A new window for a new instrument: Can and will green investment schemes unlock the high efficiency potentials in Eastern Europe?

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Abstract
According to the latest projections, "hot air", i.e. surplus of greenhouse gas emission (GHG) allowances compared to the Kyoto commitments, will total significantly higher amounts than projected even a few years ago. Since the compliance gaps of Annex I Parties of the Kyoto Protocol are unlikely to be fully filled by credits from the Joint Implementation and the Clean Development Mechanism, this hot air will be in high demand. In order to make these allowances palatable for public opinion, "green investment schemes" (GISs) have been proposed. GISs bring reductions in emissions, using the revenues from allowance sales. The major hypothetical advantage of GISs over flexible mechanisms (FM) is that its potentially diverse architectures could overcome the liabilities of the FMs, and could focus on the highest priorities in emission reduction in the selling countries.

Several countries of Central and Eastern Europe (CEE) are considering the establishment of GISs in the European Union. Due to the large amount of hot air, GISs could provide a unique window of opportunity in these countries to finance energy-efficiency (EE). The paper first demonstrates why GISs should focus on EE, especially on investment in buildings. Next, the paper warns that the majority of potential GIS architectures will not accommodate EE investments, and therefore it is essential that such a scheme is optimised to leverage EE opportunities already on the drawing board. The paper reviews briefly the potential components of GISs, evaluates them from the perspective on their potential leverage on EE investments, and suggests alternative architectures that can optimise the benefits of GISs for the selling country, as well as the planet.

Introduction: areas where energy-efficiency is hard to improve through policies and measures

PROBLEM SETTING AND OPPORTUNITIES FOR ADDRESSING THE PROBLEM

Former communist countries in Central and Eastern Europe (CEE) still lag behind Western Europe in terms of their energy efficiency (EE), indicating their higher EE potentials if these two regions are compared. However, much of this potential, especially in the building sector, is difficult to unlock due to a broad range of barriers (IEA 2006b). For instance, poorly constructed block-houses represent only one of the several areas where there is major potential for cost-effective efficiency investments but it is hampered by strong and diverse barriers, however, it is difficult, if not impossible, to expect that any market mechanisms can be introduced to unlock the large potential. In addition, regulatory measures are also difficult to introduce for retrofit situations, due to the severe shortage of access to capital and because of other barriers detailed above. At the same time, improvement in these areas is crucial if these countries aim to radically reduce their carbon emissions in the long-term, as well as address the significant social pressures and fuel poverty associated with the disproportionately high heating costs in such dwellings.

Presently, there are two attractive new opportunities through which these problems, which are difficult to solve through the existing portfolio of instruments and measures, could be suf-

ficiently improved. These are the leveraging of the Structural Funds in the new EU member states, and "Green Investment Schemes" (GISs) through the Kyoto Protocol's International Emission Trading mechanism. Both of these sources of financing could potentially solve a major part of the problem – at the same time, there is also a high risk that the funds will not be directed to these areas, or the structure of their spending will exclude these areas so difficult to finance.

AIM AND QUESTIONS OF THE PAPER

The aim of this paper is to examine GISs, one of these two attractive new sources of potential finance.. The study will show how GISs could be leveraged to address those problematic areas of EE improvements that contribute significantly to social and environmental problems but are difficult to address through other mechanisms.

The paper first reviews the concept of GISs and their basic design options, then it provides a review of the carbon market to show the potential role and significance of GISs. The paper outlines a set of criteria through which target areas for GISs can and should be selected, and identifies a few priority areas for CEE countries. Finally, the paper reviews the major GIS architectures, and discusses which architecture options could promote EE effectively.

This paper is based on several pieces of research. First, Proletina Stoyanova has completed her MS thesis at the Central European University (CEU) on how to leverage the potential Bulgarian GIS for promoting EE in buildings. Second, the other authors of this paper have completed a background study for the Hungarian Ministry of Environment and Water Management on a potential design of options for the Hungarian GIS. In addition, the authors have worked on how the flexible mechanisms (FM) could promote EE in the CEE region. This paper represents a synthesis of these pieces of research, from the perspective of answering the questions:

- How important a role will and could GISs play in the CEE region?
- How could GISs be best leveraged to unlock the major efficiency potentials in the region?

Background: Green Investment Schemes

As a result of the collapse of former centrally planned economies, the CEE countries, together with Russia and the Ukraine, will have app. 6.2 billion tons of CO_2eq. (see below) surplus emission allowances (referred as assigned amount units, or AAUs) between 2008 and 2012, compared to their compliance targets as defined by the Kyoto Protocol. In principle, these allowances could be sold under Article 17 of the Kyoto Protocol, to countries not able to comply with their targets.

However, the majority of the countries with a compliance gap, such as the majority of the EU-15 and Japan, have already announced that they do not intend to achieve their compliance with the Kyoto Protocol through "hot air", i.e. through the purchase of surplus allowances that are not the result of real emission reduction activities (Gorina, 2006; Carbon Finance at the World Bank, 2006). Since the AAU buying countries (typically ones largely concerned with global climate change) will spend large amounts of taxpayer's money on purchasing allowances from other countries, it is very important for them to show their voters that this money has been spent on investments that do contribute in the long-term to the mitigation of the climate change problem.

