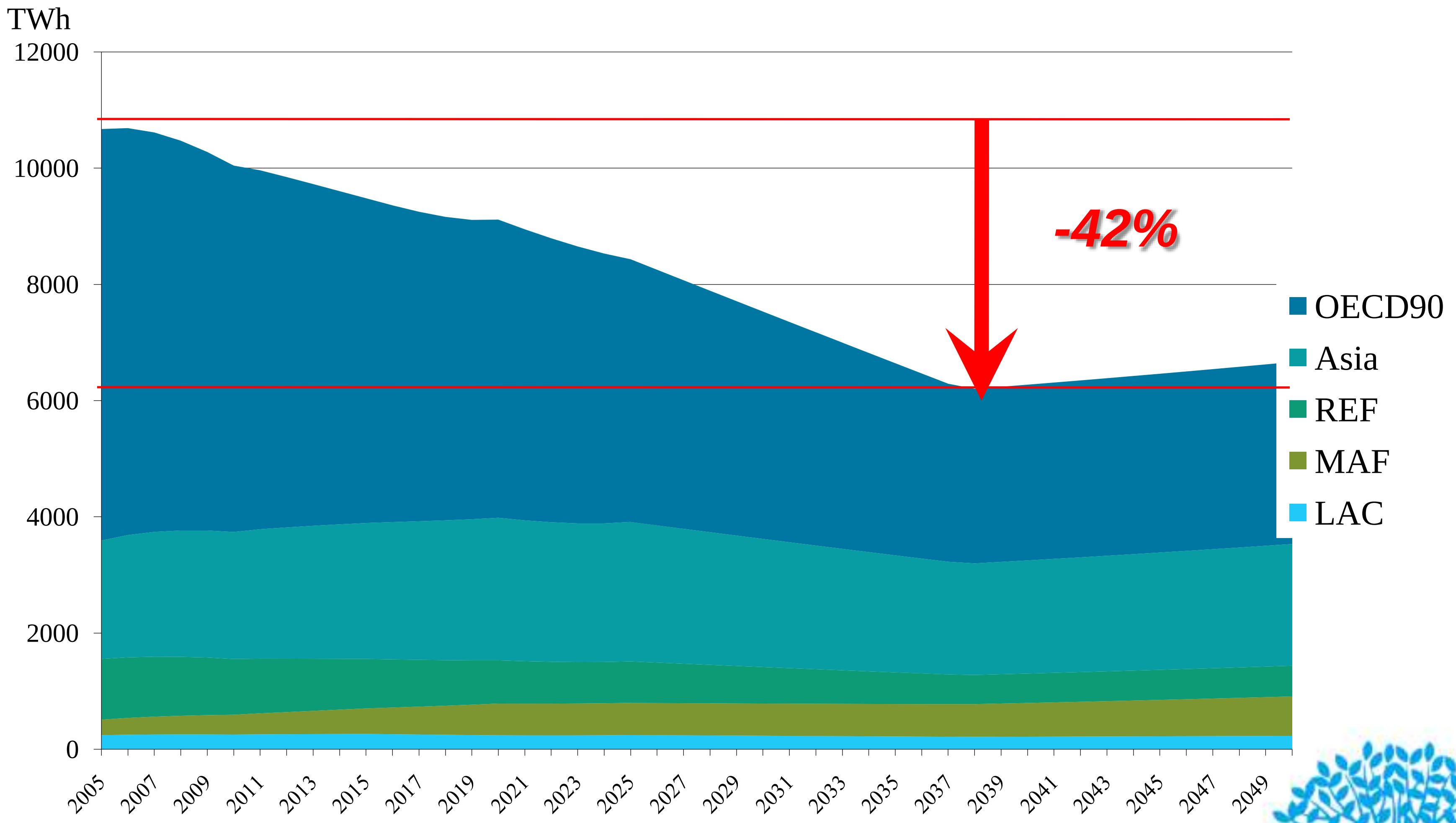
Final thermal energy consumption in the world's buildings by region, 2005-2050

3%/yr retrofit rate, suboptimal retrofit rate



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The lock-in effect through substandard retrofit, different retrofit rates
Global total final thermal energy consumption in buildings

% values of the lock-in effect represent the % of 2005 values

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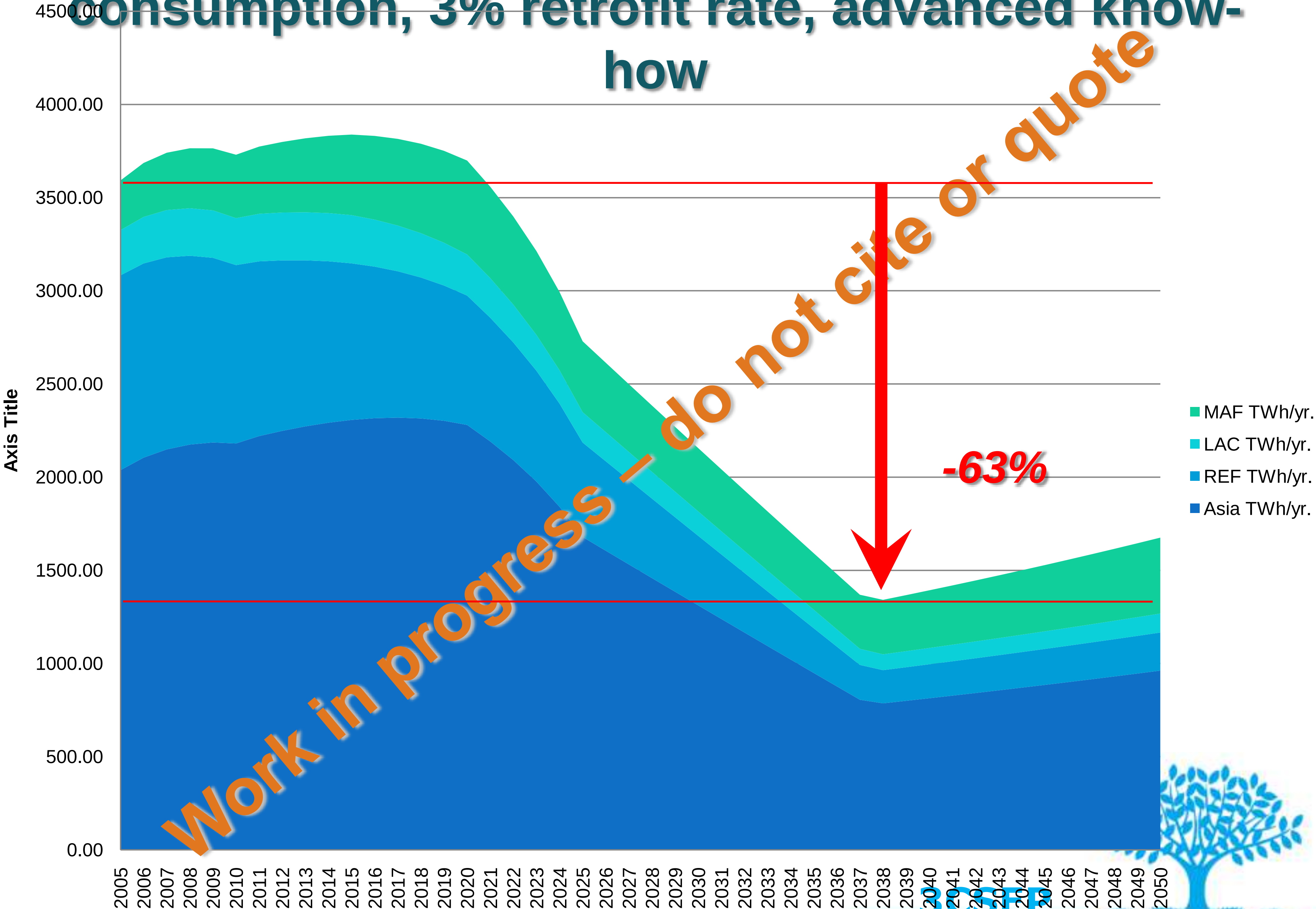
Non-OECD building thermal final energy consumption, 3% retrofit rate, advanced know-how



