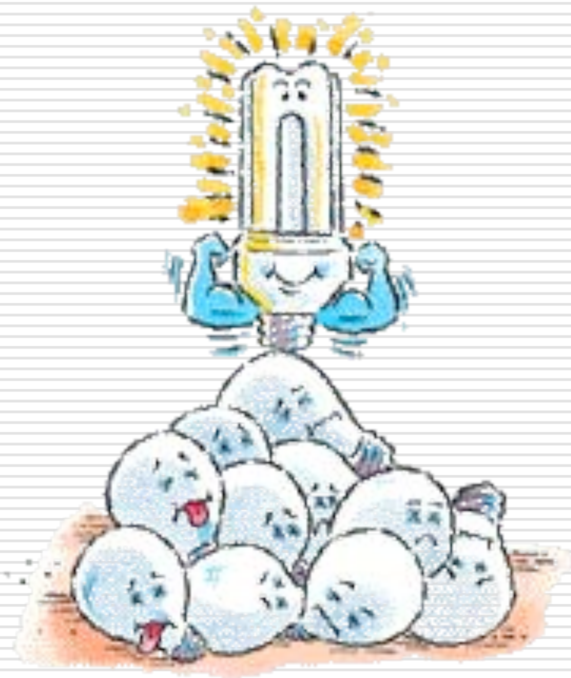
A new window for a new instrument: Can and will GREEN INVESTMENT SCHEMES unlock the high efficiency potentials in Eastern Europe?



Diana Ürge-Vorsatz

Aleksandra Novikova

Central European University

CENTRAL EUROPEAN UNIVERSITY 1991-2006

15 YEARS OF ACHIEVEMENT

Outline

- Background:
  - What is GIS?
  - The size of the "goldmine": prospects for GIS
- Why should EE be the top priority for GIS in CEE?
  - Benefits for the selling country
  - Benefits for CC mitigation
  - Benefits for EE
- If it is all so good, what are the challenges?
- GIS design options favouring EE
- Conclusion

Background: GIS

- Most former communist countries have substantial "hot air"
- Most other Annex-I countries have difficulties with meeting their Kyoto commitments, even if CDM and JI prosper in the remaining time to 2012
- However, meeting Kyoto commitments through hot air is not palatable with the public opinion of most potential buyers
- Therefore, GIS is designed to "green" hot air.
- Thus, GIS = sale of AAUs, tied to certain criteria that ensure that the carbon revenues will result in emission reductions.
- Major **opportunity** of GIS: no formal rules – entirely flexible. Its architechture depends on the agreement between the selling and buying parties.
- However, that is the greatest **risk** as well.

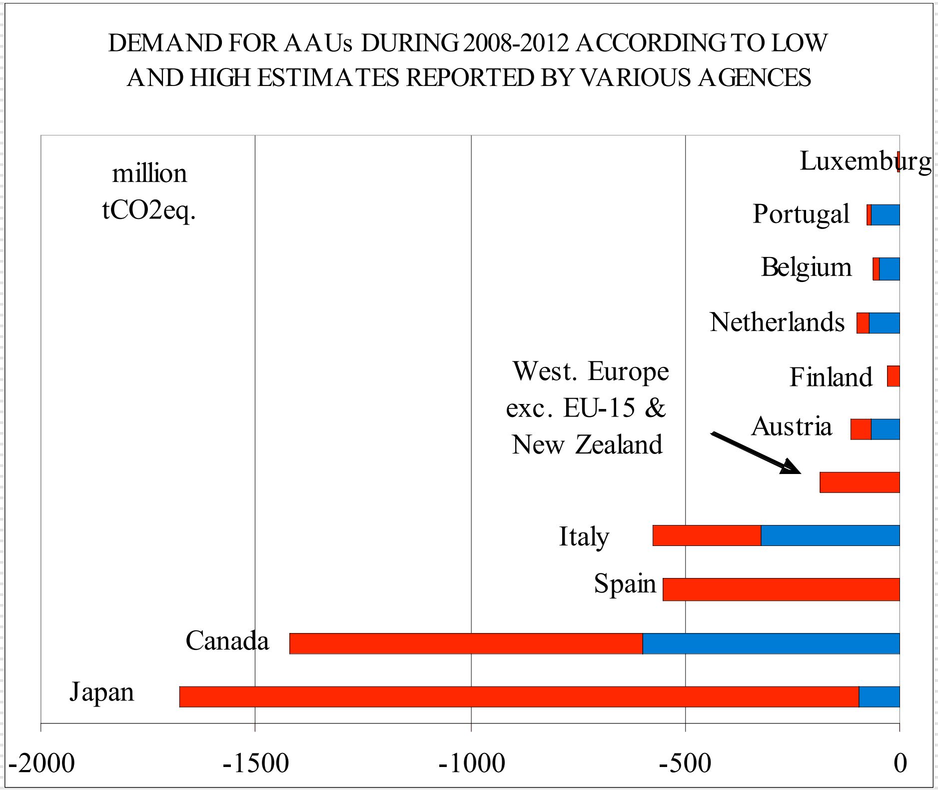
Background: How "deep is the goldmine"? 1.

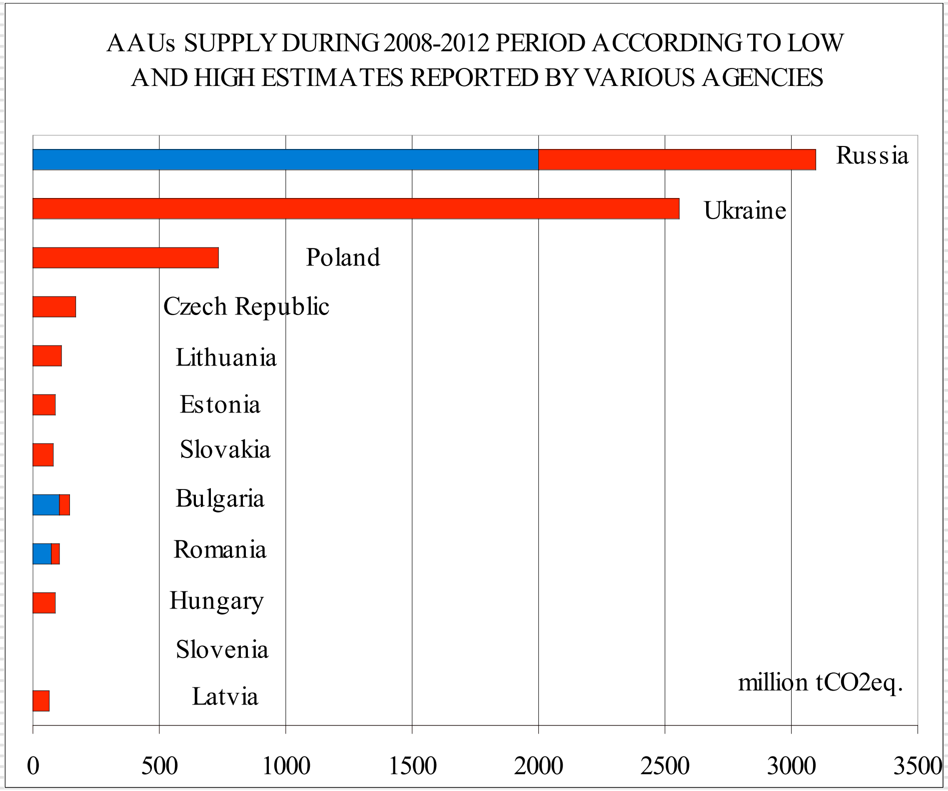
- **CDM and JI will be unable to fill in the compliance gap alone -> IET will be needed**
- Gassan-zade (2006) estimates the compliance gap for 2008 – 2012 at **5.6 billion tCO2eq**
- The supply of AAUs is likely to be higher

Gassan-zade, O. 2006. Market potential for AAU trading. Presentation at the IEA-IETA-EPRI Emissions Trading Workshop in Paris, September 27, 2006

Estimated supply and demand for AAUs
summary of high and low estimates, 2008 - 2012

The **global market reserves of AAUs are appr. 6.1 – 7.3 billion tCO2eq., whereas the maximum demand for AAUs might be 2.0-4.8 billion tCO2eq.**





Note: The two colours distinguish lower and upper estimates, for bars with a single colour no range was located *Sources: Urge-Vorsatz et al ECEEE 2007*

CO_2 emissions in 2004 and projections for 2010 compared to the Kyoto target

[1] For all countries, the base year is 1990, except for Hungary (1985-1987), Poland (1988) and Slovenia (1986).