In order to bridge this gap, GISs have been proposed to be set up in the countries with excess emissions (Tangen et al, 2002; Blyth and Baron, 2003). Green Investment Schemes tie greenhouse gas (GHG) emission reductions to the sale of AAUs, therefore "greening hot air". The well-designed GISs have major benefits for both buyers and sellers of AAUs. The buyers can comply with their Kyoto commitments at potentially reduced costs than they would be able to do so in their home countries. If GISs credibly "green" hot air, this contribution to the Kyoto compliance will also result in GHG emission reductions, therefore addressing the climate change problem. Selling countries benefit through receiving revenues that can be spent on investments otherwise difficult to finance, or that can replace or mitigate the impact of policies that otherwise would be difficult to implement or may have unwelcome social burdens. In addition, it is important to acknowledge the substantial co-benefits that are associated with certain GHG mitigation measures, such as improved energy-efficiency, including increased energy security, improved social welfare through decreased energy bills, improved competitiveness, potentially increased real estate values and employment, deployment and diffusion of modern technologies, and regional development benefits (IPCC, forthcoming).

The key characteristic of GISs is that **presently no international law or treaty regulates them**, as opposed to, for instance, other Kyoto FM such as the Clean Development Mechanism (CDM) and Joint Implementation (JI) that are subject to the Marrakech Accords as well as the broad range of decisions by the CDM Supervisory Board and JI Supervisory Committee. Presently, any concrete decisions related to their architecture or acceptability is merely at the discretion of the two governments: the buying and the selling one.

This flexibility and the lack of previous experience and track record provide both the most important advantages and the risks of GISs. The advantage is derived from the fact that the scheme can presently be applied effectively in principle to any GHG mitigation activity, found acceptable by the selling and buying parties. For instance, it could target areas presently not being affected by other key mitigation measures, or that is crucial but enjoys little benefit from policies or support measures. For instance, while there is a strong temptation to engineer GIS in a similar framework as the other two FM (CDM and JI), it could apply a modified architecture to "correct" for the failures or shortcomings of these two.

At the same time, the lack of previous experience and even extensive background research poses the risk that initially even the most optimally designed systems may not bring the desired effects. For instance, the so well-studied and broadly consulted and debated European Union Emissions Trading Scheme (EU ETS) also needs to go through several stages of adjustment to make it more effective after the first stages of operation, as it has not been bringing the expected impacts.

Therefore, it is of utmost importance that the different open architecture options and their impacts on the different fields of

Table 1. Key modalities of GIS architectures

	GIS architecture modalities	Notes
Type of greening	Hard greening	Requirement for verifiable emission reductions additional to what would 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 EE 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 distribution	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
Beneficia-ries	Firms and Non-profit organizations	Applying for funding also for capacity building programs
	Central and local authorities	
	Physical persons	
Timeframe	Short	During the first Kyoto commitment period (2008-2012)
	Long	May extend beyond the first Kyoto commitment period

economy and environment are at least well studied and each national GIS scheme (or each bilateral one) is designed with a profound understanding of the potential impacts of these choices – since even this will not eliminate all risks of malfunction or other problems. Table 1 reviews the key architectural decisions of GISs, while the rest of this paper discusses the impacts of these choices, and provides a framework according to which such an evaluation can take place.

Review of the carbon market: the potential role of GIS

THE ROOM FOR INTERNATIONAL EMISSION TRADING AND GREEN INVESTMENT SCHEMES UNDER IT

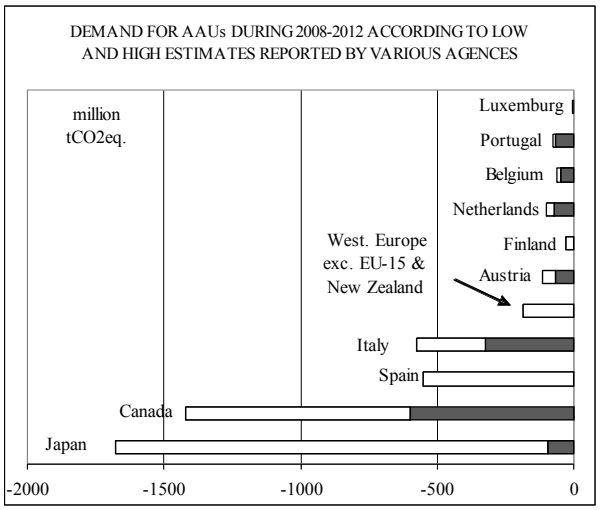
Before discussing the details of the potential impacts of the choices in these modalities, a review of the carbon market is provided from the perspective of its impact on the potential role of GIS.

The potential importance of GIS on the international market will be mainly determined by the overall demand for AAU purchases and the expected scale of AAU transactions. These transactions, in turn, are determined by the gap between the Kyoto target of the Annex I Parties and their projected emissions during the period 2008-2012. While the start of the first Kyoto commitment period is very close, both the demand and the supply of greened AAUs are presently very uncertain for various reasons. As Gassan-zade (2006a) reported, **the overall compliance gap over this period is currently estimated at about 5.6 billion tCO_2eq**. The demand of Annex I Countries for emission reductions which is not covered by the JI and CDM has to be covered through International Emission Trading. The projections of supply and demand of AAUs vary by sources, therefore, both the low and high recent projections of the demand and supply for AAUs of different countries are presented in Figure 1. According to this figure, the **global market reserves of AAUs are appr. 6.1 – 7.3 billion tCO_2eq., whereas the maximum demand for AAUs might be 2.0-4.8 billion tCO_2eq**. The demand for AAUs is smaller than the overall compliance gap since many countries are expected to cover part of this gap through JI and CDM.

