# Heating in Transition

UNDP-GEF

AUTHORS
SUSAN LEGRO & GRANT BALLARD-TREMEER
EDITOR
LOIS JENSEN

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# Foreword

Heating in Transition is the third in the 'Lessons for the Future/Monitoring and Evaluation Report Series'.[1] It present the results of analytical work carried out in the transition economies of Europe and the Commonwealth of Independent States (CIS) through the Global Environment Facility (GEF) portfolio of the United Nations Development Programme (UNDP). The purpose of the series is to disseminate findings of studies based on experiences gained from UNDP-GEF's own projects and programmes, or from activities of our partners and other concerned organizations working in areas relevant to GEF operations. The publications have various objectives and target groups. First and foremost, it is our intention to make available lessons and good practices from past and ongoing operations to projects proponents, designers and implementers, the executing agencies of UNDP-GEF projects and UNDP staff. Second, the monitoring and evaluation series is aimed at highlighting key issues and results related to UNDP-GEF work for our principal constituencies, including the GEF Council and global environmental conventions. Finally, we hope that the publications will serve to spread the word of our work to other interested parties, including academic and research institutions, non-governmental organizations and civil society, and the public at large. The reports are published at irregular intervals when relevant materials and studies are completed and become available.

The third issue of this series focuses on heating. UNDP now has more than ten years' experience in developing and implementing projects that provide heat and often hot water (referred to as 'heating projects' in this report) to people in cold climates.

After more than a decade of activity in the transition economies of Europe and the CIS, there is a need to assess the performance of the portfolio. Because many of the projects are still in the early stages of implementation, successful techniques can still be used to improve ongoing projects.

Furthermore, heat remains a critical human security issue in the region, and efficient heating can bring environmental, economic and social benefits to local communities. Co-authors Susan Legro and Grant Ballard-Tremeer have designed this report to make lessons learned in the process available to governments and other donors, and to provide some thoughts about future activity in the region given the huge changes and ever-widening differences among countries in the region.

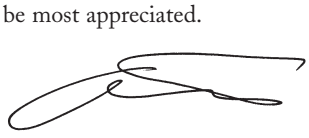
Particular issues in the study focus on the evolution of the barrier removal model for service delivery, emerging trends in project financing and management issues relevant to heating projects. The analysis refers primarily to the 20 heating projects in the UNDP-GEF portfolio and pipeline (14 in energy efficiency and six in renewable energy), although it also refers to other projects implemented by UNDP to support key findings.

This report springs from formal and informal stocktaking activities in the area of heating by UNDP-GEF over the past several years. These include a UNDP-GEF sponsored workshop, 'Heating and Hot Water Portfolio of the UNDP/GEF: Strategic Directions', held in Prague, Czech Republic, in February 2004. Representatives of 11 heat sector projects in the Eurasia region presented their findings, lessons learned and best practices. The participants also discussed the future of the heat sector portfolio with UNDP/GEF regional and global staff. The report also draws upon ongoing discussions with project personnel and UNDP country office staff and other key sectoral meetings. These include the February 2004 regional conference on district heating policy organized by the International Energy Agency (IEA), and work conducted by consultants to assess the UNDP-GEF portfolio of projects in the heat sector and compare them with similar projects outside of the UNDP portfolio.

Financial support for the 2004 workshop, the external study and this publication came from UNDP's Global Cooperation Framework, through the Sustainable Energy Programme of the UNDP Energy and Environment Group, as well as from UNDP-GEF. We gratefully acknowledge this support.

In addition, we would like to thank the 2004 workshop speakers and participants. Finally, special thanks go to the following reviewers, who provided numerous insights and helpful comments: Angela Morin Allen, Geordie Colville, Vladimir Litvak, Valya Peeva and Vesa Rutanen.

Your comments on the report, and on the 'Lessons for the Future/Monitoring & Evaluation Report Series' in general, will be most appreciated.



Juha I. Uitto Marcel Alers

1 The first report, published in November 2003, was Conserving *Forest Biodiversity: Threat, Solutions and Experiences*. The second report, published in May 2004, was *Solar Photovoltaics in Africa: Experiences with Financing and Delivery Models.*

# List of Abbreviations

| | |
|---|---|
| **$CO_2$** | Carbon dioxide |
| **EBRD** | European Bank for Reconstruction and Development |
| **ESCO** | Energy Service Company |
| **EU** | European Union |
| **GDP** | Gross domestic product |
| **GEF** | Global Environment Facility |
| **IBRD** | International Bank for Reconstruction and Development |
| **IEA** | International Energy Agency |
| **IFC** | International Finance Corporation |
| **M&E** | Monitoring and Evaluation |
| **NGO** | Non-governmental organization |
| **$NO_X$** | Nitrous oxide |
| **ODA** | Official Development Assistance |
| **PDF** | Project Development Facility |
| **PHARE** | Poland and Hungary: Assistance for the Reconstruction of the Economy |
| **PPF** | Project Preparation Fund |
| **RBEC** | Regional Bureau for Europe and the CIS |
| **SAVE** | A multi-year programme for the promotion of energy efficiency in the European Community administered through the Directorate General for Transport and Energy. SAVE II encompasses activities during the 1998-2002 period. |
| **$SO_2$** | Sulphur dioxide |
| **SPPD** | Support for Policy and Programme Development |
| **UNDP** | United Nations Development Programme |
| **UNFCCC** | United Nations Framework Convention on Climate Change |
| **UNOPS** | United Nations Office for Project Services |

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# Executive Summary

## INTRODUCTION

The 20 heating sector projects discussed in this report are located in a region with long, cold winters. Though the challenges of heating in the transition economies of Europe and the Commonwealth of Independent States (CIS) are vastly different from those of most developing countries, heating is still a key development issue. For some, it can also be matter of life and death.

At the most basic level, heating projects that improve end-use energy efficiency can dramatically increase comfort and health for people in their homes, in schools, in hospitals and in other buildings. But the benefits can also include a broader range of social, environmental and economic issues. In addition to reducing pollution levels and greenhouse gas emissions, such projects can create new jobs and reduce the need for energy imports, freeing up funds for urgently needed social programmes.

Some of the wide-ranging benefits of energy-saving projects can be seen in the UNDP-GEF heating projects discussed in this report:

- Nearly 70 percent of Bulgarian municipalities are now reached by the EcoEnergy network, which is providing expertise on designing and carrying out municipal energy-saving projects. Participating municipalities have already funded and completed a number of energy-efficient heating projects.
- Three cities in the Czech Republic are building low-cost, energy-efficient housing for their citizens. Architects trained through the project are now using their skills to design efficient single-family homes as well.
- Residents in the Russian city of Vladimir who received little or no heat during the winter are now warm and comfortable thanks to new building-level boilers.
- Air pollution will be reduced around schools in north-west Slovakia as they convert their boilers from dirty-burning coal to modern biomass. The construction of a new biomass pellet plant will also create jobs in a region with the highest unemployment in the country.

The key challenge for development assistance in the heating sector is to determine the point at which reforms are viable. Good training can overcome significant barriers, such as the shortage of capital and creditworthiness, as long as a clear client and a market for heating services are present.

### Types of Interventions

The work of UNDP-GEF in the heating sector in the early 1990s took a 'pilot' approach in which demonstration projects were expected to lead to replication. In the mid-1990s, the GEF introduced the 'barrier removal' approach to project design, against the backdrop of growing divergence in the pace of political reforms and economic restructuring in the region. The GEF has now shifted to a system of strategic priorities and project development that will highlight market transformation, in the face of even more extreme differences in the economic status of countries in the region.

Policy interventions in UNDP-GEF heating projects have tended to focus directly on heat (and/or biomass) legislation, since project personnel found it difficult to influence high-level fiscal policies with an impact on the heating sector. Education and outreach activities that focus on key municipal officials appear to be very effective in terms of the investment and satisfaction that results. Trends in interventions include capacity-development, the establishment of networks, working with municipalities as partners, and cultivating partners in 'social' ministries.

### Financing Mechanisms

Real and perceived risk and low project profitability have meant that countries in the region require a combination of traditional commercial financing approaches and targeted policy measures to overcome financing barriers for heating projects. Commercial sources include equity, performance contracting, debt financing, lease financing and carbon financing.

Among non-commercial sources of financing, Official Development Assistance (ODA) has been a significant form of co-financing for UNDP-GEF projects. Other possible non-commercial sources identified include: research, development and demonstration support; investment subsidies, such as risk guarantees and loans; production tax credits for renewable energy producers;

feed-in tariffs; bidding (or tendering) procedures; and a quota system based on a renewable portfolio standard.