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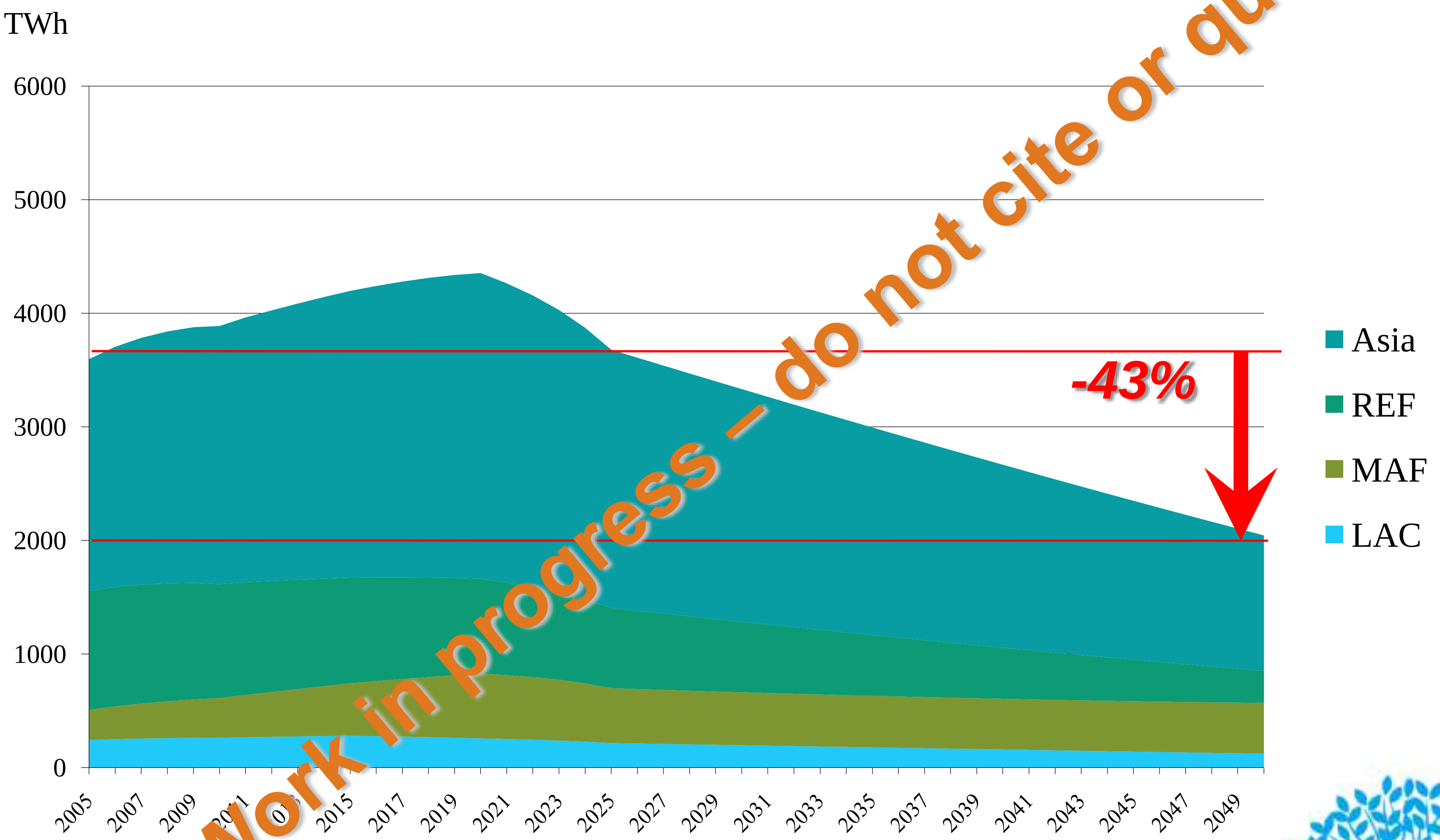
Space heating and cooling final energy consumption
2.0 % retrofit rate, exemplary buildings



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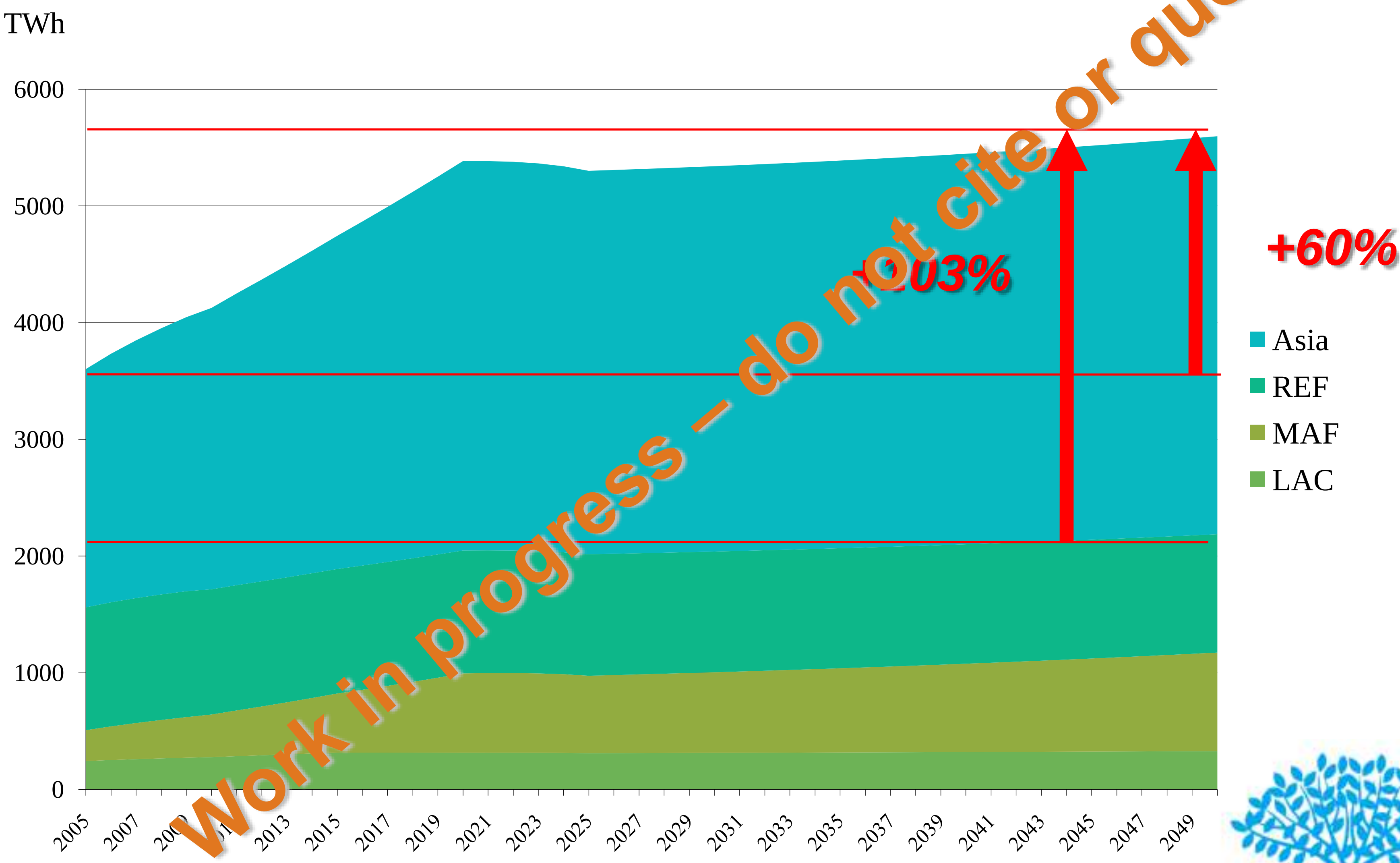
Space heating and cooling final energy consumption
0.5 % retrofit rate, substandard retrofit buildings