These figures illustrate that in case all countries sell and buy to the maximum of their capacity and demand, there is likely to be a **major oversupply of AAUs** on the carbon market. Practically, Russia and Ukraine alone can satisfy the world's entire demand for AAUs, even if the most pessimistic projections are taken for the size of the compliance gap. The figures also illustrate that the final balance on the market is significantly determined by a few countries, both on the selling and purchasing side. For instance, Canada's recent decision on not purchasing foreign allowances or emission reductions significantly pushes the market towards the state of oversupply. In case all other potential buyers are expected to comply with the Kyoto Protocol and will resort to purchasing AAUs for the amount they are short for their Kyoto Protocol compliance, the balance of the market is mainly determined by Russia and Ukraine.

Since these two players are key to determining the overall size of the GIS market, let us review their position related to GIS. It is possible that Russia will not sell its whole stock of surplus AAUs in the first commitment period (Novosti 2006; Ellis and Tirpak, 2006). Moreover, it is uncertain whether Russia will be eligible for International Emission Trading, taking into account the present state of its compliance with the eligibility criteria. Therefore, there is some chance that Russia will not be able to sell its AAUs (Ellis and Tirpak, 2006; Gorina 2006). In addition, it is also questionable whether Russia – as *any* other potential selling country – can work out a GIS scheme that is credible enough for potential buyers. Thus, there are chances that the major competition on the AAU market will be between

the CEE countries and Ukraine. Ukraine is progressing with the carbon market infrastructure and may become a pioneer in greening its AAUs, although Russia has also recently agreed to host a major World Bank study on its potential GIS (Point Carbon, 31 January 2007). **Recently, experts in Nairobi suggested that the supply of AAUs will be 1.5-2 billion $tCO_2eq.$ within the 2008-2012 period from all AAU sellers** (Point Carbon, 21 November 2006), although this may change if Russia enters the market. In summary, the overall role of GIS will be largely determined by the ability of Russia (and Ukraine) to meet the criteria to use International Emission Trading, as well as developing credible, acceptable GIS schemes for buying countries.



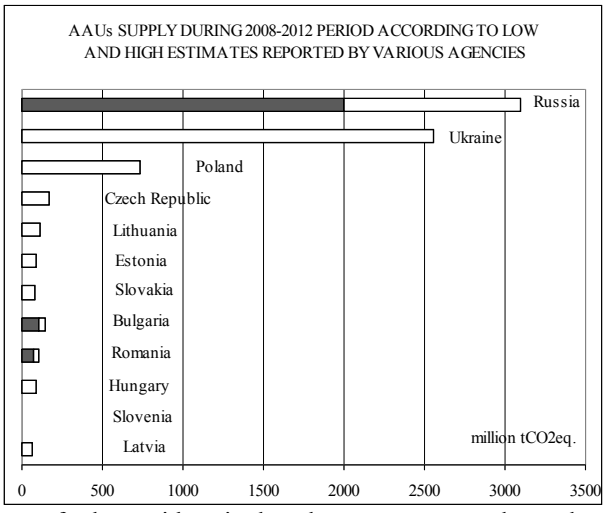


Figure 1. *Expected demand and supply for AAUs in the 2008 – 2012 period, as summarized from different literature sources. Note: The two colours distinguish lower and upper estimates, for bars with a single colour no range was located*
Sources for Figure: a). Hungary: (Feiler, 2006); b). The Czech Republic, Poland, Lithuania, Estonia, Slovakia, Slovenia, and Latvia[1]: (European Environmental Agency, 2006); c). Russia: (Golub et al., 2006; Gorina 2006); d). Ukraine (Ministry of Environmental Protection of Ukraine, 2006); d). Bulgaria[2] (Ministry of Environment and Water. Republic of Bulgaria, 2006), e). Romania (Ministry of Environment and Water Management of Romania, 2006); f). EU-15 countries[3]: (European Commission, 2006); Japan (Government of Japan, 2005; Gassan-zade 2006a); g). Canada, the rest of Western Europe and New Zealand (Gassan-zade 2006a, b).

While the amount of greened AAUs put on the market by the two major sellers is presently uncertain, it is more certain that many of the smaller former communist countries, possessing excess AAUs, are heavily working on developing GIS schemes, and many of them are close to finalising transactions. Thus, even in the unlikely case that the two major buyers will not participate on the GIS market, it is likely that GIS will play an important role.

EXPECTED PRICE OF CARBON CREDITS UNDER GREEN INVESTMENT SCHEMES

There is a broad range of speculations related to the expected price of AAUs among market participants. The price for AAU under GIS will reflect the price of other carbon assets (EUAs[4], CERs, and ERUs[5]), eligibility risk, host country reputation risk, compliance costs for buyers as well as mitigation costs of assumed projects in the host countries, as well as the balance of supply and demand for greened AAUs. According to one view (Streck, 2005), the AAU price, which theoretically reflects the lowest risks in comparison with CDM or JI and has the highest value for Kyoto compliance, is expected to be higher than that of CER and ERU, i.e. now at least higher than the 12 EUR/tCO_2 which has to be paid for CER in 2006 (Capoor and Ambrosi, 2006). However, other participants consider the risks associated with hot-air AAUs the highest due to strong "green" orientation of some purchasing governments, and therefore expect these prices to be lower than that of other carbon assets. Also, AAUs are not convertible to EUAs, and since the EU ETS is presently the largest driver on the carbon market an expected stricter allocation for the second ETS period, and thus potentially re-increasing EUA prices, will not draw AAU prices directly with it unlike CERs and ERUs which are are linked with EUAs to some extent.