**Management Issues**

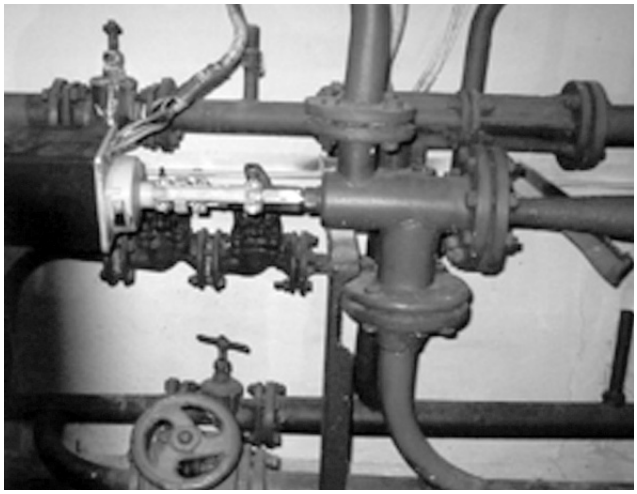
- Potential partner programmes for 'mainstreaming' GEF concepts include rural development and post-conflict programmes, the Public-Private Partnerships for Urban Environment programme, and the Energy and Environment Thematic Trust Fund.
- There appears to be a correlation between project success and the capacity and support of the UNDP country office.
- Adequate support for monitoring and evaluation should be included in UNDP-GEF projects, with successful approaches and data shared across projects.
- It is difficult to draw conclusions about the correlation between levels of co-financing and project replication or sustainability in the portfolio.
- Capacity development measures for project experts and project trainees have become an important phenomenon in the portfolio over time.

**Conclusion**

The pivotal role of heat in economic development, environmental quality and human security in the transition economies of Europe and the CIS argues for a strong role for heating projects at UNDP and within new GEF priorities. Future 'best practice' heating projects should be treated as human security initiatives within UNDP that can produce substantial benefits for the environment, economic development and governance, while improving standards of living. They would involve efficiency in supply and end-use (district heating, building efficiency) or efficiency combined with renewable energy (biomass) and would draw upon a master energy plan that evaluated the financial and environmental implications of various strategies. They would focus on building capacity to identify, prioritize, and finance investments in heating rather than developing or promoting a specific financial mechanism. They would also include continued networking across projects in the portfolio to spread successful mechanisms and develop capacity across the region.

The many reforms that the Europe and CIS region have witnessed over the past 15 years have not reduced the need for an affordable and reliable supply of heat. However, they have increased the opportunity to address the issues related to heating projects in new and creative ways and to share these approaches openly.

*Kazakhstan: Smog over Almaty in winter season*



*Typical heat substation with hydroelevator as a heat control at building level.*

# Chapter 1

# INTRODUCTION

UNDP has already marked its tenth year of work in Europe and the Commonwealth of Independent States (CIS)[2] in the heating sector. The portfolio consists of 20 heating sector projects under development and implementation, co-financed by the Global Environment Facility (GEF) (see Annex 2 for a complete list of projects). These projects cover a broad range of areas, including heat supply (efficiency and renewable sources), distribution (upgrading of district heating networks and improved balance between heat networks and building-level heating), and use (improved thermal performance of buildings, metering and control) for both heat and hot water. As a portfolio, they form an important part of UNDP's work in economies in transition, representing a total of more than $30 million in GEF funds, and leveraging well over $100 million in local co-financing [3].

The Europe and the CIS region, which is characterized by countries transitioning from centrally planned to market economies, presents significant opportunities for improvements in environmental performance in almost all sectors as well as in social conditions. In general, centrally planned economies sent the wrong signals to consumers and planners. This resulted in decisions that did not reflect the choices that would have been made if the actual costs and competing demands for resources were known. With economic transition came the collapse of highly centralized and inefficient production and distribution networks, with long time lags in reallocating resources to more efficient uses in a decentralized market system. Standards of living registered a catastrophic drop in the early 1990s, and in some countries they are still below their 1989 level. Dynamics in the energy sector, including the heating sector, have followed similar patterns of inefficiency in planning and consumption, decline and adjustment to market forces.

## HEAT IN A DEVELOPMENT CONTEXT

The dominant role of heating projects in Europe and the CIS makes intuitive sense: heating is of paramount importance in countries with long, cold winters. In cold climates, the ability to keep oneself warm is a basic necessity for survival - as important as food and water. Reliable and affordable heating - in the home, at work and in recreational areas - is thus a fundamental need. The Russian Federation, for example, which is the world's largest country in terms of area, is characterized by a consistently cold climate with mean annual temperatures of less than 5° Centigrade across most of the country. This severe climate necessitates special requirements regarding the energy resource costs for heating and creating acceptable living conditions. Central heating is thus a major factor in the Russian Federation's energy balance, and the heating supply market represents almost $30 billion in sales, making it one of the biggest national markets (Bashmakov, 2004). The financial flows into the heating systems around Europe and the CIS are enormous. The heating sector has become not only a burden to end-users and to governments, but also a challenge to policies promoting privatization and market reforms.

Improving the efficiency of heating - both through large, centralized district heating systems and decentralized boilers on the supply side, and through more efficient buildings on the demand side - is a domain that fits well within the GEF mandate to reduce greenhouse gas emissions. National governments consistently identify this sector as a prime source of opportunities for reducing greenhouse gas emissions. Energy efficiency improvements also contribute to the Millennium Development Goals for human security and sustainable development.

At the broadest level, the environmental sustainability of heating projects - based on energy efficiency, renewable energy or a combination of both - supports Millennium Development Goal 7: Ensure Environmental

[2] Operationally, the UNDP administers work in Europe and the CIS through a Regional Bureau for Europe and the Commonwealth of Independent States (RBEC) and a network of offices in 23 of the countries of the region. Heating sector projects under UNDP-GEF are being implemented in Armenia, Belarus (two projects), Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Latvia, Moldova, Poland, Romania, Russian Federation (three projects), Slovak Republic, Slovenia, Turkmenistan, Ukraine and Uzbekistan. In Europe and the CIS, UNDP is also active in Albania, Azerbaijan, Bosnia and Herzegovina, Cyprus, Estonia, Kosovo, Kyrgyzstan, Lithuania, The former Yugoslav Republic of Macedonia, Malta, Tajikistan, Turkey and Serbia and Montenegro, but does not have GEF-supported heating sector projects in these countries.

[3] This figure includes the four projects in the portfolio under development.

Sustainability. Fossil fuels provide the overwhelming share of inputs to heating systems across the region, and reducing dependence upon them is a step towards improving sustainability. UNDP-GEF heating projects that reduce fossil fuel use result in reductions of carbon dioxide ($CO_2$) and other greenhouse gases.

All people, regardless of their income level, have a right to adequate shelter and access to heat in winter. Yet for those in Europe and the CIS left most vulnerable as a result of the economic transition, meeting these basic needs has been difficult. Since removal of national heat and electricity subsidies - which has happened to a greater or lesser degree in various countries - a significant portion of the population has had difficulty paying their housing and heating bills. Low-income families typically pay a higher proportion of their household income for heat than higher income groups, and they are more likely to live in less energy-efficient dwellings because they cannot afford improvements in energy efficiency and may lack information about such options. In many countries in the Europe and the CIS region, low-income families are paying well over 30 percent of household incomes for heating (see Box 1 for an example from Latvia). In cases where families default on payments, local governments - which often own and/or operate municipal heat networks - are not in a position to stop supply (for both political and moral reasons). In extreme cases, such as in countries in the Caucasus, financial difficulties on the part of the government and non-payment by individuals actually led to the shutdown of large district heating systems in the mid-1990s.

The use of scarce fiscal resources to subsidize the gap between heating costs and revenues means lower investments in other sectors, including health care and education, at national or local levels. Thus improvements in efficiency in the heating sector where cost-effective investments can be made with short payback times, can result in overall improvements in revenues and additional resources for investment in other areas.

The benefits of heating-sector projects include a much broader range of social, environmental and economic issues than simply saved energy costs. A compilation of several economic studies on the non-energy benefits of weatherization programmes showed that benefits outweighed programme costs by 3.7 to 1 (Aistara, 2004).