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Conclusions

- Buildings are key to climate change mitigation in each world region
- Substantial opportunities exist; as much as 77% of 2005 final thermal energy consumption can be eliminated by 2050 by building codes, while living standards increase as BAU and energy poverty eliminated
- To reach ambitious values:
  - Building codes need to be universal and fully implemented
  - Most advanced (low-cost) know-how needs to be mandated
  - Construction industry needs to gear up soon (in app. a decade)
  - **Codes need to cover major retrofit as well**, not only newbuild
  - 2050 emissions extremely sensitive to retrofit rate: 77% energy savings for 3% retrofit rate drops to 37% for 1.4% rate!!
- Major lock-in risks exist
  - Suboptimal retrofit represents major climate lock-in risk
  - Present trends can **lock in 23% – 35% of all 2005 emissions** (increasing achievable low levels by **37 - 152%!)** for many decades
- Suboptimal retrofits should not be supported; rather wait if complex, deep retrofit is not possible yet

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"From today, each new building constructed in an energy-wasting manner or retrofited to a suboptimal level will lock us into a high climate-footprint future"

Thank you for your attention

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Supplementary slides

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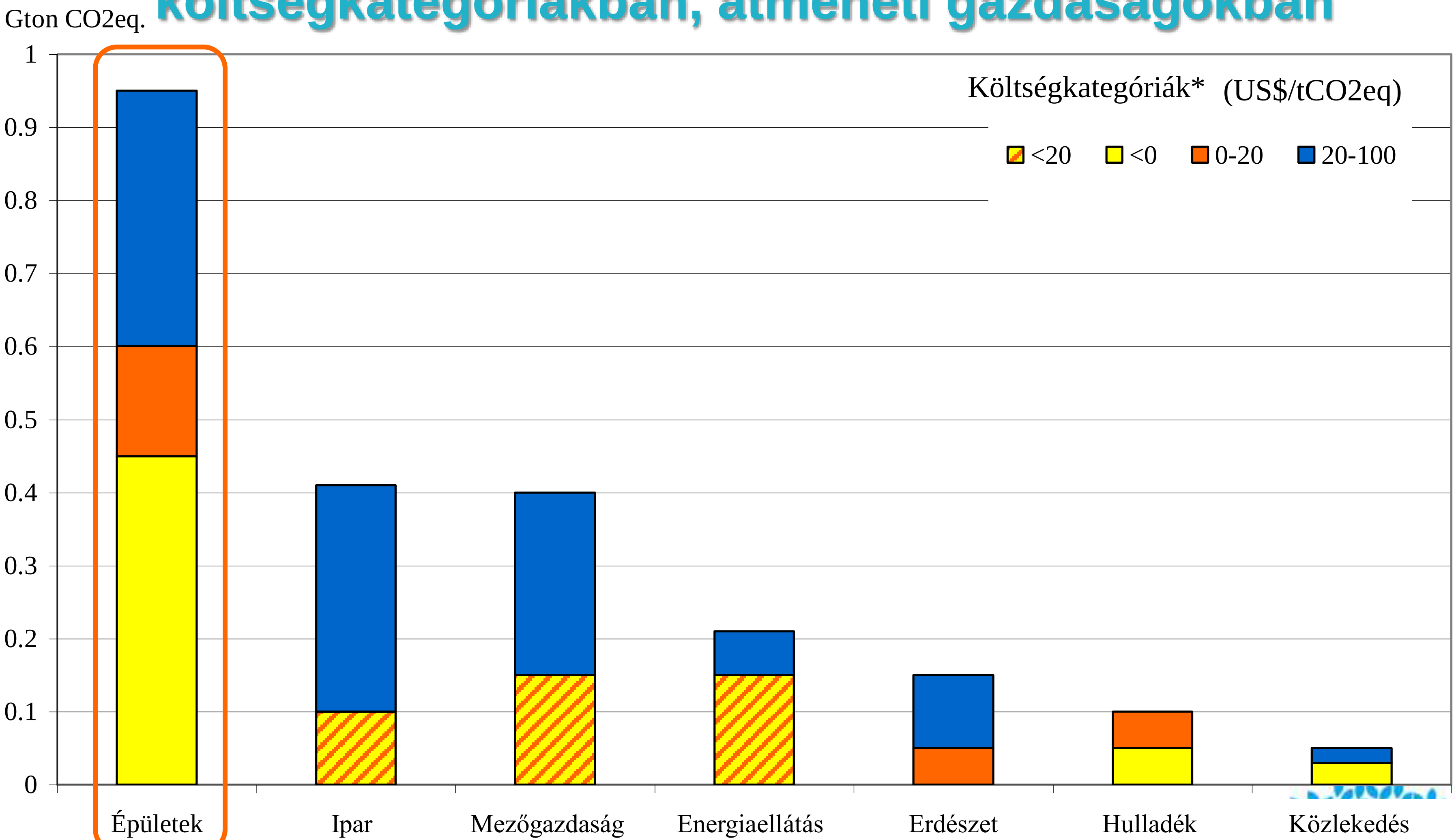
Az üvegházhatású gázok mérséklésének 2030-ra becsült szektoronkénti potenciálja különböző költségkategóriákban, átmeneti gazdaságokban



* Az épületek, erdészet, hulladék és közlekedés területein 3 kategóriába van osztva a potenciál: negatív nettó költség, 0-20 US$/t$CO_2$ és 20-100 US$/t$CO_2$. Az ipar, mezőgazdaság és energiaellátás területein 2 kategóriába van osztva: 20 US$/t$CO_2$ alatt és 20-100 US$/t$CO_2$.