There is another interesting possibility regarding the directions the carbon market may take. In case of oversupply of broadly acceptable green AAUs, the AAU price may go lower than CDM and JI. However, if GISs earn sufficient credibility by demonstrating emission reductions and perhaps other sustainability benefits (potentially higher than those associated with

1. The "hot air" over 2008-2012 for these countries is calculated as their total assigned amounts minus their commitment period reserves (i.e. not taken into account JI and banking).

2. The "hot air" for Bulgaria and Romania is estimated as 5 times difference between GHG emission projections in 2010 (according to scenarios with existing and additional policies and measures) and the commitment period reserve. The commitment period reserves for these countries are estimated as 100 % of the most recent inventory.

3. Estimates are based on the data on the Kyoto compliance gaps (taking into account various policies and measures) plus/minus carbon sinks and credits supplied by the Kyoto FM.

4. European Union Allowances (EUAs) are allowances to emit CO_2 for installations covered by the EU's Emission Trading Scheme (EU ETS). These allowances are tradable among these installations within EU ETS.

5. Under the project-base mechanisms, an Annex-I Party may purchase emission credits from a project that reduce GHG emissions for the amount that is additional to the emissions taking place without this project. CDM permits transaction of credits called Certified Emission Reductions (CERs) from a non-Annex I Party. JI allows carbon transactions from an Annex I Party and such emission credits are called Emission Reduction Units (ERUs).

Table 2. Potential revenues resulting from sales of available AAUs in the CEE countries

Country	Change, base year – 2004	Assigned amount units	Sellable AAUs	Revenues, 5 EUR/tCO_2eq.	Revenues, 20 EUR/tCO_2eq.
	%	Million tons CO_2eq.	Million tons CO_2eq.	Million EUR	Million EUR
Czech Republic	-25.1*	903	167.2	836	3343
Estonia	-50.0*	198	89.5	447	1790
Hungary	-32.0*	578	91.8	459	1836
Latvia	-58.5*	119	65.4	327	1308
Lithuania	-60.1*	221	116.1	581	2323
Poland	-31.6*	2758	731.1	3656	14623
Slovakia	-30.3*	337	81.7	409	1635
Slovenia	-0.8*	93	9.3	46	186
Romania	-47.0**	703	73.2	366	1464
Bulgaria	-57.6**	414	103.5	517	2070
Ukraine	-57.2**	4627	2560	12799	51195
Total		10952	4089	20443	81771

Sources of data: European Environmental Agency (2006), *Commission of the European Communities (2006), **UNFCCC online 2006, Ministry of Environmental Protection of Ukraine (2006), Ministry of Environment and Water, Republic of Bulgaria (2006), Ministry of Environment and Water Management of Romania (2006).
Note: Estimates of sellable AAUs in Bulgaria and Romania are based on own estimates as described in Footnote 4.

many CDM projects), there is even a **slim possibility that some of the CER/ERU market will be diverted to the green AAU one**, increasing the total size of "hot air" to be sold. However, this can only hold for the ERU/CER market which is not driven by EU ETS compliance but by direct Kyoto compliance.

If selling countries are able to establish credible GISs offering significant climate change mitigation benefits, it is possible that GISs will play a significant role on the global carbon market. If these schemes offer competitive prices and credible emission reductions, the **total GIS transactions could potentially outweigh the entire CDM and JI market combined**. If we exclude Ukraine and Russia to consider a "pessimistic" GIS scenario, but assume that the other countries are able to sell their entire AAU reserves through well-greened GISs, already in this case the GIS market can exceed the total expected CDM market. This statement is based on the following calculation. A recent report issued by Ecofys (Reece et al., 2006) concluded that a reasonable estimate of the global of JI and CDM market is to be around 400 million tons of CO2eq. per annum during 2008-2012 with a possible range of between 200 and 600 million tons of CO2eq. per annum. The AAU supply that could be delivered by the CEE countries (i.e. countries listed in Table 2[6] excluding Russia and Ukraine) of app. 310–320 million tons of CO2eq. per annum is therefore comparable to the expected contribution of JI/CDM to cover the global demand for carbon allowances.

In summary, GISs could potentially play a very important role on the global carbon market until 2012 (potentially larger than all of CDM and JI combined), and it has the potential of contributing major amount of GHG reductions if set up well. In addition, **it can bring significant revenues to selling countries** (see Table 3), **dwarfing most other funds or budget items devoted to climate change mitigation in these selling countries, and thus representing a unique opportunity to address key climate change mitigation related priorities**. However, it is likely that there is going to be a major competition among greened AAU sellers due to major oversupply of AAUs. This means that countries that pioneer the first credible green investment schemes that satisfy the demands and expectations of potential buyers will have a competitive advantage, since several buyers are ready to start the transactions.

Prioritisation of areas to be supported by GIS

As highlighted above, the potential revenues through GIS are significant. Therefore, there is clearly going to be a major demand for this income within the selling countries, and probably a competition between target areas to use these revenues. This paper presents the potential criteria that can be used to determine the target areas for GIS investments, and then suggests a logic for ranking or prioritising these criteria and, thus, the target areas.

Based on the previous discussions, there is going to be a major oversupply of AAUs on the carbon market. As a consequence, the **most important criterion** for selling as many AAUs as possible should be that the country should establish a **GIS that caters most to the interests and priorities of the buyers**.

The following criteria in the list of priorities should reflect national interests, and may include the following:

1. Maximising the **cost-efficiency** of investments through GISs, or maximising GHG savings from revenues;
2. Maximising gains **towards national social, political and regional development priorities**, and
3. Channelling the funds towards **GHG reduction needs** that are **important but are difficult to foster by business-as-usual policies or available/foreseeable support schemes**.