Country	Change, base year[1] - 2004 (%)	Baseline 2010	Baseline 2010	Difference to target in 2010:	
		High scenario (existing policies & measures), mil tCO2eq.	Low scenario (additional policies & measures), mil tCO2eq.	High scenario (existing policies & measures), in % of limit	Low scenario (additional policies & measures), in % of limit
Czech Republic	-25.0%	145	141	-18%	-20%
Estonia	-51.0%	19	17	-53%	-57%
Hungary	-31.8%	87	87	-24%	-24%
Latvia	-58.5%	14	13	-41%	-44%
Lithuania	-60.4%	25	25	-46%	-46%
Poland	-31.2%	438	438	-6%	-6%
Slovakia	-30.4%	56	54	-16%	-18%
Slovenia	-0.8%	21	20	14%	7%
Bulgaria	-57.2%	91	83	-25%	-32%
Romania	-47.0%	147	141	-39%	-42%

Source: Ürge-Vorsatz et al forthcoming Climate Policy + UNFCCC NC 4 Bulg & Rom

How deep is the goldmine: potential revenues from GIS

Source: Urge-Vorsatz and Novikova, ECEEE 2007

[1] For all countries, the base year is 1990, except for Hungary (1985-1987), Poland (1988) and Slovenia (1986).

Country	Change, base year[1] - 2004	Sellable AAUs	Revenues @5 EUR/tCO_2eq.	Revenues, @20 EUR/tCO_2eq.
	%	Million tons CO_2eq.	Billion EUR	Billion EUR
Czech Republic	-25.1	167.2	0.84	3.34
Estonia	-50.0	89.5	0.45	1.79
Hungary	-32.0	91.8	0.46	1.84
Latvia	-58.5	65.4	0.33	1.31
Lithuania	-60.1	116.1	0.58	2.32
Poland	-31.6	731.1	3.66	14.62
Slovakia	-30.3	81.7	0.41	1.64
Slovenia	-0.8	9.3	0.05	0.19
Romania	-47.0	73.2	0.37	1.46
Bulgaria	-57.6	103.5	0.52	2.07
Ukraine	-57.2	2560	12.80	51.20
Total		**4089**	**20.44**	**81.77**

CENTRAL EUROPEAN UNIVERSITY
1991-2006
15 YEARS OF ACHIEVEMENT

How deep is the goldmine: some comparisons

Country	Type of fund	Fund	Credit/grant/loans[1]	Reference
Hungary	International	German Coal-Aid Fund	54.9 million EUR starting from 1991 (3.4 million EUR annually on average)[2]	Molnár (2006)
Hungary	International	PHARE credit program	28.0 million EUR starting from 1999 (2.8 million EUR annually on average)	Molnár (2006)
Hungary	International	UNDP/GEF Fund for municipalities	0.9 million EUR starting from 2001 (0.15 million EUR annually on average)	Molnár (2006)
Hungary	National	Széchenyi Plan	26.6 million EUR starting from 2001- 2002 (4.8 million EUR annually on average)	Molnár (2006)
Hungary	National	NEP National Energy Saving Program	19.2 million EUR starting from 2003-2004 (5.5 million EUR annually on average)	Molnár (2006)
Hungary	National	KIOP Environmenal Protection and Infrastructure Program	23.8 million EUR in 2004-2006 (7.95 million EUR annually on average)	Molnár (2006)
Estonia	National	KredEx	App. 1.1 million EUR in 2005	Adler (2006)
Poland	National	Thermal Modernisation Fund	28.8 million EUR in 2005	Mazurkiewicz (2006)
Czech Republic	National	Czech Energy Agency	App. 0.11 mil EUR in 2005	Bubeník (2006)
Bulgaria	National	Bulgarian Energy Efficiency Fund	App. 3.75 - 4 mil EUR in 2006	Gerginov (2006)
EU-25	International	European Investment Bank	2.2 billion EUR annually	Beck (2006)

So how to use the gold?

What should GIS revenues be spent on?

Potential criteria to choose priority areas for GIS

- Cheap(est) emission reductions
- National priority areas
- Failure or limitation of other instruments in the sector
- Interests of buyer
- others

A potential target area for GIS: improved building energy efficiency 1.

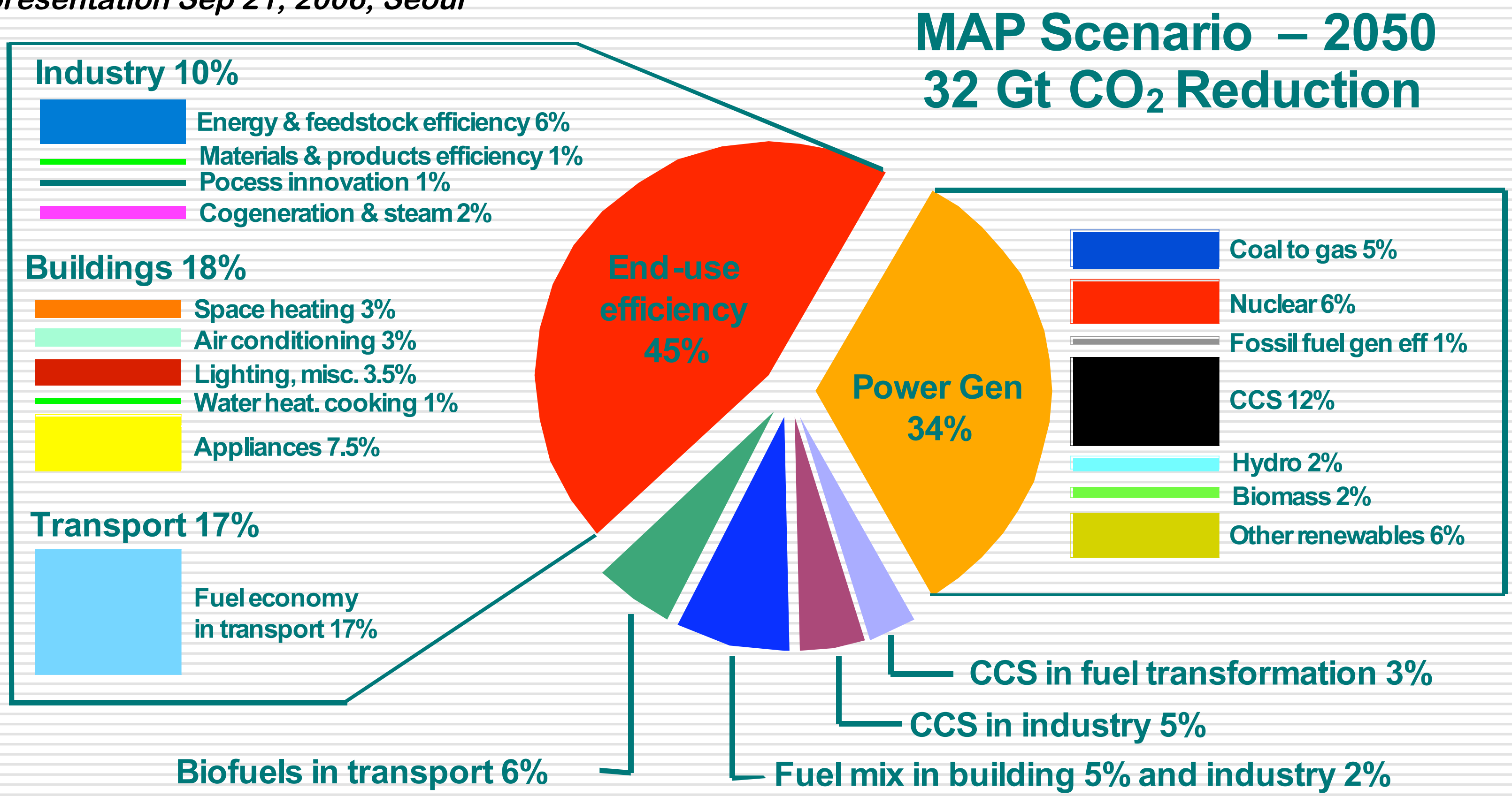
- Buildings represent app. 1/3 of national CO_2 emissions
- Energy-efficiency improvements in buildings supply the largest cost-effective and low-cost CO_2 mitigation potential
- E.g. specific energy consumption in the existing Bulgarian panel building stock is about 200kWh/m2/a, app. 250kWh/m2/a in Hungary vs. 70kWh/m2/a in Austria (sources: Stoyanova 2006, Molnar 2007)