The benefits of providing low-income energy assistance programmes accrue not only to the households that receive the improved services, but also to utility companies, municipalities, other energy service recipients and society as a whole. In the case of weatherization projects

BOX 1

### More than Half of Latvia's Population Struggle to Pay Heating Bills

Since privatization of the Latvian housing stock in 1995 and removal of national heat and electricity subsidies in 1998, a significant portion of the Latvian population has had difficulty paying their housing and heating bills. According to the 2000 Household Budget Survey, 55 percent of all residents have problems paying their housing and utility bills, and 16 percent of the population has arrears for heating bills. For the urban areas, these figures are 67 percent and 19 percent, respectively, and higher still in rented - as opposed to privately owned - apartments. Moreover, the value of the statistically determined basket of minimum goods and services needed per person was $139 per month in 2000, (1 US$ = 0.61 Latvian lats), yet the average monthly income per household member in the same year was $113 (Central Statistics Bureau, 2001) Social assistance programmes that reduce housing and heating costs were available only to those whose incomes were less than 28 Latvian lats per month. These figures indicate that the groups of people who have had difficulty paying for their heat and housing costs are broad and includes the unemployed, pensioners, families with young children as well as many working people, whose income is simply not enough to cover all basic needs, yet who are not eligible for social assistance.

In Latvia, the average amount of total household income spent on heat in seven surveyed municipalities was 30 percent, and over 45 percent in the most extreme cases.

*From: Aistara, G. Designing Low-Income Energy Assistance Programs: A Handbook for Municipalities, UNDP Latvia, 2004. This report was prepared within the context of the UNDP-GEF project on biomass heating in Latvia.*

that focus on low-cost improvements to households, these benefits can include:

- **Benefits to recipient households**, including savings on energy and water, increased property values resulting from structural improvements, avoided disconnection and reconnection services for heat and electricity, reduced risk of having to move to a different dwelling due to unaffordable housing costs, reduced need for 'home-made' and less effective weatherization options, decreased incidence of illness and increased comfort levels;[4]
- **Benefits to municipalities, utilities and other energy service recipients**, including reduced need for payment assistance, decreased levels of arrears and debt, reduced costs for disconnection and reconnection services, and decreased losses in transmission and distribution (due to lower loads);
- **Societal benefits**, including reduced pollution levels and environmental impact (due to decreased demand), creation of new jobs and the associated higher spending levels in the local community, tax benefits to the municipality and state, and reduced need for energy imports.

Heating projects that lead to reductions in greenhouse gases are particularly important in transition economies for three reasons. First, they target a sector that is a clear priority for host governments. Participating countries consistently identify the heating sector as a potential area for mitigation in their National Communications to the UN Framework Convention on Climate Change (UNFCCC). For example, the First National Communication from Ukraine estimates that mitigation measures to improve heat supply systems could generate annual savings of nearly 10,800 kilotons of $CO_2$ annually and that efficiency measures in the residential sector could generate annual savings of more than 24,000 kilotons of $CO_2$.[5] Both sets of measures would also be consistent with national environmental goals for reducing air pollution.[6] Other incentives have emerged in the form of European Union standards for the nine Europe and the CIS countries that joined the EU in May 2004. Poland, for example, adapted its thermal protection standards for newly erected buildings to meet EU requirements during its 1996-2000 reporting period to the UNFCCC. It reduced $CO_2$ emissions in the municipal sector as the result of efficiency and renewable energy projects funded through its Ecofund, national funds, and voivodeship (district) funds on the order of 4 million metric tons of $CO_2$ during the same reporting period, including as significant a share of reductions (1.9 million metric tons of $CO_2$) from the modernization of heating systems.[7]

Second, the projects target a sector with a relatively high level of inefficiency and waste. Strategic investments can provide high levels of reductions at a low cost. Again, the National Communication from Ukraine to the UNFCCC estimates that the cost of mitigating carbon in the residential sector would be less than one third the cost of mitigation measures in the agricultural sector and less than one quarter the cost of mitigation measures in the transport sector.[8]

Finally, UNDP-GEF heating projects target countries that have some of the highest per capita greenhouse gas emission levels in the world (see Figure 1). Successful approaches to emissions reductions can be replicated to address these trends.

Heating projects can also provide significant benefits at the national level. For oil and gas producing countries in the region, fuel that is not consumed domestically can be sold on the international market at world prices. For countries dependent on fuel imports, energy efficiency reduces the amount of money spent on imports and

[4] For example, an energy-efficiency project carried out by the Russian Center for Energy Efficiency in Magadan, Russian Federation, found that 380 orphans and disabled people living in the target facilities experienced average indoor temperatures of 44-53 degrees Fahrenheit (7-12 degrees Centigrade). Retrofits saved the facilities $230,000 per year, reduced carbon dioxide emissions by 3,000 metric tons, and raised the indoor temperatures to 66-70 degrees Fahrenheit (19-21 degrees Centigrade).

[5] Source: Ukraine. Ukraine: The First National Communication on Climate Change. Kyiv, 1998, pp. 26, 28.

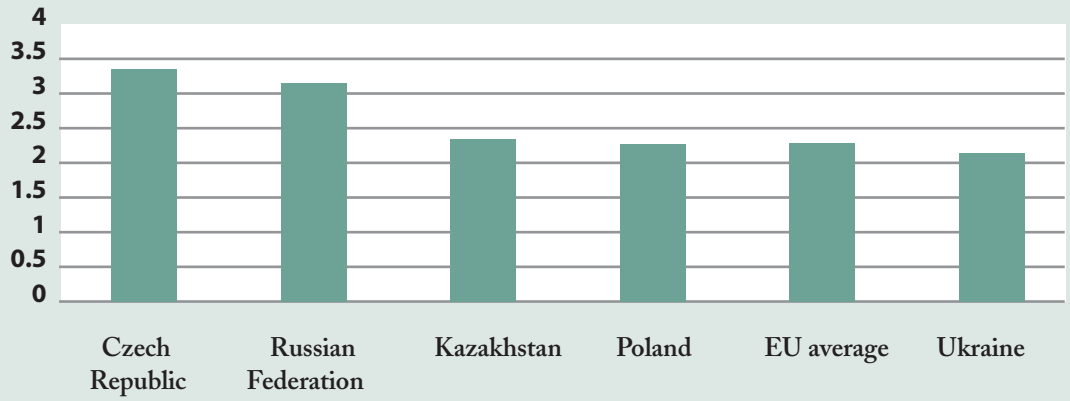
[6] Ibid.

[7] Source: Republic of Poland. Third National Communication to the Conference of Parties to the United Nations Framework Convention on Climate Change. Warsaw, 2001, p. 42. Overall savings in the municipal sector were actually higher (4.8 million metric tons) because they included fuel-switching projects.

[8] Ibid, p. 28. The measure used is one of cumulative capital investment over the entire period over annual direct benefits, expressed as $1,000/teragram of carbon equivalent.

FIGURE 1

Per Capita Greenhouse Gas Emissions in 2000 (metric tons of carbon per person)




improves national security by reducing dependence on imported fuel.

At the local level, reductions in emissions of sulphur dioxide ($SO_2$), nitrous oxide (NOx), ash and particulates can occur to the point where project results may actually be visible to residents. In many cases, less fossil fuel also means lower heating bills for families or for the government body responsible for heating schools, hospitals and other public buildings. In countries where heat costs are subsidized by the government, the financial burden on government may also decrease. The economic significance of heating projects is often reflected in municipal expenditures: The single largest expenditure of many cities in the colder parts of Europe and the CIS is the heating sector. Savings in that area can translate into money available for education, health care, and other municipal services.

Finally, the techniques used by energy efficiency projects have other local benefits. Maintenance and service providers may be able to develop a market for efficiency measures, and biomass-fired heating projects support local business for harvesting, processing and delivery of this renewable fuel. At the most basic level, heating projects that improve end-use energy efficiency can dramatically increase comfort and health for people in their homes, in schools, in hospitals and in other buildings.

The following snapshots from several UNDP-GEF projects in the heating sector illustrate the variety of benefits can be provided:

- Nearly 70 percent of Bulgarian municipalities are now part of the EcoEnergy municipal energy efficiency network. The network is a source of expertise on designing and carrying out municipal energy-saving projects. Participating municipalities have already funded and completed new heating projects.
- Three cities in the Czech Republic are building low-cost, energy-efficient housing for their citizens. Architects trained through the project are using their skills to design efficient single-family homes as well.
- Residents in the Russian city of Vladimir who received little or no heat during the winter are now warm and comfortable thanks to new building-level boilers.
- Air pollution will be reduced around schools in northwest Slovakia as they convert their boilers from dirty-burning coal to modern biomass. The construction of a new biomass pellet plant will also create jobs in a region with the highest unemployment in the country.

- Several projects trained experts who were then able to provide expertise to projects in other countries in the region.
- In a UNDP Thematic Trust Fund project in Bosnia and Herzegovina, vulnerable groups returning to their homes under a post-war development programme will benefit from improved comfort and reduced fuel costs in new and reconstructed buildings.
- In a UNDP Thematic Trust Fund project in Hungary and the Slovak Republic, the project team is developing small-scale initiatives in Roma settlements to improve access to basic energy services, including heating.[9]

Heat-related projects are not new to UNDP, but the Europe and the CIS region has demanded new and different approaches. In regions where UNDP has worked for several decades, heat generation has often focused on new industrial development, such as sugar cane or bagasse biomass facilities in Latin America, rather than efficiency measures in boiler houses that have been in operation for more than 50 years. Fossil fuel use in households is another issue that varies widely between this region and others: project developers may refer to firewood and cook stoves in Africa or South Asia rather than a district heating plant serving multiple apartment buildings. Despite the differences, it is important to remember that heating in economies in transition is a key development issue: reliable and affordable heating is literally a matter of life or death.