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Az építésügy társadalmi, gazdasági és környezetvédelmi fontossága

- Az építésügy kulcs az éghajlatváltozás problémájának megoldásához
- Valószínűleg az egyetlen olyan terület, ahol nyertes-nyertes (win-win(-win)) intézkedések a zöld szakpolitikák

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- Az építésügy kulcs az éghajlatváltozás problémájának megoldásához
- Valószínűleg az egyetlen olyan terület, ahol nyertes-nyertes (win-win(-win)) intézkedések a zöld szakpolitikák
  - Munkahelyteremtés, egészségügy, gazdaságélénkítés, új üzleti lehetőségek, szegénység csökkentése, stb.
- A környezetvédelmi hasznokon felül talán még fontosabbak a gazdasági, társadalmi hasznok
  - Világszerte több épületenergiahatékonysági program eredménye növelte az ország GDP-jét akár pár %-kal is

Quantified non-energy benefits of building energy-efficiency programs (1/5)

Co-benefits	Country/ region	Methodology	Impact of CO_2 emission reduction		References
			Physical indicator	Monetary indicator	
Quantifiable health effects					
Morbidity reduction	USA, New Zealand, Denmark	• A double-blind, multiple crossover intervention • Initial self-completed background questionnaires; then shorter weekly questionnaires assessing the outcomes • Environmental measurements • Statistical analysis • Cost-benefit analysis • Literature review • Authors' adjustment/estimates	USA: A drop of concentration of the smallest airborne particles by 94% resulted a decrease of confusion scale by 3.7%, fatigue scale by 2.5%, the feeling of "stuffy" air 5.3%, of "too humid" by 7.0%, of "too cold" by 5.5% and "too warm" by 3.5%. USA: Cooler temperatures within the recommended comfort range resulted in a decrease of the chest tightness by 23.4% per each 1°C decrease. Denmark: Better thermal air quality led to better concentration of 15% of respondents and a 34% decrease "sick building syndrome*" cases.	USA: Improved ventilation may result in net savings of EUR 302/employee-yr. that on a national scale represents productivity gain of EUR 17 billion/yr. USA: NPV** over the lifetime of improved ventilation can reach as hight as EUR 1,652/hh. USA: Better ventilation and indoor air quality reduce influenza and cold by 9-20% (ca 16-37 million cases) that translates into savings of EUR 4.5-10.6 billion/yr. New Zealand: Health benefits due to a weatherization program amount to EUR 35/hh-yr. or 18.5% of the total annual energy savings of a household.	Mendell et al. 2002; Milton et al. 2000; Schweitzer and Tonn 2002; Wyon 1994; Stoecklein and Scumatz 2007; Fisk 1999; Fisk 2000a
Mortality reduction	Hungary; USA, Ireland, Norway	• Bottom-up study (with Monte Carlo simulation) • Statistic time-series analysis: semi-parametric log-linear model, a weighted 2-stage regression • Analysis of mortality statistics with a population of a similar country as the control group	USA: Every 10 g/m^3 increase in ambient particulate matter (the day before deaths occur) brings a 0.5% increase in the overall mortality. Ireland, Norway: The share of excess winter mortality attributable to poor thermal housing standards is 50% for cardiovascular disease and 57% for respiratory disease.	Hungary: Energy saving program resulted in the total health benefit of EUR 489 million/yr. due to a decrease of chronic respiratory diseases and premature mortality. Ireland, Norway: A total mortality benefit of a hypothetical thermal-improving program is EUR 1.5 billion (undiscounted) for a study in the left column.	Aunan et al. 2000; Samet et al. 2000; Clinch and Healy 1999

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Quantified non-energy benefits of building energy-efficiency programs (2/5)

Co-benefits	Country/ region	Methodology	Impact of CO_2 emission reduction		References
			Physical indicator	Monetary indicator	
Environmental (ecological) co-benefits					
General environmental benefits	New Zealand	• Direct computation • Willingness to pay/to accept, contingent valuation, other survey-based methods	NZ: Benefits to the environment gained after the weatherization program amount to EUR 44/hh.-yr. in 2007 that accounts for around 18.7% of the total annual energy expenditures saved		Stoecklein and Scumatz 2007
Cleaner indoor air	USA	• Literature review • Data analysis	US: A sample considered a reduction of concentration of the smallest airborne particles by 94% US: The reduction in the emission/yr. of a green school as compared to the average practice: - 1,200 pounds of NOx - a principal component of smog - 1,300 pounds of SO2 - a principal cause of acid rain - 585,000 pounds of CO2 - GHG and the principal product of combustion - 150 pounds of coarse particulate matter (PM10) – a principal cause of respiratory illness and an important contributor to smog.		Mendell et al. 2002; Kats 2005
Fish impingement	USA	• Literature review • Authors' adjustment/estimates	USA: NPV of reduction in fish impingement over the lifetime of weatherization measures is EUR 17.6/hh.		Schweitzer and Tonn 2002.
Waste water and sewage	USA	• Literature review • Authors' adjustment/estimates	USA: NPV of reduction in waste water and sewage over the lifetime of weatherization measures is EUR 2.6 – 495.3/hh.		Schweitzer and Tonn 2002
Construction and demolition waste benefits	USA	• Statistical analysis • NPV analysis with a 7% DR over 20 years	USA: Construction and demolition diversion rates are 50-75% lower in green buildings (with the maximum of 99% in some projects) as compared to an average practice USA: A sample of 21 green buildings submitted for certification, 81% of such buildings reduced construction waste by at lease 50%, 38% of such buildings reduced construction waste by 75% or more		SBTF 2001; Kats 2005
Reduction in air pollution (indoor + outdoor)	USA	• Literature review • Authors' adjustment/estimates • Statistical analysis	USA: A green school emits 544 kg of NO_x , 590 kg of SO_2, 265 tonnes of CO_2, 68 kg of coarse particulate matter (PM10) less in comparison with the average practice	USA: The study in the left column results in NPV EUR 0.4/ft^2 (~EUR 0.037/m^2) over 20 yr. USA: NPV of air emission reduction (CO_2, SO_x, NO_x, CO, CH_4, PM) over lifetime of the measures is (all in thousand EUR/hh.: a) from natural gas burning 30.2 - 37.7; b) from electricity consumption EUR 118-185; c) air emissions of heavy metals is 0.75-12.8	Schweitzer and Tonn 2002; Kats 2005; Kats 2006

Quantified non-energy benefits of building energy-efficiency programs (3/5)