Emission Reduction by Technology Area

IEA Energy Technology Perspectives

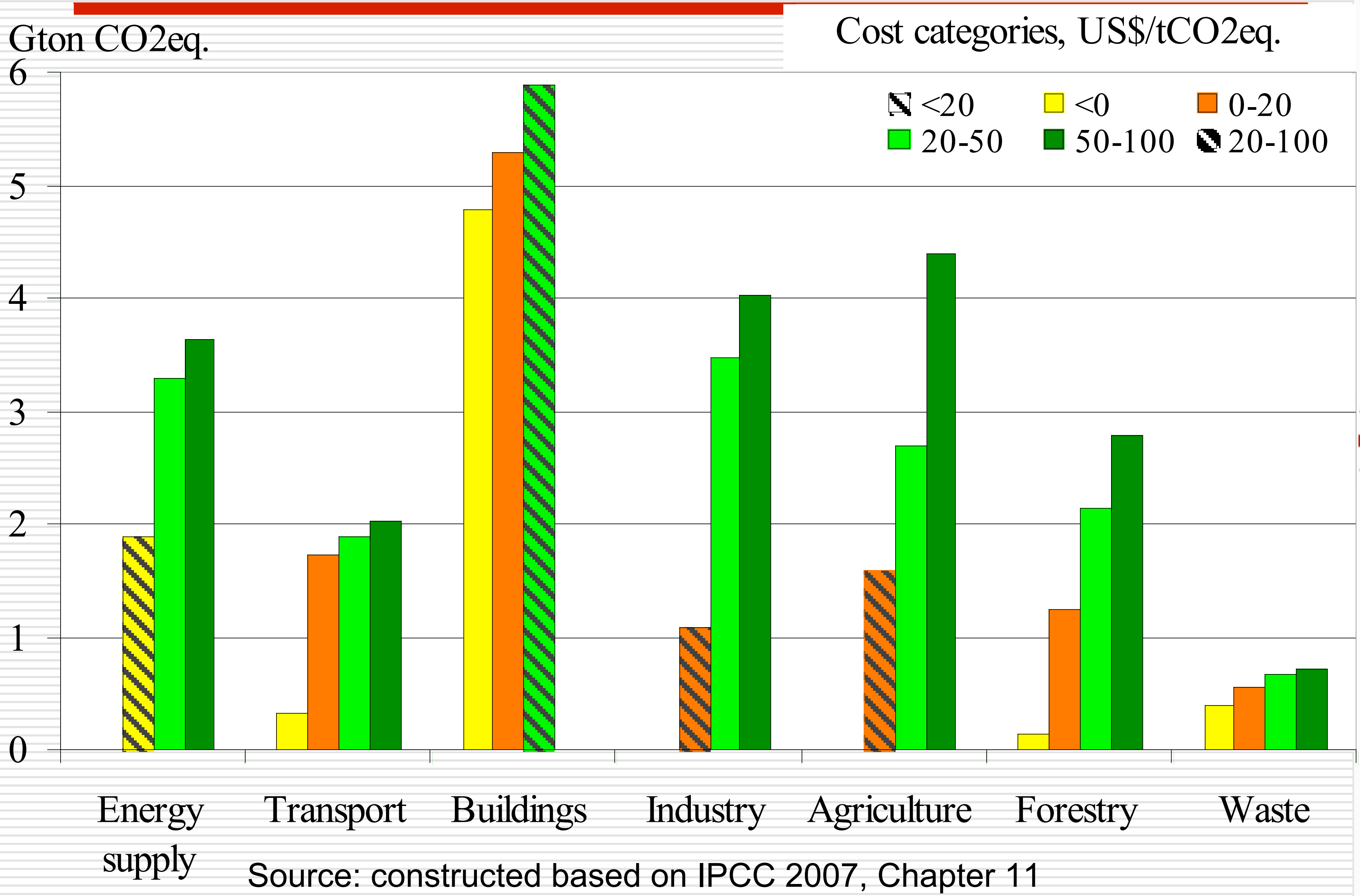
ACT Map Scenario

Source: Dolf Gielen, IEA presentation Sep 21, 2006, Seoul



Improved energy efficiency most important contributor to reduced emissions

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



Source: constructed based on IPCC 2007, Chapter 11

Eurima (2005) findings on en-ef potentials in NEU-8 buildings

- Technical potential from measures in building envelope:
  - esp. insulation of walls, roofs, cellar/ground floor, windows with lower U-value
- 62 mil tCO2 in 2015 as comp. to frozen-efficiency baseline

Note: NEU-8 are Hungary, Slovakia, Slovenia, Estonia, Latvia, Lithuania, Poland, the Czech Republic.

Reference: Petersdorff et al. 2005

A potential target area for GIS: improved building energy efficiency 2.

- Improving EE in the residential sector increases social welfare; helps the population cope with increasing energy prices (e.g. Hungarian unrest)
- Reduced energy bills in the public sector reduce budget deficits
- Reduced energy consumption helps energy security
- ...among many other co-benefits
- There are few instruments that have worked in these two areas, especially the residential sector

A potential target area for GIS: improved building energy efficiency 3.

- ESCOs may work in the public sector, but carbon revenues could help enhance cost-effectiveness of projects
- JI has not been working in the buildings sector (energy-efficiency projects have been limited) due to high transaction costs and other reasons
- Most regulations target new construction; retrofit of existing buildings is hard to influence (EPB dir)
- Several finance/subsidy programs have been operating (successfully) in the region targeting (building) energy efficiency, but overall funds are limited
- Several potential buyers expressed interest in GIS targeted to building EE

Challenges to GIS in CEE

- Will GIS happen?
  - Counter-interest of both buyers and few potential sellers
- Flexibility of GIS is also its “threat” to EE
  - Many architectures may not accommodate or encourage EE projects
  - Lessons need to be learned from JI (CDM), ESCOs and existing financing instruments, to determine what designs may be effective
- More complex architectures may result in lower carbon price due to perceived risks
- Timing: high time pressure
- Little previous experience and research in the field to be used for an optimised design; limited capacity

GIS design options and their impacts on the target area

	GIS design elements	Notes (source: Stoyanova 2006, MS Thesis at CEU)
Type of greening	Hard greening	Requirement for verifiable emission reductions additional to what would have happen in the absence of the project
	Soft greening	No verification of emission reductions required
	Hard and Soft greening	
Project or policy-based	Project-based	Implementation of individual projects and project bundling
	Policy-based	Implementation of policy based activities (e.g. development and introduction of energy efficiency standards and labelling)
Project/ program selection	Top-down	Pre-defined programs for directing investments into prioritized sectors and measures
	Bottom-up	Project-proposals from organizations, individuals and local authorities
	Combination	Funds allocated to several prioritized sectors and project selection within each sector
Funds distribu-tion	Grants	Amount corresponding to the quantity of reduced emissions
	Soft loans	Loans with below-market interest rates and longer repayment periods
	Soft loans and grants	
	Credit guarantees	Guarantees for credits granted by other institutions
	Equity for projects	GIS finances projects, taking an equity share and a corresponding share of the revenues
Benefici-aries	Firms and Non-profit organizations	
	Central and local authorities	Applying for funding also for capacity building programs
	Physical persons	
Time-frame	Short	During the first commitment period (2008-2012)
	Long	During and after the first commitment period