## THE MARKET FOR DISTRICT HEATING

The 'market' for district heating is complex. Some of this complexity can be attributed to the unique historical legacy of economies in Europe and the CIS. Many large district heating systems were built under an economic system where capital had no value in and of itself and hard currency constraints did not exist. Relative costs of construction could be discussed by comparing payback periods for project alternatives, but overall cost-benefit analysis was absent. In addition, in systems where prices did not necessarily reflect actual production costs and where cross-subsidies were endemic, artificially low fuel prices removed any incentives for energy efficiency. This was particularly true at the level of the end-user, as many Europe and the CIS consumers paid a nominal fee for heating that bore no relation to its actual cost. Furthermore, collective ownership of production facilities and centralized decision-making on investments often resulted in a meshed system of industrial facilities supplying heat to residential systems and where energy savings at any point in the chain of production, distribution, and consumption would not accrue to the investor.

As a result, many heating practices that were still common during the beginning of economic reforms in the 1990s were simply not financially sustainable. However, the concurrent sharp reduction in gross domestic product (GDP) across the region meant that cash-strapped governments had little capital to invest in reforms and restructuring of the heating sector. Meanwhile, consumers, who had seen their purchasing power erode, were suddenly being asked to pay bills that they simply could not afford, and the quality of heating services was often poor and unreliable.

Ironically, the centralized heating systems that had been put into place were quite efficient in their conception. While energy losses due to poor maintenance or equipment were common, the use of centralized heating systems made sense in densely populated urban areas, and the use of co-generation plants to provide both heat and power for residents (for example, in the Russian Federation) is a design feature that is seen as a desirable model for Europe today.

As reforms have continued, the need for affordable and reliable heating remains great, particularly among groups that are least able to pay for it. In lower income countries, where this need is most acute, the inability to pay for reforms - and even basic services - is evident, even within middle-income populations. In one study of Armenia, Kyrgyzstan and Moldova, data on household expenditures for fuel showed that 'non-poor people were able to obtain heat at a cost of between $30 and $50 per year while poor people spend between $25 and $40 per year'.[10]

[9] Source: Lampietti, Julian A. and Anke S. Meyer. Coping with the Cold: Heating Strategies for Eastern Europe and Central Asia's Poor. Washington, DC: World Bank, 2002, p. 1.

*Residential Building in Almaty (Kazakhstan) with district Heating.*

## PREREQUISITES FOR INTERVENTION

The key challenge for development assistance in the heating sector is to determine the point at which reforms are viable. While it may be possible to identify heating systems in great need of improvement where investments would generate economic and environmental benefits, these investments will not be viable without someone or something that will pay for heating services.

Numerous studies have examined the financial viability of investments in the heating sector. One such study, focusing on district heating systems in Europe and the CIS, looked at certain characteristics that could support investment, such as system density, prices of energy and rates of payment.[11] While it is now clear that someone must be willing to pay for heat, one of the major findings from the UNDP-GEF portfolio is that in the residential sector, this 'someone' has not turned out to be the end-user. Although many UNDP-GEF heating projects and projects by other donors during the 1990s were designed with the vision of an individual end-user paying for heat and, for efficiency measures, services, this has not reflected reality.

Instead, successful UNDP projects have identified other clients. In the biomass promotion projects in Slovenia and Slovakia, municipalities will be assuming debt and making investments. In Belarus, a project under develop ment will assist the national government in lending to municipalities for heat-related efficiency measures. In the Russian Federation, the federal Ministry of Education is using its capital investment budget to undertake heating improvements in schools. In Armenia, the national government is providing a sovereign guarantee so that the municipality of Yerevan can use International Bank for Reconstruction and Development (IBRD) loan funds for the reconstruction of its heating facilities. And in a UNDP project in the Russian Federation, carried out under a programme called Public-Private Partnerships for the Urban Environment, the project team introduced the concept of an Association of Communal Services Payers, a group with the benefits of homeowner associations but without many of their disadvantages. Ironically, an institutional client may actually increase the chances for individuals to benefit from heating projects by ensuring a ready budget for investment and control over a larger number of facilities.

There have been strong results in projects that have targeted municipal institutions as the main market for energy efficiency and renewable energy products and services. In some cases, municipalities have much greater equity,

[10] Source: Lampietti, Julian A. and Anke S. Meyer. Coping with the Cold: Heating Strategies for Eastern Europe and Central Asia's Poor. Washington, DC: World Bank, 2002, p. 1.

[11] Meyer, Anke and Wolfgang Mostert. Increasing the efficiency of heating systems in Central and Eastern Europe and the former Soviet Union. World Bank, 2000. See also: Bashmakov, Igor, 'District Heating Capacity and Demand in Russia: Policy Approaches for Improvement' from District Heating Policy in Transition Economies, IEA/OECD Conference, Prague, 23-24 February 2004, for Russian data on density versus heat loss (4) and non-payments as a function of purchasing power (6).

and when they are subsidizing heat and hot water consumption, they have a much stronger incentive to reduce excess consumption than do individual residents, who, for technological or social reasons often cannot be easily cut off from a district heating system for non-payment.

Good training can overcome significant barriers, such *as shortage of capital and credit-worthiness as long as a clear client and a market for heating services are present*. In 2003, the UNDP-GEF project implementation report for the project in Bulgaria stated, 'Municipalities still face financial and investment constraints due to the Currency Board Arrangement, the existing regulatory framework, and the overall economic situation in the country. The heightened local-level awareness about the benefits from implementation of energy-efficiency measures provides the basis for a new approach to energy-efficiency project development and capacity-building in the EcoEnergy municipalities. Self-sustainable mechanisms for project development have been started thanks to the huge "initiation" effort carried out under the current UNDP-GEF project'. In the Bulgaria project, therefore, the 'clients' for heating services in public buildings were municipal governments. Although they faced financial constraints in the amount that they could invest in energy efficiency, they were able to identify funds to support projects related to heating.

In the case of the UNDP-GEF housing project in the Czech Republic, the municipalities were the developers who paid for construction and managed operations - another situation where efficiency at a competitive cost can be very attractive. In the case of the UNDP-GEF project in Bulgaria, the municipalities had some aggregated funding at the local level, even when their residents had incomes too low to consider individual investments in heating efficiency.

Energy service companies (ESCOs) operating in the heating sector are fairly common in some countries (Hungary, for example). However, a new approach is being piloted in a UNDP-GEF project in the Ukraine that is creating a municipally owned ESCO that will finance and carry out energy efficiency projects - first in its home city of Rivne and subsequently in other municipalities. This project is an example of a new approach in Ukraine for providing services to a proven client (municipalities). Currently, the project team is establishing the ESCO and meeting with funders to attract the necessary equity investment in the company.

In addition to municipalities, national/federal agencies can be an important market, if only because they oversee vast numbers of heating facilities and buildings across the region. For example, the Russian Schools Efficiency project (see Box 2) is working with the Ministry of Education. In short, entities that are responsible for financing heat and hot water provision are the most consistent supporters of energy efficiency gains over time. In addition, the UNDP-GEF projects in Belarus, Poland, Slovakia and Slovenia are partially financing heat sector retrofits using soft loans and/or grants from national agencies or funds offering them. In Latvia, soft loans will cover part of the cost of additional biomass projects beyond the pilot municipality of Ludza.

One area where potential clients have not yet been reached is in the management and maintenance of common areas in multi-unit residential buildings. Tenant associations or other types of associations of utility customers have not played a major role in UNDP-GEF projects under implementation. However, this constituency will be involved in UNDP-GEF projects in Armenia and Kazakhstan.

In countries without a viable client, projects have not been able to succeed or proceed in a timely manner. In Moldova, for example, citizens cannot meet the costs of heating their flats, but municipalities lack their own funds and support from the national government. In Uzbekistan, several of the centralized heating systems have simply been turned off due to lack of financing. By the term 'viable client', it is understood that where the market may not support investments in heating, there must be another source of support, most likely in the form of government investment or payments in the heat sector or buildings sector, in order for a project to succeed.