Co-benefits	Country/ region	Methodology	Impact of CO_2 emission reduction: Physical indicator	Impact of CO_2 emission reduction: Monetary indicator	References
Economic co-benefits and ancillary financial impacts					
Indirect secondary impact from reduced overall market demand and resulting lower energy prices market-wide	USA	• NPV analysis with a 7% DR over 20 years • Literature review • Simplified quantification of the effect of renewable energy/energy efficiency on gas prices and bills • Using a range of plausible inverse elasticity estimates	USA: Efficiency-driven reductions in demand results in a in long-term energy price decrease equal to 100% to 200% of direct energy savings; assuming the indirect price impact of 50% over 20 years from an efficient school design, the impact of indirect energy cost reduction for new and retrofitted schools has NPV EUR 0.21/m^2 USA: 1% decrease of the national natural gas demand through energy efficiency and renewable energy measures leads to a long-term wellhead price reduction of 0.8% - 2%; the indirect monetary savings from this price decrease amounted to 90% of the direct monetary savings that it EUR 14.6 million for all customers (cumulative 5-year impact, 1998-2002, over June-September peak hours) USA: 1% reduction in natural gas demand result in a 0.75-2.5% reduction in the long-term wellhead prices.		Kats 2006; Wiser et al. 2005; O'Connor 2004; Platts Research &Consulting 2004
Enhanced learning in 'greened' buildings	USA	• Review of the financial benefits of education	Better environmental condition lead to enhanced learning abilities; a 3-5% improvement in learning and test scores is equivalent to a 1.4% lifetime annual earnings increase; an increase in test scores from 50% to 84% is associated with a 12% increase in annual earnings.		Hanushek 2005
Employees' retention: avoided reduced-activity days	USA, The State of Washington, Ireland	• Statistical analysis • Literature review • Bottom-up model • NPV analysis with a 7% DR over 20 years • A walk-through assessment of schools • Survey	USA: The improved quality of schools increases teacher retention by 3% USA/The State of Washington: "Greening" schools could bring 5%/yr. of improvement in teacher retention	USA : if the cost of teacher loss is 50% of salary, the left column tops study equals to a saving of EUR 0.28/m^2 if ~214 m^2/teacher is assumed USA/The State of Washington (left column): Savings of USD 160 thousand/yr. during 20 years (not discounted) Ireland: The annual value of the morbidity benefits of the energy efficiency program is EUR 58 million excl. reduced-activity days and EUR 66.6 million incl. them	Buckley et al. 2005; Kats 2005; Paladino & Company 2005; Clinch and Healy 2001
Improved productivity	USA	• Case studies on documented productivity gains • Empirical measurements • Computer-based literature searches, reviews of conference proceedings, and discussions with researchers • Multivariate linear regression	USA: In well day-lighted buildings: labor productivity rises by about 6–16%, students' test scores shows ~20–26% faster learning, retail sales rise 40%. USA: Students with the most day-lighting show 20% - 26% better results than those with the least day-lighting USA: The ventilation rates less than 100%	USA: The productivity can improve by 7.1%, 1.8%, and 1.2% with lighting, ventilation, and thermal control by a tenant; an average workforce productivity increase is 0.5% - 34%/each control type. A 1% increase in productivity (~ ca 5 minutes/day) is equal to EUR 452 – 528/employee-yr. or EUR 0.21/m^2-yr.; a 1.5 % increase in productivity (~ ca 7	Lovins 2005; Fisk 2000a; Fisk 2000b; Heschong Mahone Group 1999; Federspiel 2002; Menzies

Quantified non-energy benefits of building energy-efficiency programs (4/5)

Co-benefits	Country/ region	Methodology	Impact of CO_2 emission reduction		References
			Physical indicator	Monetary indicator	
		analysis of student perfromance data • Log-linear regression model • Statistical analysis • Questionnaire • NPV analysis with a 7% DR over 20 years	outdoor air and temperature higher than 25.4°C result in lower work performance Canada: A new ventilation system improved the productivity of co-workers by 11% versus reduced productivity by 4% in a control group USA: After building retrofitting, absenteeism rates dropped by 40% and productivity increased by more than 5%; after moving to a retrofitted facility two business units monitored 83% and 57% reductions in voluntary terminations versus a c control group with 11% reduction in voluntary termination of employment	minutes/day) is equal to ~EUR 754/employee-yr. or EUR 0.35/m^2-yr. USA: More comfortable temperature and lighting results in productivity increase by 0.5% - 5%; considering only U.S. office workers, such a change translates into an annual productivity increase of roughly EUR 15 – 121 billion.	1997; Kats 2003; Pape 1998; Shades of Green 2002
Avoided unemployment	USA	• Literature review • Authors' adjustment and calculations	NPV of avoided unemployment over the lifetime of weatherization measures is EUR 0 – 137.9/hh.		Schweitzer and Tonn 2002
Lower bad debt write-off	USA	• Literature review • Authors' adjustment/estimates	NPV of lower bad debt write-off over the lifetime of weatherization measures is EUR 11.3 – 2,610 /hh.		Schweitzer and Tonn 2002
Employment creation	USA	• NPV analysis with a 7% DR over 20 years • Literature review • Authors' adjustment/estimates • Statistical assessment of the 5- year the energy efficiency programs	USA: Green schools create more jobs than conventional schools: the long-term employment impact of increased energy efficiency may provide EUR 0.21/m^2 of benefits USA: NPV of direct and indirect employment creation over the lifetime of the measures is EUR 86.7 – 3.2 thousand/hh. (note: this benefit occurs only one time in year weatherization is performed) USA: Energy efficiency investment of EUR 85.2 million in the Massachusetts economy in 2002 created 1780 new short-term jobs; in addition, lowered energy bills for participants and for Massachusetts resulted in additional spending, creating 315 new long-term jobs; energy efficiency jobs added EUR 104.8 million to the gross state product, including EUR 48.2 million in disposable income (in 2002 in Massachusetts)		Kats 2005; Schweitzer and Tonn 2002; O'Connor 2004; Kats 2005
Rate subsidies avoided	USA	• Literature review • Authors' adjustment/estimates	NPV of avoided rate-subsidies over the lifetime of weatherization measures is EUR 4.5 – 52.8 /hh.		Schweitzer and Tonn 2002
National energy security	USA	• Literature review • Authors' adjustment/estimates	NPV of enhanced national energy security over the lifetime of weatherization measures is EUR 56.5 – 2,488/hh.		Schweitzer and Tonn 2002

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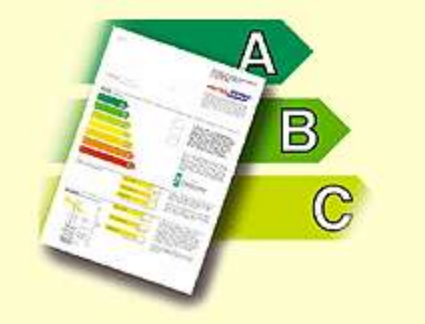
Quantified non-energy benefits of building energy-efficiency programs (5/5)