Since some of these criteria may contradict certain areas needing support, it is important to establish a clear priority list among them. This is best carried out through a national stakeholder dialogue.

At the same time, this paper intends to advocate that (c) and (b) should play the most important role in determining prior-

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

ity areas for channelling GIS funds. This can be justified by the following argumentation.

Most AAU selling countries are expected to be subject to more stringent emission reduction commitments after 2012. At the same time, those members to the EU will also be subject to increasingly stringent regulations related to EE, renewable energy generation and other related environmental goals. Therefore, it is likely that a substantial amount of reductions will take place in a business-as-usual scenario. This means that complying with more ambitious GHG reduction needs will require ambitious actions in areas that are not easily tackled by other instruments, or where the investment needs are so substantial and barriers to profit-based investment retrieval are so significant that they are hard to be borne by either private actors or public support. Since GIS revenues represent a rare, unique, but significant income, it is advisable to direct them to GHG reduction priorities that are important but cannot be easily tackled by other means. In addition, if political, social and development gains are considered as key factors of selection, this will maximise national benefits from the utilisation of GIS revenues.

Before we identify the areas that best satisfy these criteria, let us understand the **interests and decision criteria of potential buyers**, since we stated that these should be used and the primary factors of selection of a GIS architecture. The summary of the criteria of potential buyers is based on the available literature[7], as well as expert roundtables at professional international meetings (Oxford Workshop; Warwick Seminar, Energy Efficiency Business Week 2006, CEU Workshop, and others) and targeted interviews. Since the interviews were conducted on behalf of the Hungarian government, some of these factors may be more biased towards buyer interests with a stake in Hungarian AAUs.

Based on our extensive research and interviews, it can be stated that the **first and foremost criterion of potential AAU buyers is the credibility that the entire GIS revenues are fully utilised towards the goal of GHG reduction**. This is because these countries will spend a substantial amount of their taxpayers' contributions on this foreign purchase, but their taxpayers want to be assured that the money that is devoted to the compliance with the Kyoto Protocol is truly reaching its ultimate goal: contributing to combating climate change. A potential buyer even referred to this fact as the "credibility risk", which he considered as the largest risk associated with AAU transactions, and the minimisation of which is the most important factor in determining where the AAUs will be procured from.

The credibility risk is gauged by the general international perception of the business climate and financial reliability of the country, as well as by previous experience in similar transactions, such as those through JI. It can be further mitigated by a GIS having an **institutional and financial management structure** that is the **most transparent**, and **simple but the most credible and reliable in terms of fulfilling its primary goal**.

Along these lines, the buyers also want to be assured that **GIS revenues do not replace present, planned or foreseen budgetary spendings**, or are used towards compliance with present or planned EU regulations or other international or national commitments in the pipeline. This would indirectly mean that the revenues are not spent on GHG emission reductions. Therefore, the **additionality** of investments spurred by AAU sales needs to be very clear to the buyer.

It is important to note that the price of AAUs, while it is very likely to play a major role, has not yet been mentioned by any of the interview subjects or the literature as a major criterion for choice. Price is probably more likely to play a role when the competition among countries with GISs becomes more intense.

In addition to the confidence that the revenues truly being spent on additional GHG reduction efforts, the type of greening is another important consideration for the buyers. While it could be expected that a strict hard greening (i.e. where each sold AAU corresponds to an AAU saved) is the most desirable by buyers, no buyer that was interviewed insisted on the strictest definition of hard greening. This is probably because the buyers recognise the limitations from strict emission reduction tracing. It is, however, very important for all buyers that most of **the revenues are used through hard greening**, and only a minority is channelled through soft greening. The acceptability of the portion to be used for soft greening depends on the particular buyer.

In terms of the target areas where AAU sales are invested, most buyers expressed their flexibility. However, most potential buyers of Hungarian AAUs explicitly mentioned the retrofit of the old block housing stock from the perspective of thermal performance. Other buyers specified, in addition, the potential interest in expanding biomass production and use, as well as the promotion of new buildings with ultra-low specific energy consumption (such as passive buildings). Several buyers mentioned their interest in program-based GISs, and mentioned as examples to be considered the Chinese scheme proposed for the programmatic CDM. In addition, priority GHG reduction investment areas where JI has not worked, or is not allowed any more due to the EU ETS, should also be considered.

Priority areas suggested for GISs in CEE

Based on the understanding of the buyer's criteria as well as the key national criteria suggested in this paper, let us examine the most important priority areas for GIS in the CEE region, as assessed by the authors of this paper.

First of all, most assessments attest that improving EE is a global priority for GHG reductions (IEA 2006b; IPCC forthcoming; Goldemberg, 2000). This is even more true in CEE where energy intensities still lag behind those in EU-15 (IEA, 2006a), for instance, indicating high cost-effective EE and GHG mitigation potentials (Bertoldi and Atanasiu, 2006, Ürge-Vorsatz and Novikova, 2006). However, there is strong legislation in place and in the pipeline in the EU that addresses many aspects of EE (such as the Eco-Design Directive, the Energy Services Directive, the Energy Performance of Buildings (EPB) Directive, etc.).

Within the broad area of improved EE, however, there is an area that is very hard to reach by policies or market-based efficiency investments, but that is a major contributor to GHG emissions. Retrofitting the old building stock with poor ther-

7. As it was mentioned before, unfortunately literature in the field of GIS is very limited, especially considering the very fast developments in the area.