*District heating system with a solar preheater on the roof ( Almaty).*

*Boiler house in Almaty district heating system.*

# Chapter 2

# TYPES OF INTERVENTIONS

## INTRODUCTION AND BACKGROUND

Literally, billions of dollars have been spent in technical assistance in economies in transition since development agencies began to operate in the region just over a decade ago. Many of these dollars have supported assistance in the field of energy and heating, ranging from emergency fuel programmes in the Caucasus to heating plant reconstruction in the Balkans to soft loans for restructuring district heating systems across the former Soviet Union.

## EARLY 1990s: PILOT PROJECTS

Initial heating projects in the region began as a means to address environmental, economic and social problems:

- The early 1990s saw the collapse of economies, which resulted in dramatic reductions in GDP, hyperinflation and high unemployment. Heat, which had been taken for granted throughout the region, was suddenly unaffordable.
- Old equipment in plants across the region operated inefficiently after years of neglect and postponed upgrades, and energy losses in systems reached levels of up to 50 percent.
- Aging heating plants had no resources for upgrades, either from governments (which were short on resources) or from end-users (who were unable to pay their bills, and whose bills often failed to cover the necessary costs of routine maintenance, much less of investment).
- Reform was further complicated by the presence of subsidies (some federal or national, others municipal) and unclear ownership of system components.
- The vast potential for replication (with over 1,000 large district heating systems in the Russian Federation alone, and over 50,000 smaller networks) was counterbalanced by an absence of effective high-level policy, major political and business vested interests, and a piece-meal approach, rather than a systematic one.

Many early interventions were based on two key assumptions: One, that the energy-intensive heat generation sector was in need of more efficient technologies and operating practices. And two, that demonstration projects would convince decision makers that energy efficiency in these areas was a worthwhile investment, and that effective policy and institutional mechanisms would be the natural result.

The interventions were on the whole fairly similar in approach:

- A bilateral or multilateral donor would retrofit a facility (that is, a hospital or a boiler house, often in a national or territorial capital) as a 'pilot' project, training some local staff in the process.
- Subsequently, a seminar and summary report would be distributed to policy makers.

On the positive side, these projects generated on-site savings and local environmental benefits. In addition, projects achieved substantial reductions in air pollution and in greenhouse gas emissions, generally at a relatively low cost. On the negative side, there was little or no replication of pilot projects.[12] The fact that most aid was 'tied' and thus had a subtext of opening markets to costly western equipment (which became even more costly by the devaluation of the Russian ruble in 1998 and the accompanying currency problems in other CIS countries) did nothing to encourage replication.

Ironically, donors were correct in their assumptions about the need for their work. However, most projects had three unspoken assumptions: (1) that a macroeconomic recovery would happen fairly quickly; (2) that other 'market' conditions were in place for energy-saving technologies and services and renewable sources of energy such as biomass; and (3) that political and institutional issues would be easy to solve once technical solutions were demonstrated. In the first case, many countries continued to face high inflation, which made it extremely difficult to borrow money or imported technologies. While local manufacturing capacities would lead to major cost reductions and recharge the declining industrial sectors, in many cases this was not in the interests of

[12] Note: When replication was not an objective, as in the case of joint-implementation investments made by Western European investors in the RBEC region, this project design made more sense.

donors, who did not intend their support to lead to an outsourcing of their own industrial capacities. Many other countries were reluctant to lift price controls on energy, in most cases for compelling social and political reasons, making it difficult to generate a financial return on discrete investments (despite real economic benefits) even when fuel savings were large. In the second case, project developers came to realize that even when policy makers were convinced that energy efficiency was a good investment - even from a 'market' point of view - they were not able to invest. Finally, in the third case, the complexity of establishing viable mechanisms for sustainable and replicable changes was underestimated.

## THE MID-1990s: MARKET BARRIERS AND A WIDENING GAP

The reasons that investments in energy efficiency were only a small percentage of the potential for savings were then attributed to 'market barriers'. Hence the introduction of the GEF Operational Programme 5 (OP5): 'Removal of Barriers to Energy Efficiency and Conservation' and Operational Programme 6 (OP6): 'Removal of Barriers to Renewable Energy'. This approach acknowledged that many different kinds of barriers blocked the development of a market for energy efficiency products and services, ranging from lack of information to the high cost of capital and lack of access to credit.

At the same time, economic disparities in the region became more apparent. For example, several Central European countries launched their own, sometimes internally funded, mechanisms to promote energy efficiency and environmental protection. In Hungary, bilateral assistance through the German Coal Fund essentially bought down the interest rate for efficiency projects in municipalities that included heating system retrofits. In Poland, the Ecofund, which was capitalized by the retirement of sovereign debts, supported biomass energy projects and other heat-related projects in its environmental portfolio. In the Czech Republic, the National Programme on Healing the Atmosphere, which was funded by pollution-control fines, co-funded projects that switched heating systems to cleaner-burning natural gas. Several energy service companies began to operate in Central Europe, and a private market for heat-related technologies and services was born.

Elsewhere in the region, these 'models' seemed like wishful thinking. In the Balkans, post-war reconstruction programmes meant large inflows of assistance, but they favoured easy-to-contract infrastructure rather than projects that would offer efficiency or environmental sustainability. In the Russian Federation, a regional leader in approaches to energy finance, the 1998 monetary crisis set energy efficiency financing back several years. In Ukraine, the persistent practice of bartering to pay for energy in many sectors made financing almost prohibitively difficult. In Armenia, Azerbaijan and Georgia, political and economic crises led to the shutdown of the countries' largest district heating systems. In Central Asia, heating systems and industrial facilities deteriorated while price controls on fuel and high rates of non-payments by customers deterred investors.

Under the first two tranches of GEF funding, GEF I and GEF II, project developers in the region used a barrier removal approach to project design. Technical barriers, while omnipresent, were not the primary cause of inefficiency and underperformance in the sector. Project developers and stakeholders identified political, regulatory, institutional, social and economic barriers that held back potential markets. Standard interventions under the first proposals in the sector introduced in 1993-1994 included a technical demonstration in at least one municipality, capacity development of municipalities to manage their energy issues, and the dissemination of project results. After 1995, six biomass heating projects joined the portfolio, featuring fuel switching to biomass (from coal or mazut), combined with more familiar end-use efficiency measures.

The situation in 2005 is markedly different. The GEF has shifted to a system of strategic priorities and project development that will highlight market transformation. The region is taking two different economic directions: five of the countries in the heating project portfolio have joined the European Union, while one has qualified for 'least developed country' status. The situation of countries in between these two extremes is equally diverse. In

the Russian Federation and Ukraine, for example, centralized heat supply has remained fairly constant, while in the Caucasus region, many large district heating systems were simply shut down during the 1990s. While coal-fired heating predominated in the early 1990s in Central Europe, natural gas has now become far more common, both for centralized systems and for autonomous boilers. The operating environment in the region has changed dramatically over the past decade, but the objective of the projects has remained the same: to reduce or offset greenhouse gas emissions by providing heat and hot water more efficiently.

## THE BARRIER REMOVAL APPROACH

The following section explains the barrier removal approach in practice and assesses the performance of projects in key areas of activity. As an introduction, Table 1 provides an overview of various interventions in the UNDP-GEF heating portfolio.

### TABLE 1. SELECTED INTERVENTIONS TO REMOVE BARRIERS IN THE UNDP-GEF HEATING PROJECT PORTFOLIO

**Policy-related interventions**
- contributing to national, regional or local legislation
- providing advice to national decision makers
- supporting or cooperating with a professional association
- supporting the development of municipal energy plans

**Direct financing interventions**
- capitalizing energy service companies from project funds
- capitalizing a loan fund from project funds
- capitalizing a loan guarantee fund
- capitalizing a fund for energy audits from project funds

**Indirect financing interventions**
- undertaking a feasibility study and legal work behind the establishment of a municipal energy service company
- developing bankable projects
  - refining existing business plans
  - carrying out feasibility studies
  - developing a business plans
  - brokering sources of capital from parallel financing (through multilateral development banks)
- providing training in types of financing available
- working with federal agencies to allow preferential selection for projects in grant programmes

**Institution and management-related interventions**
- developing the capacity of a national-level energy efficiency centre
- creating an independent municipal energy department
- developing the capacity of a municipal energy department
- providing training in billing
- providing a focus and support for tariff-setting
- providing strategic planning for systems
- providing training in project identification
- developing training curricula for technical schools

**Sustainability planning**
- creating or strengthening institutional mechanisms to continue project benefits
- stimulating markets through targeted funds to overcome inertia or problems of scale

**Awareness-raising**
- establishing a project website -producing project reports
- producing pamphlets, guides and other materials for target groups
- participating in national events with exhibits and presentations
- disseminating a curriculum unit for secondary schools

**Technical demonstrations**
- demonstrating supply-side measures
- demonstrating demand-side measures
- training in audits
- conducting audits
- training in passive heating and design improvements

**Other training and outreach**
- providing on-call expertise
- certifying audits
- establishing a formal network nationally
- establishing an informal network nationally
- serving as a resource for project design for other GEF projects
- developing expertise used in other national projects
- developing expertise used internationally

**Monitoring and evaluation**
- developing or adapting a methodology for monitoring and evaluation project outcomes
- developing or adapting a methodology for energy-savings calculation
- developing or adapting a methodology for greenhouse gas mitigation estimates

In practice, most of these interventions appear in the projects in the UNDP-GEF heating portfolio. Table 2, excerpted from a UNDP-GEF project document from the 'Hungary: Public Sector Energy Efficiency Programme', provides an example of how the barrier removal method can be applied to a particular project.