Co-benefits	Country/ region	Methodology	Impact of CO_2 emission reduction: Physical indicator	Impact of CO_2 emission reduction: Monetary indicator	References
Service provision benefits					
Transmission and distribution loss reduction	USA	• Literature review • Authors' adjustment/estimates	USA: NPV over the lifetime of weatherization measures installed ranges EUR 24.9 – 60.3/hh.		Schweitzer and Tonn 2002
Fewer emergency gas service calls	USA	• Literature review • Authors' adjustment/estimates	USA: NPV of fewer emergency gas service calls over the lifetime of weatherization measures is EUR 29.4 – 151.5/hh.		Schweitzer and Tonn 2002
Utilities' insurance savings	USA	• Literature review • Authors' adjustment/estimates	USA: NPV of utilities insurance cost reduction over the lifetime of weatherization measures is EUR 0 – 1.5/hh.		Schweitzer and Tonn 2002
Decreased number of bill-related calls	New Zealand	• Direct computation • Willingness to pay, willingness to accept, contingent valuation and other survey-based methods	Bill-related calls became less frequent after the implementation of weatherization program, which amounted savings of NZ$30 (~EUR 15.9/hh-yr.) that is 7% of the total saved energy costs		Stoecklein and Scumatz 2007
Social co-benefits					
Improved social welfare and poverty alleviation	UK	• Survey monitoring the impact of energy company schemes which were set up to fuel poverty	UK: Energy efficiency schemes applied to 6 million households in January-December 2003 resulted in the average benefit of EUR 12.7/hh-yr.		DEFRA 2005
Safety increase: fewer fires	USA	• Literature review • Authors' adjustment/estimates	USA: NPV over the lifetime of the measures installed is EUR 0 - 418 /hh.		Schweitzer and Tonn 2002
Increased comfort	Ireland; New Zealand	• A computer-simulation energy-assessment model • Direct computation • Willingness to pay, willingness to accept, contingent valuation and other survey-based methods	Ireland: A household temperature once the energy efficiency program has been completed increased from 14 to 17.7 °C. The analysis showed that comfort benefits peak at year 7 and then decline gradually until year 20.	Ireland: The total comfort benefits of the program for households (described in the left column) amount to EUR 473 million discounted at 5% over 20 years; New Zealand: Comfort (incl. noise reduction) benefits after the weatherization program estimated as EUR 103/hh.-yr. that is 43% of the saved energy costs	Clinch and Healy 2003; Stoecklein and Scumatz 2007.

Az építésügy társadalmi, gazdasági és környezetvédelmi fontossága

- Az építésügy kulcs az éghajlatváltozás problémájának megoldásához
- Valószínűleg az egyetlen olyan terület, ahol nyertes-nyertes (win-win(-win)) intézkedések a zöld szakpolitikák
  - Munkahelyteremtés, egészségügy, gazdaságélénkítés, új üzleti lehetőségek, szegénység csökkentése, stb.
- A környezetvédelmi hasznokon felül talán még fontosabbak a gazdasági, társadalmi hasznok
  - Világszerte több épületenergiahatékonysági program eredménye növelte az ország GDP-jét akár pár %-kal is
- Évente valószínűleg többezer ember veszti életét a magyarországi energiaszegénységnek köszönhetően

A jelenlegi költségvetési struktúra főbb problémái az építésügy szempontjából



- Kulcsprobléma: az energiaárak támogatása
  - Gázártámogatás: öngól
  - A szegénység megoldása helyett előmozdítja és konzerválja azt
  - Hosszútávú és végleges megoldás: az épületállomány felújítása
- A jelenlegi támogatási rendszerek kiszámíthatatlanok, szétaprózottak, kevéssé átláthatóak és ismertek, a megújuló források sokszor aránytalanul kedvezőbb támogatásúak a hatékonysággal szemben
- Nem szabad kis megtakarításokkal megelégedni
  - Panelprogram: 10 – 30%
  - Rázár egy magas kibocsátású pályára
  - Kizárja az energiaszegénység további csökkentését
  - Az épületeket csak mint egységes rendszereket szabad tekinteni

“EU-s épületek – aranybánya

a CO2 csökkentése, energiabiztonság, munkahelyteremtés, és alacsony jövedelmű lakosság problemai kezelése szempontjából”

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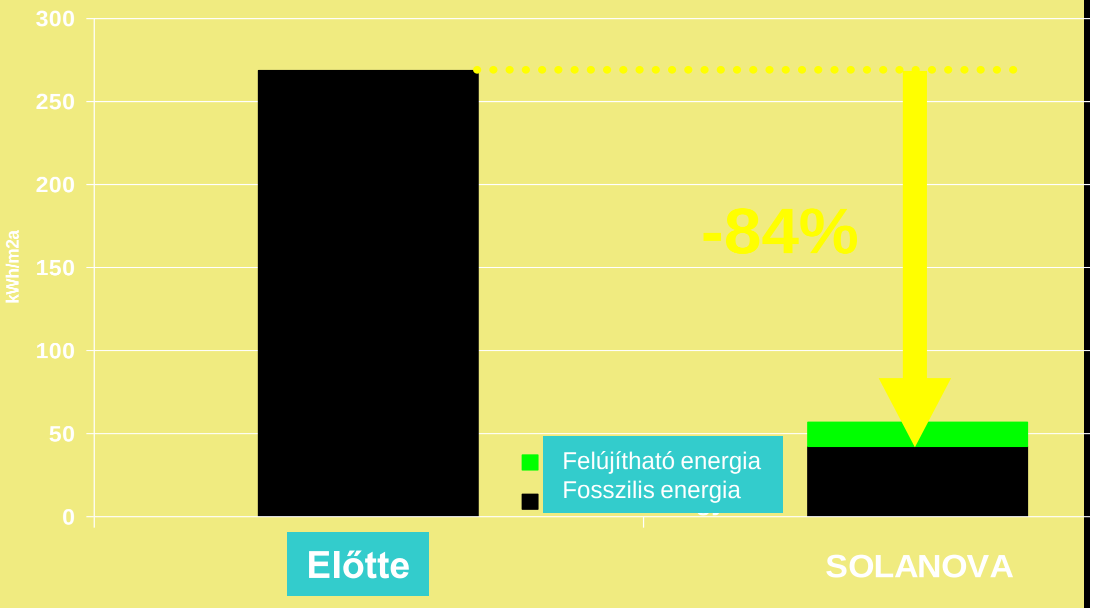

Forrás: Claude Turmes (MEP), Amsterdam Forum, 2006

További információ a Solanova-ról: www.solanova.eu

Főbb javaslatok egy zöld(ebb) költségvetés koncepciójára és a gazdaság fellendítésére 1.

- Közbeszerzés zöldítése
  - Befektetési költségek helyett életciklus-költségek minimalizálása legyen a cél
  - Osztrák és egyéb minták: szociális és középületekre passzívház-szabvány kötelező
- A közszféra példamutató szerepe: állami elkötelezettség a középületállomány radikális energetikai felújítására
  - PPP konstrukcióban – megteremti az energiahatékonysági finanszírozási és beruházási iparágat

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Főbb javaslatok egy zöld(ebb) költségvetés koncepciójára és a gazdaság fellendítésére 2.