Options in the GIS architecture	Target areas for support	Thermal retrofit of existing buildings	Support of renew-able heat	Other residential or public sector measures (inc. Standby consumption reduction)	Information dissemination, awareness raising, educational
Type of greening	Hard greening	- -	+	Variable: -- to +	- -
	Soft greening	+	+	+	+ +
	Hard and Soft greening	+ +	0	+ +	-
Project or policy/progra m-based	Project-based	+ +	+ +	Variable: - to +	-
	Policy/program-based	+ +	+	+ +	+ +
	combination	+ +	+	+	0
Project/ program selection	Top-down	-	-	+	+
	Bottom-up	+	+	+	+
	Combination	+ +	+ +	+ +	+ +
Funds distribution [1]	Grants	+ +	+ +	+ +	+ +
	Soft loans	+	+	0	-
	Soft loans & grants	+ +	+ +	0	-
	Credit guarantees	0	+	-	- -
	Revolving funds	+	+	-	- -
	Equity for projects	-	+	- -	- -

Options in the GIS architecture	Target areas for support	Thermal retrofit of existing buildings	Support of renew-able heat	Other residential or public sector measures (inc. Standby consumption reduction)	Information dissemination, awareness raising, educational
Beneficiaries	Firms & Non-profit organizations	+ +	+ +	+	+ +
	Central and local authorities	- / + Institutions operating on public budgets	+	+ +	+
	Physical persons	+ + Dwelling owners Owner associations ESCOs	+	+	0
Timeframe	Short-term (until 2012)	0	+	+	+
	Long term (beyond 2012	+ +[2]	0[3]	0	0

Notes:
[1] The authors of this paper are not financial experts, therefore the evaluations in this row should especially be viewed as indicative rather than assertive, and can change subject to a more profound analysis of financial criteria and options.
[2] Depends on the size of GIS revenues. In case the revenues are substantial, it is advisable that it is disbursed over a loger period, because retrofitting a very large number of buildings in a short period may prove challenging due to capacity constraints. In addition, a gradual retrofit schedule better leverages the natural retrofit cycle of buildings.
[3] Depends on the GIS revenue size. If the income can be effectively utilised until 2012 without meeting capacity constraints, it is better to focus the support for a shorter period.

Implications for GIS architecture options

- Architecture of GIS have a major impact on its effectiveness in different target areas
- Better if a **fairly limited amount of target areas to be supported; and fitting the GIS design carefully to the specific needs of the particular target area**.
- Type of greening
  - **A very strictly defined hard greening would be detrimental to the effectiveness,** or even operability
  - **An architecture similar to that of CDM or JI will not result in emission reductions different from BAU and** would raise the costs of GIS implementation
  - A strict monitoring and verification of additionality are especially not applicable in most of the areas

Conclusion 1.

- GIS could potentially play a crucial role on the carbon market in 2008-2012, potentially even larger than CDM/JI combined
- It could capture a major share of the low-cost EE potential in CEE (including the entire building insulation potential estimated by Eurima)
- However, significant challenges may hamper this potential to be unlocked
  - These include time and capacity limitations; conflicting interests from other stakeholders; difficulty of designing a suitable architecture
- Thus it is important that:
  - Actions start today
  - There is cooperation in sharing experiences among countries
  - More research and stakeholder consultations start regularly

Conclusion 2.

- GIS has the potential of becoming an important source of finance for EE (and other sust en goals) in Eastern Europe by 2008 – 2012
- EE in buildings is a particularly favourable area for GIS in Eastern Europe
- However, they GIS architecture will be crucial to whether it will work well in the target area
  - Typically, CDM or JI procedures should not be duplicated
  - Greening should not be too hard
  - There should be not too many target areas supported due to the fact that different target areas warrant different architectures

Thank you for your attention

Diana Ürge-Vorsatz

Vorsatzd@ceu.hu

Aleksandra Novikova

ephnoa01@phd.ceu.hu

Environmental Sciences & Policy Department
Central European University
Tel: +36-1-327-3095
Fax: +36-1-327-3031
website: http://www.ceu.hu/envsci

References

- Proletina Stoyanova, 2006: Energy efficiency through Green Investment Schemes: The case of the Bulgarian building sector. MS Thesis, CEU.
- Streck, Sh. 2005. Too Many Mechanisms, too few institutions: challenges and chances for EITs. May 25, Bonn - SBSTA
- Armenteros, M. and Michaelowa, A. 2002. HWWA discussion paper 173: Joint Implementation and EU Accession countries, Hamburg, Institute of International Economics.
- EURIMA report: Petersdroff, C., T. Boermans, S. Joosen, I. Kolacz, B. Jakubowska, M. Scharte, O. Stobbe, and J. Harnisch, 2005. Cost Effective Climate Protection in the Building Stock of the New EU Member States. Beyond EU Energy Performance of Buildings Directive. ECOFYS for EURIMA.
- IEA. 2006. Energy technology perspectives. OECD/IEA: Paris
- 4th National Communications to the UNFCCC of Hungary, the Czech Republic, Slovakia, Slovenia, and Latvia.
- 3d&4th National Communication to the UNFCCC of Lithuania.
- IEA. 2006. Key world energy statistics. OECD/IEA: Paris.
- Dolf Gielen, IEA. Energy technology perspectives: scenarios and strategies for a more sustainable energy future. Sep 21, 2006, Seoul

Supplementary slides

Conclusion 1

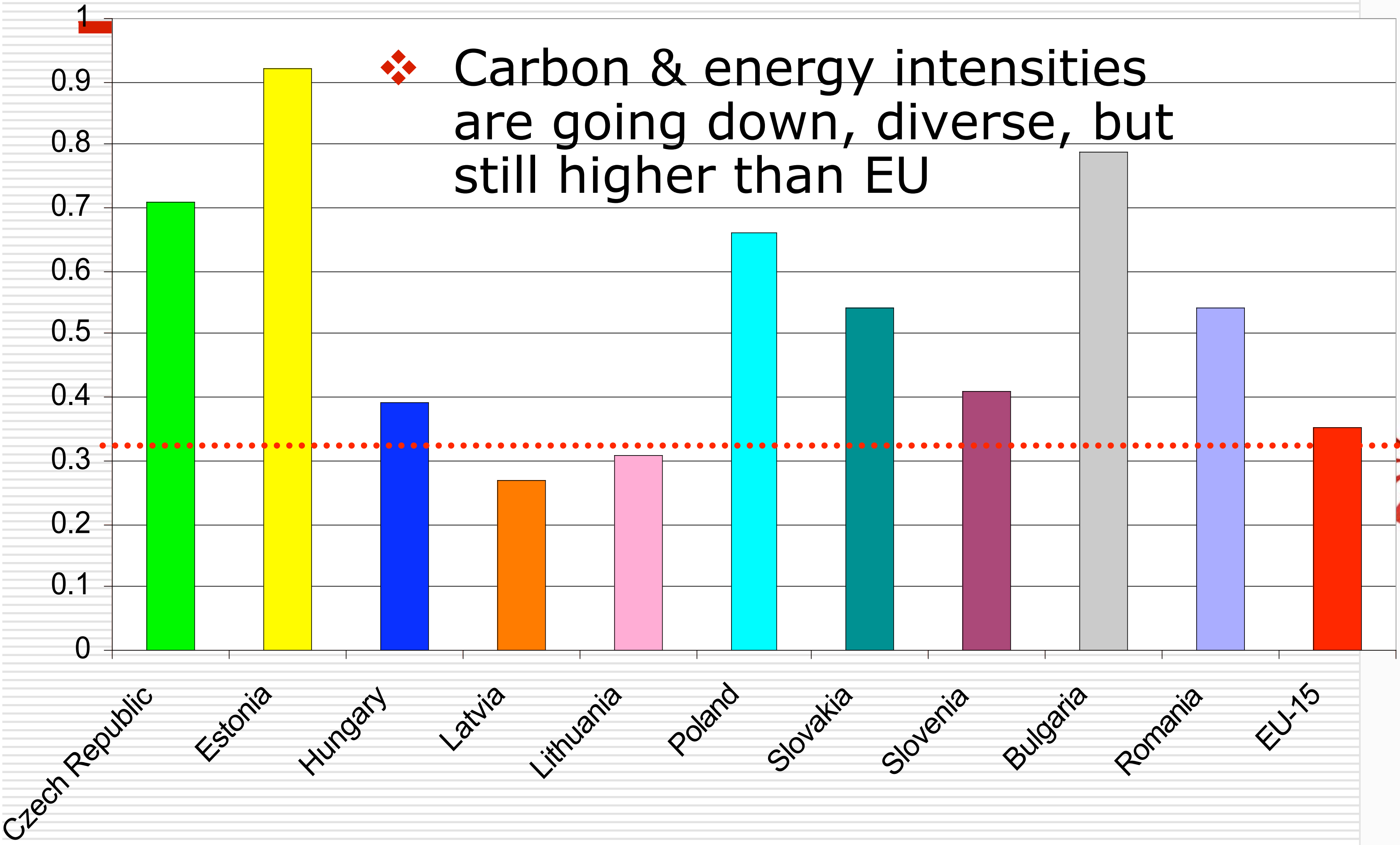
- GISs has potential to provide a new and significant source of EE financing in CEE
  - Can play a larger global role than combined CDM and JI
  - Could represent the single biggest finance source for EE in CEE in recent years
  - Represents a unique opportunity to address key climate change mitigation related priorities
- Due to possible AAUs oversupply, key criteria for choosing GIS target areas and architectures for buyers are:
  - **Credibility** that GIS revenues are utilised for GHG reduction
  - An institutional and financial management structure that is **most transparent**, and **simple but most credible**
  - Investments spurred by the AAUs sales are **additional**
- The national criteria are:
  - Channelling the AAUs revenues to **important but difficult to improve EE areas**
  - Maximising gains **towards national development priorities,**
  - Maximising **cost-efficiency** of investments through the GIS, or maximising the CO2 savings from the revenues.