The right column of the chart illustrates the GEF principle of providing complementary support to existing institutions to lend added value.

## TABLE 2. BARRIERS AND BARRIER REMOVAL ACTIVITIES FROM THE UNDP-GEF HUNGARY PUBLIC SECTOR ENERGY EFFICIENCY PROGRAMME

| | Project components | | | Parallel or related projects |
|---|---|---|---|---|
| Barriers | **Support for Energy efficiency policies, awareness, coordination and financing** | **Support for project identification, development and financing** | **Training** | |
| **Institutional and Policy Framework**<br>• Poor institutional capacity<br>• Lack of coordination | • Supporting the establishment of the government's new Energy Efficiency Agency<br>• Providing technical assistance in evaluating and implementing energy efficiency policies and regulations<br>• Supporting the new agency in identifying individuals or shared energy managers for all municipalities | • Gaining and systematizing practical experience in energy efficiency project evaluation from a national perspective (encompassing macroeconomic impact, greenhouse gas reductions, etc.) | • Identifying training needs for and training new Energy Efficiency Agency personnel | Government Action Program to Increase Energy Saving and Energy Efficiency |
| **Financial**<br>• Lack of coordination among different programmes<br>• Perception by municipalities that audits are too risky to fund without cost-sharing | • Supporting governmental financing mechanisms for energy efficiency<br>• Coordinating information on financing for energy efficiency ('One-stop shopping') | • Facilitating financial arrangements among public sector clients, project developers and commercial banks and other financial institutions<br>• Providing cost-sharing for audits and feasibility studies | • Providing training for municipal decision makers on how to prepare energy plans and identify energy efficiency projects.<br>• Training municipal energy managers on how to finance energy efficiency projects (emphasizing energy service companies and existing financing mechanisms) | GEF/International Finance Corporation; Hungary Energy Efficiency Co-Financing Programme; German Coal Aid Revolving Fund; Project Preparation Fund; Public-Private Partnerships; Energy Saving Credit Programme |
| **Supply of Energy Efficiency Services**<br>• Lack of integrated services<br>• Lack of quality-control | • Creating mechanisms for better communication and information sharing among energy efficiency service providers<br>• Supporting a governmental certification programme for energy service companies and auditors | • Providing experience for project developers in project implementation | • Training in energy services marketing and implementation (performance contracting, business planning, strategic partnerships, etc.) | European Bank for Reconstruction and Development |
| **Demand for energy efficiency services**<br>• Lack of awareness<br>• Lack of capacity | • Help create an energy- efficiency information system<br>• Promote improved communication with municipalities on efficiency issues | • Carrying out outreach activities to promote awareness of energy efficiency potential<br>• Generating awareness and demand by support for audits and feasibility studies | • Carrying out workshops to disseminate project outcomes and lessons learned for potential public sector clients | PHARE (an EU programme for economic reconstruction in Poland and Hungary that later expanded to 14 Central and Eastern European countries), along with PHARE regional centres and networks |

*Source: Hungary: Public Sector Energy Efficiency Programme, project brief submitted to the GEF Council, February 2000.*

The following sections will summarize the performance of various types of activities by the types of barriers removed: The removed barriers in these cases are those related to policy, awareness and knowledge, and technology. Barriers to financing are discussed in Chapter 3, and barriers to monitoring and evaluation are discussed in Chapter 4.

## PROJECT PERFORMANCE IN THE POLICY SECTOR

UNDP-GEF heating projects have resulted in changes in several policies at the national level. For example, for the UNDP-GEF project in Bulgaria, experts contributed to the development of the 2004 Energy Efficiency Act, which will provide national legislative support for energy savings and subsequent emissions mitigation. A UNDP-GEF project in the Czech Republic helped to revise national energy efficiency standards for buildings that have led to reduced energy consumption (and reduced greenhouse gas emissions). In the UNDP-GEF project in Latvia, the project team supported the development of a national strategy to support and promote the use of biomass, and policy support is targeting both the national and municipal government.

However, while policy interventions tended to focus directly on heat (and/or biomass) legislation, most investments are likely to be constrained by broader economic and fiscal policy. For example, policy-related activities in the UNDP-GEF project in Slovenia focused on providing commentary on a national strategy for renewable energy. However, across the region, work on national heating policy as part of an overall energy balance or market for products and services has been constrained by a lack of influence on the part of project teams on upstream macroeconomic policy. Projects also lacked mechanisms aimed at increasing this influence, and engaging the right decision makers.

This constraint is wholly understandable - a single project cannot possibly tackle politically sensitive, high-level reforms in pricing or ownership, issues that are often difficult even for government agencies to influence. Tariff reform is an uphill battle for politicians in any country. For example, a recent report from the International Energy Agency on district heating policy[13] included two initial steps for sectoral reform - establishing an independent regulator and removing direct heat production subsidies - that would require major political leverage to accomplish.

The question then becomes how to inform and stimulate the policy debate through a comprehensive engagement strategy. Project proponents to date have focused on the area of specialization - heat or biomass energy - where they have a thorough understanding of the legal issues and contacts with decision makers, and are recognized as experts. In practice, the focus of energy policy work funded by the GEF and other donors has largely targeted energy agencies. As a result, certain types of reforms, such as the shift from blanket heat subsidies to targeted payments to low-income families, which involve ministries handling social welfare, are not addressed. An independent final evaluation of the Bulgaria project, for example, found that macroeconomic reforms and energy subsidies were addressed by the project activities, but that the scope of those issues was beyond the project's budget and design.

These limitations can even affect policies within the energy sector. Government policies that subsidize certain types of fuel or that promote piecemeal regulation or reform of the energy sector can also affect projects. For example, a government that does have policies in place to support co-generation may unwittingly create disincentives for its use in centralized heating, increasing emissions and reducing overall energy efficiency.
Single-issue policy promotion has meant that the chances of success are highest in countries on a faster reform track (for example, Latvia and Slovenia), where external political incentives provide the necessary muscle for change. Unfortunately, in countries where reforms in the business environment have been somewhat slower (Bulgaria and Romania, for example) or a great deal slower (Kazakhstan, Moldova and Uzbekistan) and policy reforms are greatly needed, the success of policy development activities has been hindered by the overall operating environment.

[13] Organisation for Economic Co-operation and Development/International Energy Agency, Coming in from the Cold: Improving District Heating Policy in Transition Economies. Paris: OECD/IEA, 2004, p. 232.

BOX 2

Policy Work in Practice

The following excerpts from two project documents give a sample of the types of policy-related activities in projects that have started in the past four years. While Latvia is now a member of the European Union, Turkmenistan continues to experience economic difficulties more typical of the Central Asian republics.

**Excerpt from a UNDP-GEF biomass project in Latvia**

**Output:** Create the conditions necessary for the implementation a national strategy for a district heating system involving biomass combustion and other renewable sources.

**Activities:**

- Prepare an analysis of the Latvian Energy Balance and provide projections for future development up to 2020.
- Analyse future potential for biofuels and their place in the National Energy Policy, especially the heating sector.
- Price dynamics of energy fuels and their impact on use of biofuels in the future.
- Undertake an analysis of the Baltic Sea region experience in supporting measures for renewable energy production.
- Undertake an analysis and modeling of the application of different support measures for use of biofuels in energy protion, such as tradable green certificates, $CO_2$ tax, etc.
- Summarize above findings and recommendations on implementation of the national strategy for heating in line with district heating and implementation arrangements formulated.
- Present findings and recommendations in the interministerial working group and organize high-level interministerial wo shops to facilitate the incorporation of findings into the National Energy Policy.