- Bármilyen kvótakereskedelemből származó bevételt csak ÜHG csökkentési beruházásra lehessen költeni, pl. Épületfelújítás
- Átstruktúrálni a kohéziós és struktúrális alapokból érkező pénzek prioritásait
  - Minden beruházásnál megvizsgálni, hogy a legalacsonyabb energiafelhasználású és kibocsájtású alternatívát mozdítja-e elő, és ezt kötelezővé tenni
- Több beruházást a felhasználói oldalra, kevesebbet az ellátásra
- Elgondolkodtató példa: Nabucco
  - „Az EU épületeiben a költség-hatékony energiahatékonysági beruházások 5oo millió köbméter földgázt takarítanának meg.” [Eurima és Ecofys 2009] Ez 5-ször annyi, mint amennyit a Nabucco szállítana.
  - A Nabucco költsége kb. €8 bln, a déli áramlaté > €10 bln. Ez a pénz elég lenne, hogy nagy hatékonyságra felújítsuk célországok (Hu/Sk/Slo/Cz) teljes épületállományának 2/3-át (@50% társfinanszírozással) [Eurima/Ecofy 2007]

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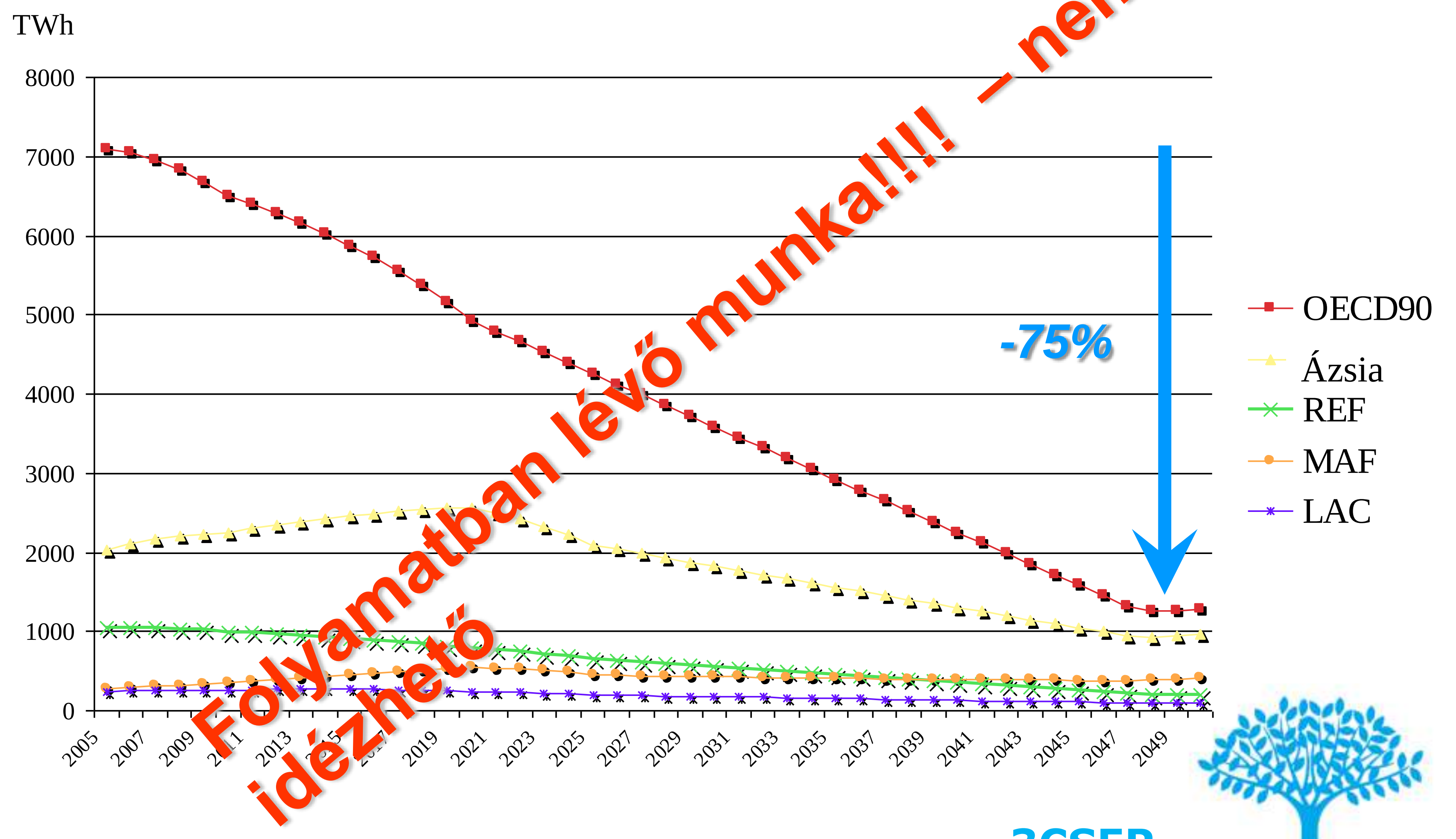
A térfűtés és hűtés végső energiafelhasználása a világ térségeiben, 2005-2050

2%/év felújítási arány



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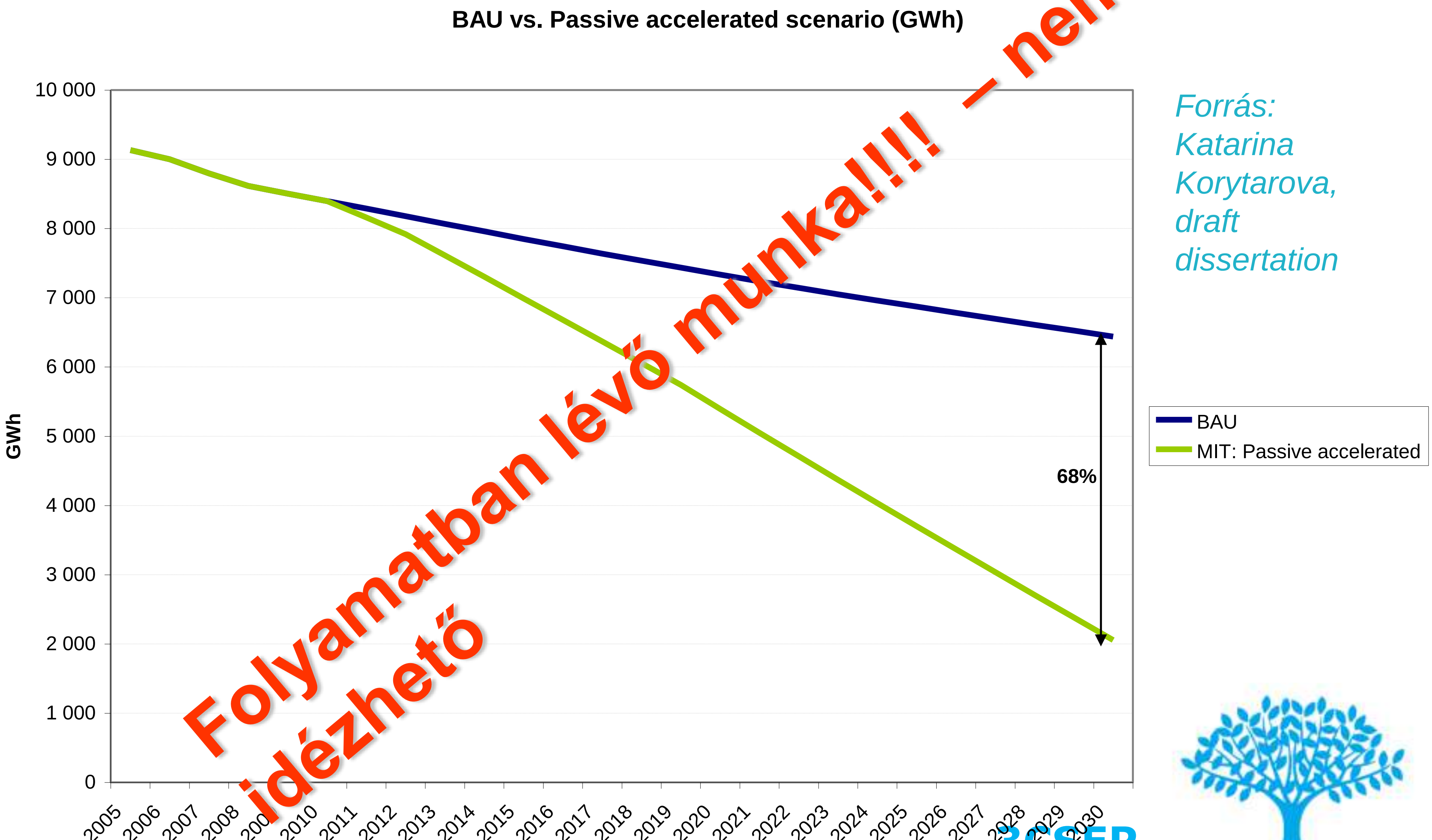
Magyarország: éghajlatvédelmi forgatókönyv, középületek, 2005 – 2030

passzívháznorma gyorsított elterjedése



Forrás: Katarina Korytarova, draft dissertation

Folyamatban lévő munka!!! – nem idézhető

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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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What is a sustainable level of retrofit?