Table 3. Review of selected funds financing EE improvement in the buildings sector in the CEE region

Country	Type of fund	Fund	Credit/grant/loans	Reference
Hungary	International	German Coal-Aid Fund	54.9 million EUR starting from 1991 (3.4 million EUR annually on average)	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)

mal performance, especially in panel block housing units, can save a major amount of GHGs in these countries. Unfortunately, thorough, updated assessments are not available to estimate the vast potentials that are available in this sector, but let us cite a few indicators. EURIMA report (Petersdorff et al. 2005) analyzed the impact of the EU Directive on Energy Performance of Buildings concerning the heating-related CO_2 reduction potential and its cost-effectiveness in comparison to the frozen efficiency scenario. The technical potential for eight member states (Hungary, Slovakia, Slovenia, Estonia, Latvia, Lithuania, Poland, and the Czech Republic) was estimated as high as 62 million tCO_2 in 2015, whereas this potential for the EU-15 buildings totalled 378 million tCO_2. Another indicator is that a pilot project in Hungary has demonstrated app. 80 % heat and hot water savings through applying passive construction techniques through a retrofit of a typical panel block house in Dunaújváros (Hermelink, 2006).

While a very important area for reducing overall GHG emissions, retrofitting inefficient residential buildings is perhaps the most difficult area to target, either by policies or through market-based instruments. The reasons are manifold. First, whereas investments are typically cost-effective, especially as a result of recent energy tariff hikes – the payback times are often quite long to make attractive investments. Business-based capturing of these potentials are also hard because an EE retrofit must also address other retrofit priorities (one cannot only improve insulation, but other building-shell related renovation must also be tackled at the same time), jeopardising or often cancelling the cost-effectiveness of the investments. In addition, it is hard for ESCOs or other profit-based energy service providers to invest in these upgrades because larger buildings where the economies of scale justify the transaction costs of such retrofits, typically have a large number of owners and occupants, making it very difficult and expensive to arrange the legal, financial and logistical implementation of these retrofits. This has proven difficult even with the leveraging of certain subsidies such as the carbon-revenues through JI. Therefore, a purely market-based solution is not possible. At the same time, retrofit of existing buildings is hard to target by policies, too. The EPB Directive is a pioneer in this regard, mandating certain EE measures for the case of the retrofits of large buildings. Whereas there are efforts to bring the limits for these mandatory measures down to smaller buildings, this would be especially hard in CEE countries. These efforts, along with other policies mandating EE targeted retrofits is very difficult to introduce in these regions where the housing that is most in need of such retrofits is typically inhabited by population groups with the least access to self-financing or to capital markets. Therefore, such mandatory requirements may rather result in non-compliance or the delaying of regular retrofits due to the lack of extra capital available for the EE measures.

In summary, the thermal retrofitting of the old panel building stock is a high priority from the perspective of GHG emission reductions, but at the same time it is very difficult to promote by existing or planned policy instruments. The only tool that has been working in this field in these countries is the application of various subsidy schemes (such as the Polish Thermal Modernisation Fund, the Hungarian Panel Credit, the Czech Energy Agency, and others), however, due to the limited budgetary affluence of these countries, these funds have been limited to a small contribution to the overall retrofit requirements. Table 3 shows the funds disbursed by a selection of EE funds in the region (most of them are not exclusively for building renovation). An analysis of Table 2 and Table 3 [8, 9] shows that the potential GIS revenues can serve as a much more generous source to support the required investments into retrofits as compared to possibilities of the funds.

In addition to satisfying the criterion for important GHG reduction priority areas that are difficult to tackle through other instruments and measures, the retrofitting of the panel building stock also offers extensive political, social, developmental and other gains. These include the social and political benefit of reducing the burden of utility bill payments for the poorer popu-

8. Amounts are converted to EUR according to exchange rates from European Central Bank Online Database at URL: http://www.ecb.int/stats/exchange/eurofxref/html/index.en.html#data [Consulted 2 February 2006].

9. Amounts in Hungarian Forints (HUF) are converted into EUR at 250 HUF = 1 EUR.

lation segments after the drastic tariff increases over the past decade(s); reduced energy dependence, especially on Russian gas that plays a key role in supplying heating needs in many of these countries; freeing up subsidies that have been directed at helping the poor with coping with bill payments; and increasing the property values of the old building stock[10].

Finally, while an important area of GHG emissions, buildings have not been addressed by other flexible mechanisms, in particular, JI or ETS (Novikova et al. 2006).

Targeting GIS revenues in this field offers another attractive advantage for GIS: retrofitting of buildings is a clearly demonstrable spending, and while emission reduction verification and tracking may be expensive, savings are easy to estimate. The easily visible and traceable investments (for instance, the number of buildings insulated is easy to check) contribute significantly towards the buyers' demands for transparency and reducing the "credibility risk" (for instance, the media in the buyer's countries can show the buildings that have been retrofitted through their taxpayers' money, almost "visibly" saving CO_2 emissions).

In summary, **this paper argues that thermal retrofitting of the old building stock, especially the panel block houses, should be considered as the single most important priority for GIS schemes in the CEE region**. This target area satisfies almost all criteria for prioritising GIS investments from both the buyers' and sellers' perspective (with the exception of maximising cost-effectiveness, according to which this is unlikely to be the leading option): it reduces the "credibility risk" perceived by the buying party; it can serve as the basis of a simple, transparent GIS scheme (due to the large investment needs, no fragmentation is needed in the target areas, because even in the case of an optimistic market scenario, all revenues could potentially be targeted to this area in most countries) increasing the attractiveness for buyers; it can make a significant overall difference in national GHG emissions; at the same time it is difficult to be targeted by other instruments; and it is associated with major social, political and economic dividends.