**Excerpt from a UNDP-GEF District Heating Project in Turkmenistan**

**Output:** Adoption of a National Heat Strategy

**Activities:**

- Prepare a draft concept for a national strategy for developing heat and hot water supply services based on the principle of sustainable development. The strategy will be based on the results and conclusions of pre-feasibility studies and master plans prepared for the participating municipalities as well as on the recommendations for overcoming the identified barriers to financing these projects. In preparing the draft strategy, the project will also draw upon experiences from other CIS countries through programmes by the World Bank (heat sector strategy studies) and the United Nations Economic Commission for Europe (energy strategy studies).
- Organizing workshop(s) for key government and municipal authorities, local experts and other key stakeholders to present, evaluate and discuss the results and conclusions of the project.
- Facilitating the process of adopting the heat strategy by the government by conducting other public awareness-raising activities and consultations with key stakeholders.

One positive sign in national-level work is that projects that have built networks of municipalities, such as those in Bulgaria and the Czech Republic, have been able to lobby the national government for changes in policy or programmes that would support energy efficiency. The UNDP-GEF project in Bulgaria has used its EcoEnergy Network in cooperation with the National Association of Municipalities to 'influence the national legislation applicable to municipal energy management and to improve options for municipalities to obtain financing for energy efficiency projects' (2003 Project Implementation Review). For example, the municipalities are lobbying to change federal regulations and lengthen repayment loans and increase the share of municipal budgets that can be spent on loan repayment. Both changes would increase the potential for energy efficiency investments. As macroeconomic conditions improve, a large number of municipal energy efficiency projects developed through project training sessions will be able to move forward more quickly. This tandem approach of focusing on success within existing policy constraints while lobbying for large-scale change is a good practice that could be replicated in other projects, both proposed and ongoing.

At the local level, nearly all projects using policy-related interventions have found that the development of local legislation has involved more regulatory work than originally anticipated (see Box 3 for an example from the Russian Federation).

BOX 3

### Developing Local Capacity to Heat Homes Efficiently in Vladimir, Russian Federation [14]

As with most UNDP-GEF heating projects involving energy efficiency, the Vladimir project began as a technical demonstration coupled with attempts to reform the operating environment at the local level. As the project went on, it became clear that attempts to influence change at the local level - and to measure that change - would be time- and labour-intensive because of the many interlocking pieces that formed this operating environment. The team responded with a variety of capacity development and evaluation activities discussed below.
*The key lesson learned is that capacity development at the local level can be as complex and comprehensive as at the national level. Proper project design and funding can address these challenges and are critical to replication.*

**Objectives**
The Vladimir project was originally designed to 'enhance capacities in both the private and public sectors in the city of Vladimir to overcome barriers to energy efficiency investments in residential buildings and related heat-distribution systems'.[15] The objectives in capacity development were very ambitious, focusing on both individuals and institutions (and hoping to influence systemic capacity). Capacity to be developed ranged from private management and public administration to technology transfer, scientific monitoring and modelling, and legislative and regulatory reform.

**Results**
By the end of the project, the municipality had improved its ability to provide heat to residents in its 96-building demonstration zone. The team installed three autonomous boilers (independent of the district heating system), including rooftop and basement boilers, taking buildings that were receiving very little heat off of the central heating plant distribution system. In addition, 10 buildings were fitted with heat meters at the apartment and building level under a project component financed by a World Bank loan and additional metering equipment installed at the district boiler houses. As a result, 1,400 tenants were more comfortable and paid 3-10 percent less for their heat, and the project team estimated that fuel savings in the project zone reached almost 900 metric tons/year.

[14] The full title of the project under discussion was RUS/96/G31 'Capacity Building to Reduce Key Barriers to Energy Efficiency in Russian Residential Building and Heat Supply'.
[15] As described in the project summary of the project document.

On the management front, the project created a private company, Vladesco, to operate and maintain the off-grid boilers. It also created a monitoring and billing service for the city that handled flats with meters, flats in buildings with meters, and flats served by a substation with a meter. Nearly all of these activities (and subsequent results) required changes in local legislation and regulations.

City officials and employees of the district heating companies received training in business planning. The project team developed the capacity of the private heat company and the project service unit to manage tariffs, billing, work with the private heat company, and overall policy. The team also conducted a media campaign through TV, radio and newspaper articles to improve tenants' awareness and understanding of the energy-saving technologies being introduced. Finally, the team developed methodologies on all aspects of its operations that were collected in reports, guidelines and best practices.

**Challenges and Opportunities**

The key challenge of the project was the sheer number of areas in which capacity development was necessary - technical, legislative, regulatory, managerial, economic and policy-related - along with an inadequate project design from a capacity-building perspective. (As far as the project team was concerned, the capacity development component was completed in the first year of the project and was subsequently omitted from annual project reports). The breadth and depth of capacity development necessary was reflected in the implementation time of the project; originally scheduled for 4 years and 4 months, the project ended in 2004 after nearly 7 years. A related challenge was how to encourage the replication of such a labour-intensive effort (not to mention the equipment) without the support that the Vladimir project had been able to draw upon. While two other municipalities are considering the project model for tariffs and billing, significant replication has not yet taken place. However, the exhaustive documentation by the project has provided a blueprint for other municipalities that may want to follow the Vladimir approach. The final substantial challenge is related to systemic capacity: There is still a lack of strong economic incentives for tenants to conserve energy given their existing tariffs.

**Lessons Learned**

- Capacity development activities for local-level heat sector restructuring projects should reflect the complexity of the heat supply process and the institutional, contractual, legal and financial relationships in both project design and budgeting. Ownership questions in particular can create systemic barriers to reforms.
- In many countries in the RBEC region, capacity development activities in the residential heating sector can leverage changes that affect housing and municipal services as a whole (for example, the formation of tenant associations to handle heating at the building level). Projects should assess this overlap in project-related regulations and legislation and understand the implications, both positive and negative, before launching the project.
- Replication in heat sector projects requires substantial resources. Efforts to replicate results can benefit from the early involvement and capacity-development activities of key people from potential replication sites.
- Developing the capacity of elected officials and civil servants should include as many officials as is feasible in order to reduce the risk of project delays or friction due to political turnover at the local level.
- When developing the capacity of municipalities to manage heating, documentation is very important to avoid 're-inventing the wheel'. However, the documentation must be easily accessible and organized by target group to reach different stakeholders in replication sites.
- Monitoring and evaluation of projects with this level of complexity should be broad and should cover capacity-building with impact/outcome measures, where possible. The breadth of activities and specialized nature of monitoring energy and climate benefits may often require a budget larger than the standard UNDP line item for monitoring and evaluation.
- Projects involving the creation of private companies for municipal services face a special array of capacity development needs. Developers should refer to existing models for these types of public-private partnerships.

For more information, visit the project website at http://www.ucit.orbita.ru/environment/

*Source: UNDP Action-Reflection Note (2004).*

## EDUCATION AND OUTREACH PERFORMANCE

Activities addressing knowledge and awareness barriers have produced some important results in individual projects.

First, training and outreach have reduced barriers in several key areas. For example, the policy development described above resulted in part from training activities. Access to financing, discussed in detail in Chapter 3, has also improved due to these activities. In the UNDP-GEF project in Bulgaria, project training (and the positive example of the demonstration projects, which yielded impressive results) allowed municipalities to find and use their own funding for energy efficiency projects. Participating municipalities have financed more than 18 energy efficiency projects in addition to the pilot project, including three hospital retrofits and six school building retrofits, all of which have reduced heat consumption and improved comfort levels. In short, they have cultivated a heterogeneous market for financing energy efficiency projects where a market had barely existed apart from a few bilateral grants and Bulgarian government grants.

Box 4 describes the use of education and outreach activities in a UNDP-GEF project in the Czech Republic that resulted in replication several times over.

### BOX 4.

#### Low-Cost, Low-Energy Housing for Czech Families[16]

In many energy-efficient housing projects, developers seek a grant or subsidy to cover the cost of expensive, highly efficient technologies. However, in the Czech Republic, a GEF project team set out to use low-cost design measures that would result in low-cost, low-energy municipal apartments. In addition, the team sought to convince municipalities and families to invest in these buildings. Many projects involve changing public perceptions about energy technologies, which can be a bigger barrier than introducing the technologies themselves. As the project manager said, "This project has been all about communication."

*The key lesson learned is that capacity development activities involving all constituencies are critical to the success of projects that involve changing perceptions.* Work with all stakeholders helped to move forward with construction in several sites and ensured that the project results continued to spread even after the official conclusion of activities.

**Objectives**

The project was designed to reduce $CO_2$ emissions in the Czech Republic by improving the energy efficiency of new buildings, reducing operational costs and increasing comfort levels for residents. The project designers focused on municipal housing as a way to influence the construction of multi-unit residential buildings that already had an investor (the municipality). GEF funding was used only for capacity development, while investment costs were covered by municipal financing (equity) and tenants, who acquired the titles to their flats after 20 years of monthly payments to the municipality.