- Ecofys (Hermelink: How deep to go?) 2009 finds:
- For new buildings a primary energy level of appr. 140 kWh/m2a for space heat, DHW, household electricity and embodied energy,
  - ~ the primary energy requirement for passive houses.
- From an energy life-cycle perspective [Hermelink 2006] analyses which renovation level should be achieved in order to be better than a rebuild option. He concludes that "taking sustainability seriously, a space heat consumption between 25 and 40 kWh/m2a should be aimed at" in renovation.
- = savings of 80% - 90%.

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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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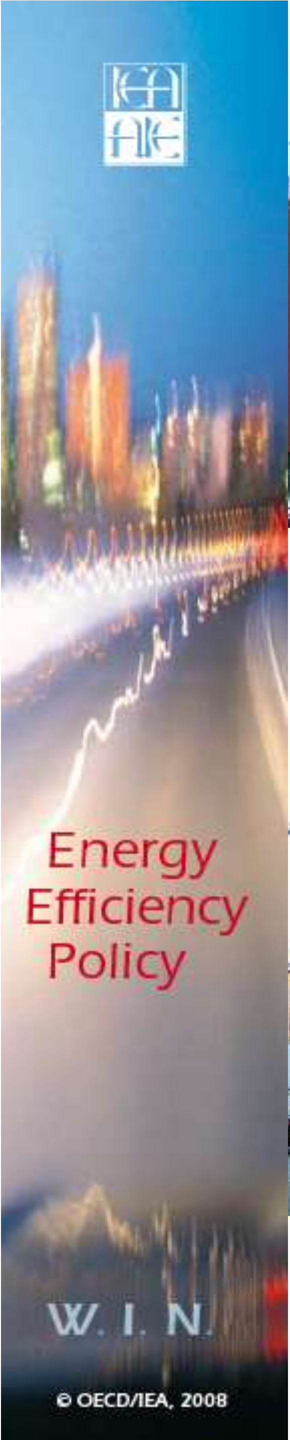

Frankfurt/M Germany Sophienhof
FAAG/ABG Frankfurt Architect Fuessler

Blocks of Flats

160 dwellings
14 767 m²
Passive House Technology
15 kwh / m² per year

Can we afford this ?

Source: Jens Lausten, IEA

Extra costs
= 3-5% of the total costs

Payback = 9 – 10 years

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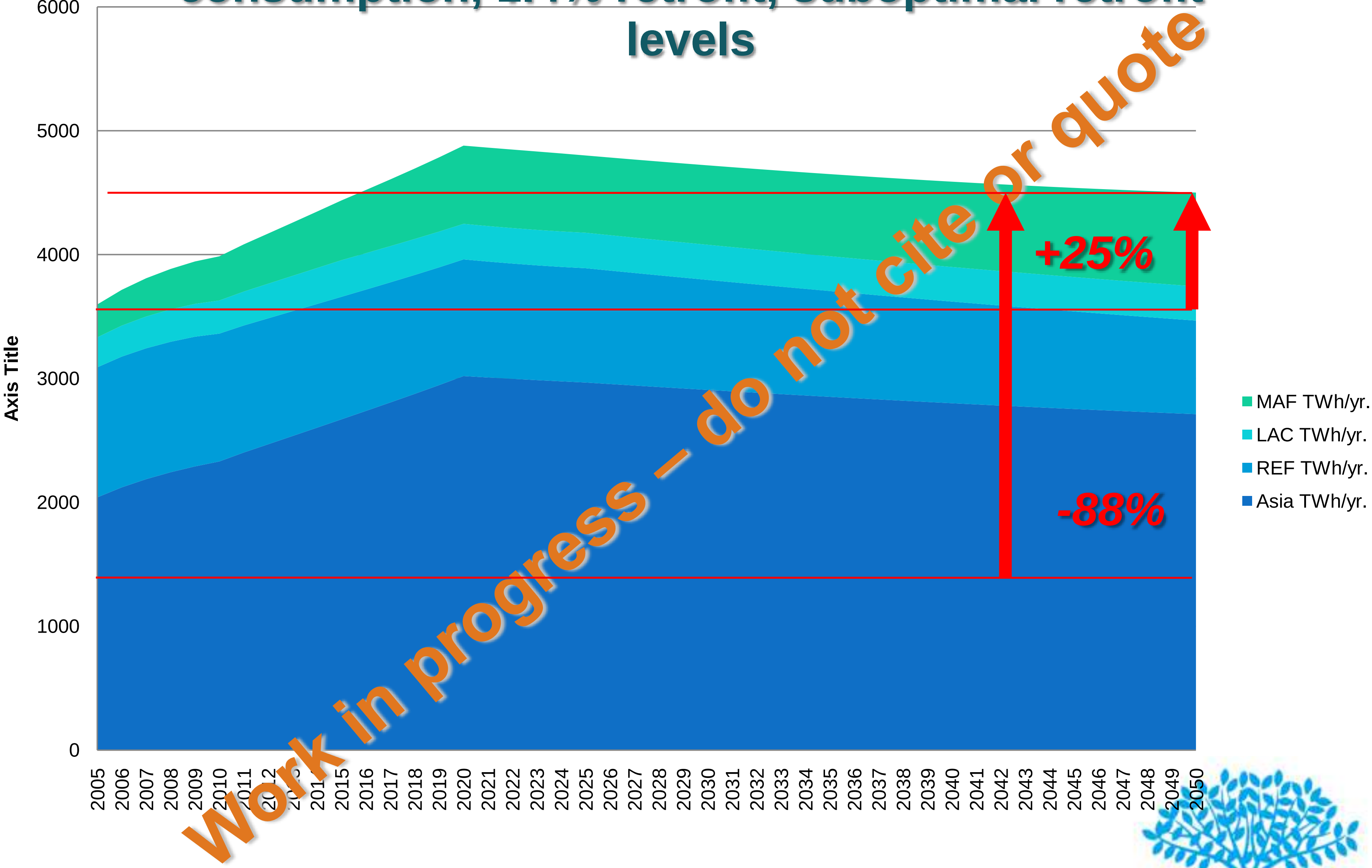
Non-OECD building thermal final energy consumption, 1.4% retrofit, suboptimal retrofit levels



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