Conclusion 2

- For the CEE countries, the priority areas for support are:
  - **Retrofitting the old building stock**
  - Promoting ultra-low energy new construction
  - Supporting biomass-based heating
  - Standby, low-power mode & idle electricity consum. reduction
  - Education, training and awareness raising
- Architecture of GIS is important for its effectiveness
  - **Not to rely on very strict hard greening**
  - **Not an extension of JI**.
  - A small role of soft greening is also advisable
- Focus only on a few selected support areas
- Target areas are best supported by grants
- Challenges for GIS: time and capacity limitations; conflicting interests; difficulty of designing a suitable architecture
- Thus it is important that:
  - Actions start today
  - There is cooperation in sharing experiences among countries
  - More research and stakeholder consultations start regularly

JI: past, present and outlook

Overall potential for JI: CO_2 intensity of GDP in 2004 at PPP rates (kg CO_2/2000USD PPP)



- Carbon & energy intensities are going down, diverse, but still higher than EU

Constructed base on IEA key world energy stat 2006

Scope for JI in NEU-8

- High energy & CO_2 intensities → high economic energy svg&mitigation potential, 20% (EP 2005)
  - Buildings
- Additionally, high potential for fuel switch due to reliance on hi-carbon fuels (Est, Pl)
- Rich RES potentials; additionality of RES-E JI is questionable due to high RES targets
  - Biomass for electricity and heat and biofuels
  - Landfill gas recovery
  - Wind
- CHP/DH

Scope for JI in NEU-8: biomass and buildings

- Buildings and biomass are esp welcome:
  - The cheapest potential (37% BL in 2020 bldgs)
- Hard to capture by other mechanisms
  - There are policies but not effective due to high barriers
  - Esp. in residential sector, ESCOs do not work well
- Provide co-benefits
  - Biomass:
    - assist agricultural problems
  - Buildings:
    - Social welfare improvement;
    - Help population with coping with increasing tariffs and gas price hikes
    - Helps energy security and reduces import needs
- These potentials could be unlocked through more ambitious policies or the flexibility mechanisms

Inventory of AIJ projects in CEE: initially there was en ef projects, but disappeared afterwards

	Energy efficiency DH	Energy efficiency other	Forest preservation	Fuel switch	RES Boiler Conversion	RES other	Total number of AIJ
Hungary	0	2	0	2	0	0	4
Poland	0	2	0	1	0	0	3
Czech Republic	0	1	1	2	0	0	4
Slovakia	0	1	0	2	1	0	4
Latvia	5	6	0	1	12	1	25
Estonia	8	6	0	0	7	0	21
Lithuania	1	1	0	0	7	0	9
Slovenia	0	0	0	0	0	0	0
Total	14	19	1	8	27	1	70

More than a third (27) out of the 70 registered projects were oriented to boiler conversion to biomass. **Source**: Evans 2001, UNFCCC 2002

Illustration of On-going JI activities in CEE 1.

Organization/ country of cooperation→ Host country ↓	SenterNovem / Netherlands	Austria	Danish Agency of Env. Protection	Prototype Carbon Fund/ World Bank	Others
Bulgaria (MEWB site+Grozeva 2005) 12 projects	-3 Gasification projects of towns -1 Co-generation power station -1 Co-generation -1 CHP project	Kommunalkredit Public Consulting: -1 Hydropower plant -1 Ind en-ef and co-generation	-1 Agroplychim N_2O reduction project	-1 Biomass utilization -1 Rehabilitation of DH system	Netherlands Fund/EBRD: -1 Biomass and energy efficiency
Latvia 1 project	-N.a.	-N.a.	-N.a.	-1 Solid waste management (PCF site)	-N.a.
Slovakia 2 projects	-1 Landfill gas recovery project (MESR site)	N.a.	-1 Geothermal Project (DEFA site)	N.a.	N.a.

As of September 2006

Illustration of On-going JI activities in CEE 1.

Organization/ country of cooperation→ Host country ↓	**SenterNovem / Netherlands**	**Austria**	**Danish Agency of Env. Protection**	**Prototype Carbon Fund/ World Bank**	**Others**
Hungary (Feiler – pers.com.) 16 projects	-3 Project on shift to biomass -1 CH_4 from landfills -1 Project on cogeneration from biomass to energy and heat	Austrian companies: -1 Landfill wastes to CH_4 -1 Agricult. wastes to CH_4 -3 Wind energy		-1 Shift to Biomass	Mitsubishi/Japan: -1 Energy ef. improv. -1 Using CH_4 from geothermal sources Company name N.A: -1 Reducing N_2O at acid factory -1 Wind energy -1 Gas from thermal water use in 26 places
Lithuania (Bubniene –e-mail comm., Danish Carbon website) 4 projects	N.a.	N.a.	-Flare Gas Reduction Project	N.a.	Company name N.A. -2 energy conversion -1 CH_4 collection from landfill

Illustration of On-going JI activities in CEE 1.