Placing emphasis on thermal retrofitting does not mean that other areas could or should not be considered as priorities. But due to the overwhelming benefits of the area discussed, other options are overshadowed by the one discussed in this paper and thus will not be detailed. Nevertheless, other areas deserving consideration are summarised as follows:

- **Biomass-based heating, especially on a small-scale**. Presently a lot of policies are aimed at promoting renewable electricity generation. However, as the Forres report has demonstrated (Ragwitz, 2005), renewable energy priorities are different for the new EU member states than for the old ones, since there is a much larger potential for renewable heat (mainly biomass, but also geothermal and solar), especially in non-grid based applications. There are few, if any policies promoting this area, and JI projects have also failed in this field (non-grid based biomass heat applications). At the same time, promoting biomass-plantations and fuel switch to biomass-based district heat will also be associated with significant economic, social, environmental and political gains, such as relieving the social stress exerted by the mandatory reduction of agricultural production by EU policies through converting agricultural enterprises to biomass-growing ones.
- Efforts to **reduce the standby, low-power mode and idle electricity consumption** of appliances, IT and communication equipment, and industrial installations. While the EU has introduced a number of policies in the area (such as the eco-design directive), there is still significant room for improvement, which can save significant amounts of electricity (some German studies estimate that standby power is responsible for app. 10 % of electricity consumption by private households (IEA, 2001)) while not compromising any energy services. These countries are especially behind in this area, as most policy-makers and even researchers have not even recognised the importance of standby power consumption.
- **Education, training, awareness raising.** Not only is the general population generally less aware of the scale of the impacts and challenges associated with climate change, they are in general less aware of the options available to them for taking actions at their own level. In addition, general education and professional training also needs to be better tailored towards climate-friendly action and practices.

Implications for GIS architecture options

It has been demonstrated above that choices about the concrete GIS architecture have a major impact on the effectiveness of the scheme in the different target areas. All target areas have slightly different GIS architectures that work most effectively in promoting the particular area, especially if cost-efficiency is also considered. This points to the **need of a fairly limited amount of target areas to be supported**[11]; **and fitting the GIS design carefully to the specific needs of the particular target area**.

After having identified the major advisable target areas for GISs in CEE, this paper finally reviews the implications of these priorities, as well as other criteria to be applied for GIS design discussed above in this paper, on the decisions made related to the modalities of GIS architectures described above in Table 1.

Table 4 [12, 13, 14] reviews the implications of the major GIS architecture modalities on four selected GIS priority areas to be

10. The influence of energy payments on the property value of dwellings was well demonstrated in 2007 in Hungary. After a major increase in district heating tariffs, the market value of district heated flats has dropped significantly.

11. This statement refers to the option if a country chooses to set up a general GIS scheme, and not separate schemes for each GIS transaction, although is partially applicable in such cases, too.

12. The authors of this paper are not financial experts, therefore the evaluations of the funds distribution should especially be viewed as indicative rather than assertive, and can change subject to a more profound analysis of financial criteria and options.

13. The long term timeframe of the thermal retrofit of existing buildings 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.

14. The long term timeframe of the support of renewable heat 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.

Table 4. Implications of the various GIS architecture modalities on the priority areas for support as suggested by this paper

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

considered in CEE. It is important to note that the exact evaluations of the various options are indicative rather than assertive, and very much depend on the concrete situation in the country and the measures within the listed target areas identified more specifically. The point of the table is twofold: (i) **to provide a framework according to which concrete GIS architecture options can be evaluated for concrete decision-making**, and (ii) to provide an indication which options are generally more suitable for the various support areas.

A summary of the selected key findings related to the GIS architecture options follow.

Type of greening. Considering the proposed areas for support, **a very strictly defined hard greening would be detrimental to the effectiveness, or even operability, of the scheme for the selected target areas**. While tracking and rough verification of emission reductions (thus hard greening) are essential, but **an architecture similar to that of CDM or JI will not result in emission reductions different from business-as-usual measures and instruments**. A strict monitoring and verification of additionality are especially not applicable in most of the areas proposed for support in this paper, as well demonstrated by the experiences of JI and CDM.

Novikova et al. (2006) and Ürge-Vorsatz and Novikova (2006) analysed the declining trend for building-, transport-, and biofuel- related projects starting from the AIJ phase and ending with the currently planned JI/CDM projects. They concluded that the number of such projects is unlikely to experience a considerable increase unless some effective measures are taken to empower these mechanisms to better work for buildings. One of the main reasons for this is high transaction costs of JI and CDM projects in these sectors. Thus, Michaelowa et al. (2004) identified that the transaction costs of CDM projects targeted to EE in housing and small and medium enterprises are as high as 100 EUR/tCO_2eq. that is 100-1000 times higher than in the industrial sector. Therefore, **if complicated administrative procedures similar to those in JI and CDM will be repeated in GISs design it would raise the costs of GIS implementation in these areas to prohibitively high levels.**

In summary, a composite model of greening is suggested by this paper, combining a small share of elements through soft greening (such as those covering the operational costs of GISs, awareness raising about the support as well as establishing the background conditions in which the measures can be promoted in a most effective way), but focusing the largest share of GIS revenues on investments whose emission reductions can be calculated, monitored and clearly demonstrated, but that do not require verification procedures defined by strictly hard greening definitions.

Project or Program/policy-based GIS. While there are widespread concerns about the misuse of carbon revenues for program/policy based measures for various reasons, it is advisable to examine the feasibility of such options in dedicated studies. These options may result in cheaper specific GHG reductions in certain areas, and there are indications that a few best practices (at least on the drawing table) exist worldwide in programmatic approaches that can be utilised, such as from CDM.

Distribution of funds. While revolving funds and soft loans are typically very attractive options for a market-oriented approach to improved EE, experts do not recommend these financing options to be used by GIS schemes aiming to promote any of the areas identified in this paper as priorities. This is because revolving type funds or soft loans have generally been available in these countries for a number of years, and investments that can be financed through such arrangements have already taken place. Thus, these financing options are largely "saturated", and may not work well in the selected target areas. Therefore, while politically not attractive, **the selected areas are best supported by grants**. The share of the grants in the total investment, however, should never be 100 %, but this rate should be set at a level that the investments are just made financially attractive/feasible through the support. In order to be able to leverage other funds that require co-financing that is otherwise hard to make available, it should be considered if the encouragement of leveraging other funding as co-financing (such as EU funds, structural funds, etc.) is advisable in the particular cases or not.[15]

Selection of target areas. In addition to the discussion above, it is important to note that in general a GIS structure is recommended that **focuses on a few selected support areas** rather than one fragmented to support many areas. This is due to several reasons: demands of potential buyers for simplicity and transparency; higher effectiveness if the funds do not get fragmented; better possibilities to tailor-design the GIS architecture optimised to most cost-effectively support the selected target area; and more opportunities that allow the system to improve through learning-by-doing after the initial experiences.

Institutional arrangements. Due to the very likely short operational timeframe (GIS funds are unlikely to be available for much longer than 2012, and following funds may have different priorities)**, it is more cost-effective and effective to leverage existing institutional structures (or perhaps existing and well-working EE funds) rather than setting up new institutions/funds**. This is also important because it takes time for the beneficiaries to learn about the schemes and gain experience in applying, as well as for the founders to optimise the scheme, and this way the lead times of operationalising the scheme can be minimised.

Summary and conclusion

In summary, the paper has concluded that GISs could play a significant role on the carbon market, as well as in providing a new and significant source of EE financing in the former communist countries. **Concretely, the GIS could potentially play a larger global role in GHG mitigation until 2012 than all of CDM and JI combined, and it has the potential of contributing major amount of GHG reductions if set up well.** In addition, **it can bring significant revenues to selling countries, in the order of magnitude of EUR 7.6 – 30.6 billion[16], dwarfing most other funds or budget items devoted to climate change mitigation or EE in these selling countries, and thus representing a unique opportunity to address key climate change**

15. It is important to note that there are strict EU regulations limiting the amount/share of support allowable to be granted for various investments, depending on EU region and other factors. This fact needs to be considered carefully for each GIS design.

16. For the CEE countries excluding Russia and Ukraine assuming the AAU price 5 and 20 EUR/CO_2eq.

mitigation related priorities. However, it is likely that there is going to be a major competition among greened AAU sellers due to major oversupply of AAUs. This means that countries that pioneer the first credible green investment schemes that satisfy largely the demands and expectations of potential buyers will have a competitive advantage, since several buyers are ready to start the transactions.

Due to this possible oversupply, the paper has concluded that the key criteria for choosing GIS target areas and architectures should be the interests and priorities of potential buyers. The first and foremost of these is the **credibility** that the entire GIS revenues are fully utilised towards the goal of GHG reduction. This needs to be complemented by an institutional and financial management structure that is **most transparent**, and **simple but most credible.** It is also important that the **additionality** of investments spurred by the AAU sales needs to be very clear to the buyer, eliminating any doubt that GIS revenues are just spent to replace other necessary spendings. As far as the national criteria are concerned, this paper suggested the following priorities among these: (i) Channelling the funds towards **GHG reduction needs** that are **important but are difficult to foster by business-as-usual policies or available/foreseeable support schemes;** (ii) Maximising gains **towards national social, political and regional development priorities,** and (iii) Maximising the **cost-efficiency** of investments through the GIS, or maximising the CO_2 savings from the revenues.

If these criteria are considered for the CEE countries, the paper has identified the following priority areas for support: (i) **Retrofitting the old building stock with poor thermal performance,** especially that in the panel block housing units; (ii) promoting ultra-low energy new construction, such as passive solar buildings; (iii) supporting biomass-based heating, especially in small-scale and non-grid applications; (iv) efforts to reduce the standby, low-power mode and idle electricity consumption, and (v) education, training and awareness raising in relation with the priority areas identified in points (i) through (iv).

In order for GISs to effectively promote the priority areas identified in this paper, the decisions related to the architectural modalities of GISs are crucially important. The paper summarised the following key recommendations for GISs aiming to promote the target areas identified in the previous paragraph.

a. It is vitally important that GISs **do not rely on very strict hard greening**, i.e. strict monitoring and verification protocols such as in CDM or JI. It **should *not* be an extension of JI**. At the same time, tracking of emission reduction needs to be solved (therefore a simple type of investment such as retrofit of a certain type of building like panel blocks offer easy solutions) to ensure hard greening and sufficient real emission reductions. A small role of soft greening is also advisable, if the buyer countries accept this.

b. a GIS structure is recommended that **focuses on a few selected support areas** rather than one fragmented to support many areas

c. the identified **target areas are best supported by grants** rather than through revolving funds, soft loans or other more market-friendly financing schemes.

In conclusion, green investment schemes have a significant potential to unlock the high efficiency potentials in the CEE region Europe, and could make a significant difference in improving EE in certain areas. However, there are also major risks that this will not take place. First and foremost, it is crucial that the GIS architecture sis optimised to leverage EE opportunities from the start of the planning process to the monitoring and verification scheme.

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