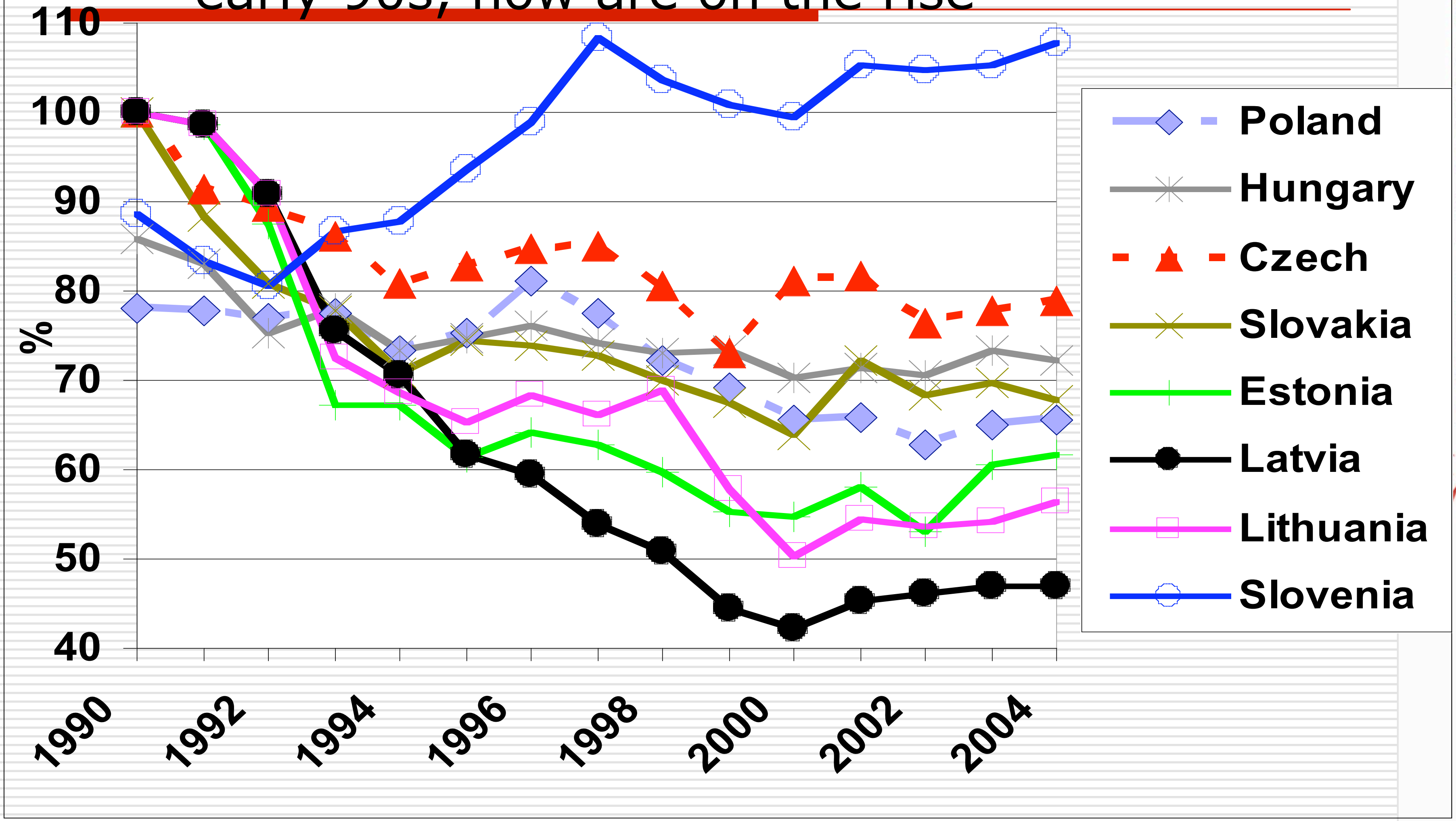
Organization/ country of cooperation→ Host country ↓	SenterNovem/ Netherlands	Danish Agency of Environmental Protection	Prototype Carbon Fund/ World Bank	Others
Estonia 6 projects	-1 Wind energy project (SenterNovem site)	-1 Windmill project (DEFA site)	N.a.	Finnish government: -3 DH projects -1 Wind Energy (FMFADC site)
Romania (MEWMR site) 9 projects	-2 modernization of hydro units -1 Cement Plant -Municipal Cogeneration -Landfill Gas Recovery in 4 Cities	-1 Biomass project on Sawdust -1 Geothermal energy use and DH Systems -1 Rehabilitation of DH Systems	- Afforestation of degradated agricultural soils	Switzerland: -1 Thermal energy project

Illustration of On-going JI activities in CEE 1.

Organization /country of cooperation → **Host country ↓**	**SenterNovem/ Netherlands**	**Danish Agency of Environmental Protection**	**Prototype Carbon Fund/ World Bank**	**Others**
Poland (Paczosa, 2005) 7 projects	-1 Utilization of biomass for heating -1 Landfill gas recovery	-1 Wind Energy -2 Utilization of CH4 from landfill -Geothermal project	N.a.	Canada: - Construction of small hydropower plants
Czech Republic (webcite of the Ministry of the Env Cz) 40 projects	-	-1 N2O reduction in techn. process	-16 Small hydropower plant -5 DH projects -1 Waste dump -1 Hydrogen Boiler	Company name N.A.: -1 Biomass processing, -4 Biomass central Heating, -7 Biomass Central Heat. -3 Central Heating

Percentage of CO2 emissions compared to base year*

- IET: CO2 emissions heavily declined in the early 90s, now are on the rise



Base year 1990, except for Hungary (1985-1987), Poland (1988) and Slovenia (1986).

Source of data: IEA Balances of OECD 2002, Key world energy stat 2003, 2004, 2005, 2006.

GIS initiatives in the region

- WB
  - Launch of GIS research in Bulgaria in 2004
  - Expressed interest to initiate design of GIS in interested countries (Romania, Poland, Czech and Slovak Republic)
  - Allocates funds for these activities
- Hungarian government started considering a GIS scheme and building the legal framework; proposal to the Parliament may be submitted in a month or two

How to design GIS?

- Will GIS has to be designed how to capture energy efficiency?
- Too dependant on the state: risk of efficient selection of projects in CEE
- Selection of projects biased
- Will transaction costs of GIS be higher than those of JI?

Conclusion: how much EE and RES will the flex mex deliver in CEE?

- High cost-effective potentials, esp. in buildings, biomass and biofuels
- However, JI (Track-1) will play a positive, but limited role
- Straight" IET itself is not likely to lead to emission reductions in NEU-8 (+2) in the first commitment period
- **GIS may make an important difference in capturing energy-efficiency and biomass potentials, if it is well designed (this is the challenge!)**

Acknowledgment

- Jozsef Feiler, Head of the unit "Climate protection and energy" of the Hungarian Ministry of Water and the Environment

Options for the GIS design overcoming the barriers to energy efficiency in buildings through JI

Main barrier	GIS options to overcome the barriers	Advantages	Disadvantages
Small scope and high transaction costs	a) Project bundling under Hard greening	Reduction of transaction costs and economies of scale	Limitations of project bundling Difficult monitoring
	b) Individual projects or project bundling under Soft greening (no baseline determination)	No transaction costs associated with baselines, monitoring and verification	Difficult to prioritize cost-effective projects Danger of overselling AAUs
Small quantity of emission reductions	No requirement for minimum levels of emission reductions	Financing of small-scope projects with high mitigation potential	
Time limitations of JI	GIS designed as a long-term structure, extending beyond 2012	Financing of projects generating emission reductions over longer periods	

Source: Stoyanova 2006 Energy efficiency through Green Investment Schemes: The case of the Bulgarian building sector. CEU thesis

Potential for IET

- Some EiT prefer IET
- Japan, Canada, and Western Europe need IET to comply with the Kyoto Protocol
  - Potential demand for outside credits: 2.5 - 3.5 btCO_2e
  - Potential supply of CDM/JI: 0.3 - 1.0 btCO_2e
  - ⇒ **Required amount of "hot air": 1.5 - 3.2 btCO_2e** (Streck 2005)

Source: World Bank estimates in Sh. Streck presentation in Bonn, 2005

CO_2 emissions in 2002 and projections for 2010 compared to the Kyoto target

	Change from base year* to 2002 (%)	2010 projections: Difference to target
Poland	-37.3%	-7.3% to -20.8%
Hungary	-29.4%	-2.6%
Czech Republic	-23.6%	-1% to -6.7%
Slovakia	-31.7%	+0.5% to -3.1%
Estonia	-46.8%	-54.5%
Latvia	-53.9%	-38.7%
Lithuania	-46.4%	+24.7% to -11%
Slovenia	+4.6%	n.a.

Sources of data: *Calculated from data from IEA 2004. Projections adapted from Armenteros and Michaelowa 2002.* * Base years other than 1990: Hungary (average of 1985-1987); Poland (1988); and Slovenia (1986)

The AAU-Based Green Investment Scheme (GIS)

- Long term financing facility which links emission mitigation activities and projects with the transfer of AAUs
- Through such 'greening' of AAUs additional AAUs are made available for compliance and transfer
- Based on the transfer of AAUs against payment
- Similar to JI, but more flexible (eg. not tied to year)
- GIS can be cost neutral (Soft Greening)
- soft greening: Implementation of pre-defined activities which do not result in **measurable** emission reductions, as well as…
- …public awareness, demand-side management, capacity building, institutional strengthening
- How to combine the market participators?

For more info on GIS, see, for instance, World Bank 2004

Special attention: transaction costs are proportional to project size

Size	Type	CER (tCO2/year)	Transaction costs in Euro/tCO2
Very large	Large hydro, gas power plants, large combined heat-power (CHP) plants, geothermal, landfill/pipeline methane capture, cement plant efficiency, large-scale afforestation	>2000,000	0.1
Large	Wind power, solar thermal, energy efficiency in large industry	20,000-200,000	1
Small	Boiler conversion, demand side management, small hydro	2,000-20,000	10
Mini	Energy efficiency in housing and small and medium enterprises, mini hydro	200-2,000	100
Micro	Photovoltaics	<200	1000

Source: Michaelowa et.al 2004

Experience from AIJ phase: other barriers

- A shortage of the time for JI projects to become operational (the start time is no later than 2006 to contribute to reductions in 2008)
- High investment thresholds of financial institutions for considering project financing (also may be solved by bundling)
- Not transparent criteria and complicated procedures of planning and implementation of AIJ projects

Main drawback: Transaction costs of Track-2 JI

- Too high transaction costs due to difficult administrative procedures with track-2
  - The largest barrier
  - Increase with decreasing scale of projects hindering implementation of small but most frequent projects
  - Bundling if possible may partially help to overcome high TR costs (for ex., in 2001-2004 Czech Republic implemented the JI project consisting of a portfolio of 9 biomass projects)
  - However, private sector is sceptical about bundling at the corporate level due to difficulties of harmonisation of administrative procedures

Overall potentials for flexible mechanisms in NEU-8

The analysis of both demand and supply side shows that most of NEU-8 countries have considerable CO_2 surplus

- **CO_2 emissions heavily declined early 90s, now on the rise**

  Drop of CO_2 in 1990s due to economic recession:

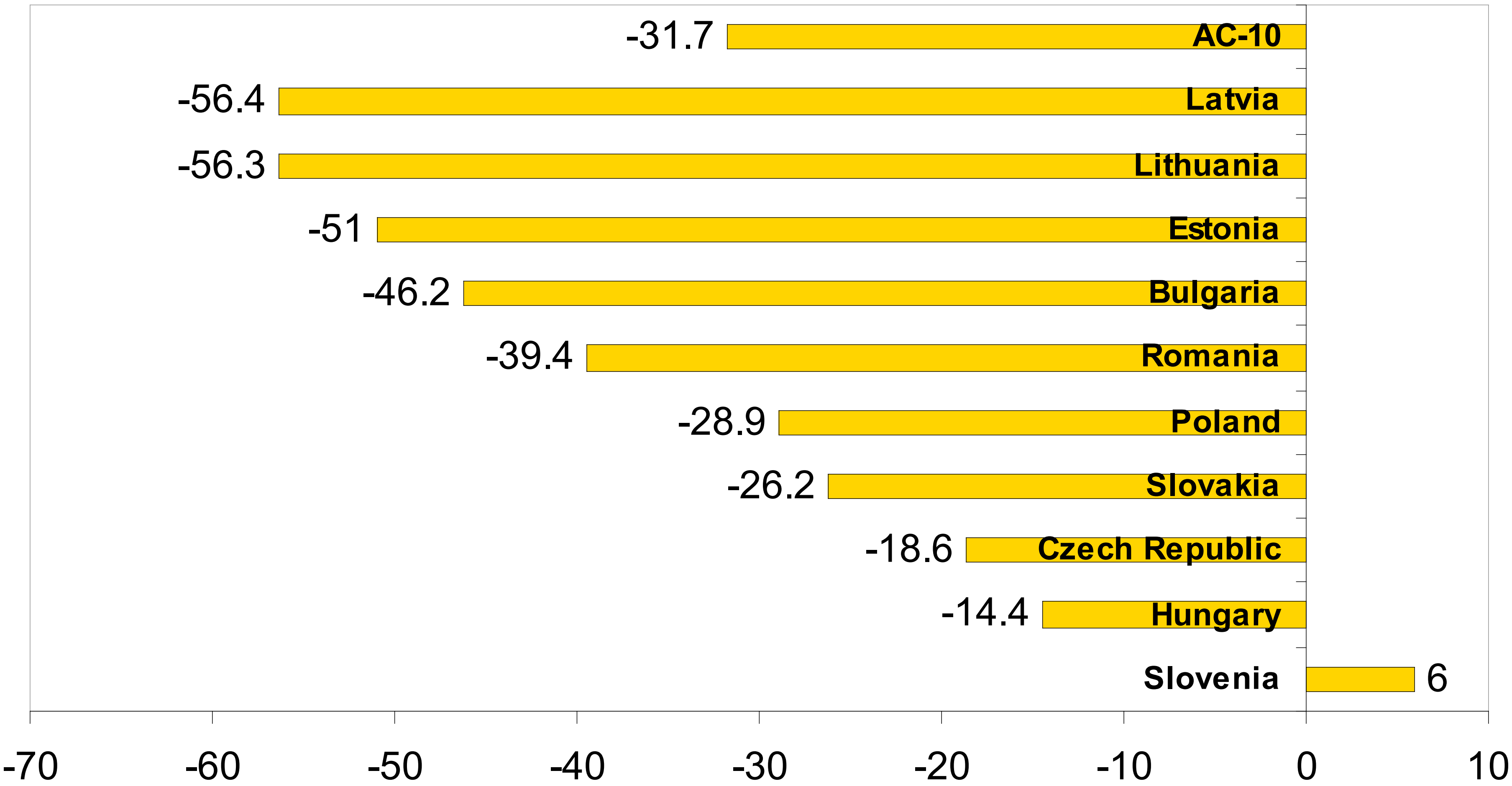
  - ✓ > than 40% in the Baltic States,
  - ✓ about 30% in the Visegrad countries
  - ✓ except: Slovenia has rising tendency from 1992

Overall potentials for flexible mechanisms in NEU-8

The analysis of both demand and supply side shows that most of NEU-8 countries have considerable CO_2 surplus

- **CO_2 emissions heavily declined early 90s, now on the rise**
- **Two of NEU-8 probably will not meet Kyoto , other six may participate in IET**
  - ✓ Fulfillment of the Kyoto Protocol will create difficulties for Slovenia (already exceeded the target) and Lithuania (due to substitution of its Ignalina nuclear plant providing over 80% of total electricity by other sources), for the rest NEU it will not cause difficulties
  - ✓ CO_2 emissions surplus for these six NEU provides an opportunity to participate in IET as sellers

Percentage points below (-) or above (+) linear target path



Source: European Environment Agency

Economically feasible reduction emissions due to different measures in NEU-8

Country	Economically feasible reduction emission
Poland	Poland has a strong potential for application of energy efficiency measures as well as renewable technologies and fuel switch. Introduction of AIJ projects showed that the reduction cost varied from 1 USD (use of biomass for power generation), to 4,6 – 64,2 USD (coal-to-gas conversion) to 26 and 130 USD (thermo-modernisation and energy conservation) per tCO2e reduced (Maly et al.2002). Comparing these costs with WB threshold, one may find the projects of fuel switch as especially attractive.
Estonia	Estonia has probed AIJ projects directed to fuel switch from fossil fuels to the local bio-ones at heat producing plants; DH improvement through reduction of heat losses and end-use energy efficiency in buildings. The average cost of CO2 emission reductions was positive (20 euro / tCO2 excluding transaction costs of 5.3. euro/tCO2) and almost reached the economically feasible threshold stated by WB (Maly et al. 2002a). Estonia has a large potential for low cost fuel switch as it rely heavily on high-carbon fuels: combustion of shale oil provides 98% of commercial electricity and 25% of heat (Point Carbon 2004a).
Slovakia	Estimates completed for Slovakia found the following projects at negative or very low abatement costs: biomass in district and space heating, biomass in industrial energy, solar heating, combined cycle in public combined heating and power (Maly et al. 2002).
Slovenia	Slovenia estimated an about 20 % cost effective energy savings potential in industry and about 30 % economic energy savings potential in the buildings sector. However, these projects require considerable investments. Having abundant biomass and hydro potential Slovenia is going to exploit the rest of non-utilised biomass (about 30%of the total technical potential) and hydro resources (about 60% of the technical potential) (Maly et al. 2002).

Economically feasible reduction emissions due to different measures in NEU-8

Country	Economically feasible reduction emission
The Czech Republic	Czech experts estimated the large potential of CO2 emission reduction with marginal abatement costs up to 30 USD/t of CO2 in following sectors: production and distribution of power and heat, landfill gas recovery, utilisation of renewable energy sources, energy savings in public and residential buildings, forestation and forest management, power and heat sector (Maly et al. 2002).
Hungary	The largest potential of GHG emission reductions belongs to the residential sector. The most economically feasible is the application of CHP and district heating in this sector having high potential and medium amendment costs (Maly et al. 2002).
Lithuania	There is a high energy conservation potential in modernisation of heat supply and use in buildings. The largest energy and GHG mitigation potential can be achieved by improvement of the thermal insulation of buildings (it can save about 45% of energy consumption in the housing sector). Another possibility for emission reductions is CHP infrastructure modernisation through fuel switch in Power Plant Facilities (Maly et al. 2002).
Latvia	Technical potential is feasible in the majority of DH systems constructed in 1960 - 1990. The measures can be directed to improvement of centralised district substations and heating schemes having the largest heat loses of 25-50% depending on the season. Large potential is also seen in building insulation (Maly et al. 2002).

Summary of JI trends

- Most of JI projects are RES (esp. fuel switch to biomass)
- High potential is hurdled with the number of barriers, the highest is high TRC resulted from administrative procedures of track-1
- Solution may bring bundling of small-scale projects, however, private sector is skeptical regarding it
- Thus, low cost demand side projects are limited
- EU enlargement wither the JI scope due to likely rising the ETS sector from 2008
- Track-1 JI projects are limited while track-2 is likely to be substituted project-based ET

Opportunities for JI: potential

Is due to:

- High carbon intensities
- Still higher energy intensities than OECD
- Energy-use efficiency potential of ~ 20%
- Reliance on carbon fuels (Estonia, Poland)
- Diverse RES potential (however, difficult to exploit under JI due to high RES targets)

Is determined by:

- Number of JI projects
- Availability of low cost mitigation options
- Market barriers

Benefits of GISs for the selling country

- Tapping of additional financing sources
- Leveraging of private financing
- Funds can be used to support seller's co-financing obligations in official borrowings
- Additional flexibility compared to JI projects
- Achievement of emission reductions in the most efficient manner
- Flexible use of funds between the projects

Source: Charlotte Streck, WB.

The Mechanisms: JI, first track

- Project-based
- Eligibility criteria need to be met
- Rules not yet defined but….up to the host country to define
- Host country validation and verification
- Flexibility which allows programmatic and sectoral approaches
- Danger of creating multiple systems (often driven by buyer-preferences)
- Challenges for Host Country
- ERUs can be used under EU ETS
- Voluntary

streck

The Mechanisms: JI, second track

- Project-based
- Rules not yet defined but….similar to CDM (?)
- Independent validation and verification (but: Transfer only after eligibility criteria are met)
- Often combined with transfer commitments of AAUs for "early credits"
- Attracts private sector and governments
- ERUs can be used under the EU ETS
- EITs have already significant experience
- voluntary

streck

International Emission Trading 1
(as defined by Art. 17 of the KP)

- Demand for CEE “hot air” is high: CDM and JI projects are expected to provide only 250-300 million tons of emission credits per year (vs. 1 billion tons needed)
- Overall compliance gap: 700 million tons/year
- EITs together have about 650 million tons/year of surplus AAUs (excluding Russia) (*Charlotte Streck, World Bank)*

Background:
how deep is the goldmine? 2.

- **CDM and JI will be unable to fill in the compliance gap alone -> IET will be needed**
- E.g. Japan, Canada, and Western Europe need IET to comply with the Kyoto Protocol (Streck 2005)
  - Potential demand for outside credits: 2.5 - 3.5 btCO2e
  - Potential supply of CDM/JI: 0.3 - 1.0 btCO2e
  - **Required amount of "hot air": 1.5 - 3.2 btCO2e**
- **In CEE-8, the amount of presently projected "hot air" is app. 140-240 mil. tCO2.**
  - **At a pessimistic carbon price (e.g. EUR 2/tCO2), this represents app. EUR 280-490 mil.**
  - **At EUR 10/tCO2, this is app. EUR 1400 – 2400 mil.**

GHG emissions reduction potential for the world's buildings stock, 2020[1]

Economic region	Countries/ country groups reviewed for region	Potential as % of national baseline for buildings[2]	Measures covering the largest potential	Measures providing the cheapest mitigation options
Developed countries	USA, EU, UK, Canada, Greece, New Zealand, Australia, Republic of Korea, Germany	**Technical:** 26%-54% **Economic:** 16%-21% **Market:** 14%-37%	1. Shell retrofit, inc. insulation, esp. windows and walls; 2. Space heating systems and standards for them; 3. Efficient lights, esp. shift to CFLs and efficient ballasts.	1. Appliances such as efficient TVs and VCRs (both on-mode and standby), refrigerators and freezers, followed by ventilators and air-conditioners; 2. Water heating equipment; 3. Lighting best practices.
Economies in Transition	Hungary, Russia	**Economic:** 18%-45%	1. Pre- and post-insulation and replacement of building components, esp. windows; 2. Efficient lighting, esp. shift to CFLs; 3. Efficient appliances such as refrigerators and water heaters.	1. Water and space heating control systems; 2. Retrofit and replacement of building components, esp. windows; 3. Efficient lighting and its controls.
Developing countries	Myanmar, India, Indonesia, Argentine, Brazil, China, Ecuador, Thailand, Pakistan, South Africa	**Technical:** up to 52% **Economic:** 18%-71% **Market:** up to 23%	1. Efficient lights, esp. shift to CFLs, light retrofit, and kerosene lamps; 2. Various types of improved cook stoves, esp. biomass stoves, followed by LPG and kerosene stoves; 3. Efficient appliances such as air-conditioners and refrigerators.	1. Improved lights, esp. shift to CFL light retrofit, and efficient kerosene lamps; 2. Various types of improved cook stoves, esp. biomass based, followed by kerosene stoves; 3. Efficient electric appliances such as refrigerators and air-conditioners.

[1] Except for EU-15, Greece, Canada, and India, for which the target year was 2010, and Hungary, for which the target was 2030.

[2] The fact that the market potential is higher than the economic potential for developed countries is explained by limitation of studies considering only one type of potential so information for some studies likely having higher economic potential is missing.

Draft, please do not cite or quote!

Eurima (2005) findings on en-ef potentials in NEU-8 buildings

- Technical potential from measures in building envelope:
  - esp. insulation of walls, roofs, cellar/ground floor, windows with lower U-value
- 62 mil tCO2 in 2015 as comp. to frozen-efficiency baseline
- Cheapest options
  - 1.Roof insulation; 2.Wall insulation; 3.Floor Insulation.
- Options delivering the largest potential
  - 1.Windows replacement; 2.Wall insulation; 3.Roof insulation.

Note: NEU-8 are Hungary, Slovakia, Slovenia, Estonia, Latvia, Lithuania, Poland, the Czech Republic.

Reference: Petersdorff et al. 2005

Options for the GIS design overcoming the barriers to energy efficiency in buildings through JI

Main barrier	GIS options to overcome the barriers	Advantages	Disadvantages
Small scope and high transaction costs	a) Project bundling under Hard greening	Reduction of transaction costs and economies of scale	Limitations of project bundling Difficult monitoring
	b) Individual projects or project bundling under Soft greening (no baseline determination)	No transaction costs associated with baselines, monitoring and verification	Difficult to prioritize cost-effective projects Danger of overselling AAUs
Small quantity of emission reductions	No requirement for minimum levels of emission reductions	Financing of small-scope projects with high mitigation potential	
Time limitations of JI	GIS designed as a long-term structure, extending beyond 2012	Financing of projects generating emission reductions over longer periods	

Source: Stoyanova 2006 Energy efficiency through Green Investment Schemes: The case of the Bulgarian building sector. CEU thesis

A potential target area for GIS: improved building energy efficiency 1.

- Buildings represent app. 1/3 of national CO_2 emissions
- Energy-efficiency improvements in buildings supply the largest cost-effective and low-cost CO_2 mitigation potential
- E.g. specific energy consumption in the existing Bulgarian panel building stock is about 200kWh/m2/a, in Hungary about 259 kWh/m2/a, vs. 70kWh/m2/a in Austria (source: Stoyanova 2006, Molnar 2007)

A potential target area for GIS: improved building energy efficiency 3.

- ESCOs may work in the public sector, but carbon revenues could help enhance cost-effectiveness of projects
- JI has not been working in the buildings sector (energy-efficiency projects have been limited) due to high transaction costs and other reasons
- Most regulations target new construction; retrofit of existing buildings are hard to influence (EPB dir)
- Several finance/subsidy programs have been operating (successfully) in the region targeting (building) energy efficiency, but overall funds are limited
- Several potential buyers expressed interest in GIS targeted to building EE