**Results**

By the end of its implementation, the project had offered technical training to 500 professionals (and 250 students), enabling them to provide a low-energy product to their clients at a competitive cost. Two municipalities, Susice and Humpolec, and four private investors paid for low-energy buildings, which averaged $520-$600 per square metre in construction costs compared to typical costs of $550 per square metre.[17] At the same time, the buildings reduced operational costs dramatically: the 70 tenants in the Susice building spent nearly 40 percent less for heating than typical tenants.

[16] The full title of project CEH/98/G35 is 'Low-Cost/Low-Energy Buildings in the Czech Republic'.
[17] Calculated using Q2 2004 exchange rates.

Finally, the low-energy practices were absorbed at two levels. First, the project team trained the State Fund for Housing Construction, which provides subsidies to municipalities for public housing, to recognize projects with energy and environmental benefits. As a result, the State Fund has now decided to support at least one of the municipalities with a grant for construction costs. Second, the architects trained under the project continue to include energy-saving elements in their designs for both municipalities and private clients. For example, six low-energy row houses and a single-family home designed by a project-trained architect are already under way.

**Challenges and Opportunities**

The key challenge to the project was not technical. It involved changing the way people think about low-energy housing. The project was instrumental in addressing that challenge in two ways. First, the team used training and outreach to change perceptions among key stakeholders (see below). Second, the team focused on designing and constructing buildings that would serve as working proof that low-cost, low-energy housing was a viable option for municipalities. These buildings fed back into training and outreach efforts.

An additional challenge was designing capacity-development activities for a wide variety of stakeholders. In addition to technical professionals, such as architects, engineers and even construction crews, the project had to work with administrative professionals, such as mayors and government grant managers. Again, multifaceted activities designed for different groups made this possible.

**Lessons Learned**

- The identification of all constituencies in need of capacity development -both technical and administrative - should be a priority for project proponents.
- Activities designed to encourage interdisciplinary communication can be beneficial to all constituencies.
- Constituencies outside of traditional 'environmental' institutions are very important. Work with the State Fund for Housing Construction and the Czech Chamber of Civil Engineers (which offered training in low-energy housing as a continuing education credit) produced excellent results.
- 'Soft' technologies (such as passive heating) still required training, outreach, materials development and other capacity-building activities to ensure successful technology transfer to stakeholders.
- Changing perceptions among project stakeholders was time-intensive and required multiple meetings and/or training sessions. Projects should include sufficient staff time for good working relationships to develop between the team and stakeholders.

For more information, visit the project website at http://www.svn.cz/index-a.htm

*Source: UNDP Action-Reflection Note (2004).*

Education and outreach activities in UNDP-GEF heat sector projects have focused on two types of constituencies. In all of the projects, extensive outreach efforts have been conducted to build the capacity of local decision makers and their personnel who focus on energy/environmental issues. And in all of the projects, individual professionals, such as scientists, architects, engineers and even construction personnel have received training that has allowed them to further their expertise. For example, architects trained under the UNDP-GEF project in the Czech Republic have begun to apply new energy-efficient design principles to work that they do for private clients. And engineers in the UNDP-GEF project in the Russian Federation have now acquired skills in dealing with a technology new to the local level (rooftop gas-fired boilers). All constituencies in the national projects have also benefited from increased understanding of energy-saving and financing concepts.

In the UNDP-GEF heat sector projects, awareness is often most effectively targeted at two to three individuals in a municipality: the mayor (who requires a basic understanding of the issues in order to play the role of project champion) and the officials responsible for energy man-

agement (who will identify measures and support their implementation) and for overall investment. Mayors who are unsupportive of a project, perhaps due to a lack of understanding of the issues or because they have other priorities, can significantly delay a project. This was the case in the UNDP-GEF project in Latvia.

In larger municipalities, there are entire departments within the municipal administration or municipally owned utilities that can benefit from training and awareness-raising. For example, the UNDP-GEF project in Vladimir, Russian Federation developed six different metering and billing software applications for use by the Project Services Unit. It may not make sense to provide extensive training for personnel with only a passing acquaintance of a project. However, providing education for municipal employees can buffer projects against the delays due to a change in political administration by ensuring that there will be civil servants who can quickly bring the newly elected officials up to speed on the status and importance of the project.

Energy managers are also a likely target for training and outreach. In smaller municipalities, there is usually no designated energy manager. The UNDP-GEF project in Hungary covers nearly 3,000 municipalities, many of which are quite small and do not have the resources to support a specialized energy manager. Therefore, the project's awareness-raising and training measures focus on individuals at the regional level who will cover several municipalities. This approach is designed to ensure that municipalities at least have access to an expert in the field.

Raising awareness among groups of professionals outside of the field of energy can also support the promotion of efficiency. The UNDP-GEF project in the Czech Republic, for example, targeted civil engineers, architects and builders. In this case, 'awareness' meant learning about design and installation techniques that could substantially improve the heating performance of a building. Another component of the Czech programme was to raise awareness regarding the costs of these measures, as the perception that efficient buildings were impractical and expensive was pervasive among professionals and municipalities alike. One innovative practice that enhanced participation in trainings was to offer continuing education credit to civil engineers who attended a series of presentations on efficient housing at a large conference.

Awareness-raising and focusing on individuals as a target group in UNDP-GEF projects are areas for further study. There are projects where individuals have been pivotal to outcomes. In the UNDP-GEF project Vladimir, for example, data indicated that at least a third of apartments that were supposed to receive meters refused installation.[18] Specific groups of end-users have not been targeted in most UNDP-GEF projects. Broad information campaigns targeting the general public through mass media and project-related publications are a common feature of many UNDP-GEF heat sector projects. However, there is no evidence from evaluations that this type of campaign is useful in making projects more sustainable or replicable.[19] While specific outreach related to project components can be effective, there is little to recommend this type of general outreach in future projects without convincing justification.

In heating projects that promote biomass energy, raising awareness is often an intervention proposed to address a different barrier altogether - a misperception of the technology to be used. In many countries in the portfolio, biomass energy is perceived as a dirty, backward means of heating - something for poor, rural inhabitants. Therefore, more biomass interventions focus on removing the stigma attached to this technology for use in the heating sector.

In summary, awareness-raising efforts were proposed in all projects in the portfolio. The activities that focused on municipalities (specifically, the mayor, the municipal official responsible for energy, and investment department personnel) appeared to be very effective in terms of

[18] Reasons listed by the project team and external consultants in project documentation included an unwillingness to allow the workers into apartments due to possible theft, damage to the apartment or discovery of self-installed, oversized (and therefore illegal) radiators. While the meters were meant only for data collection during the project, other tenants feared that the usage reflected would be too great for them to afford once meters were linked to billing

[19] In fact, most evaluations covering this area focus on outputs (that is, the number of newspaper articles or brochures published) rather than outcomes. In part, this is due to the commonly stated project objective of 'increasing awareness of energy efficiency/biomass energy among target groups' without stated benchmarks for success.

resulting investment and satisfaction. There were insufficient data to analyse outreach to building residents. Interventions proposed for 'public outreach' require more scrutiny as to their efficacy.

## TECHNOLOGY-TRANSFER PERFORMANCE

All of the projects in the UNDP-GEF heat sector portfolio involved technology that was not necessarily innovative, but may not yet have been applied in a given country. While several projects grappled with issues related to procurement or maintenance, no project found that technology risk contributed to any problems. In short, technology did not have to be innovative in order to be successful.

Project reports, however, indicated that project designers and implementers should budget and agree on arrangements for procurement that reflect the fact that the heat-related equipment may be new to a given country (or that suitable adaptations of local equipment and facilities may be sufficient for the needs of the project). Project teams have commented that maintenance and operations training should be included in any equipment contract and stated up front in the project document. These findings seem to support the move by the GEF towards a focus on financing, as heating technologies themselves do not seem to be responsible for shortcomings in technology transfer.

## EMERGING TRENDS

While project design today must take into account the background of the portfolio and all of the current methodological issues in the heating sector, project developers and their country office partners should consider four emerging trends: capacity development, project networks, acting locally, and seeking partners outside of the energy sector.

**Capacity development:** The UNDP-GEF heating portfolio tells an interesting story. Projects focusing on single pilot investments have not tended to replicate beyond the sites receiving GEF grant money or equipment. This has also been true of the financial mechanisms used in the pilot intervention (restructuring municipal heating companies to change the debt profile, vendor financing, etc.). Projects that have replicated have focused more on presenting energy-efficiency techniques and ideas for financing. For example, Bulgarian cities participating in the GEF-funded EcoEnergy network have used mechanisms ranging from funds in their operating budget (Gabrovo) to a municipal bond issue (Varna) to support energy-efficient street lighting. In the Czech Republic, energy efficiency building techniques taught to architects are being used in publicly financed buildings and also in work for private clients, who utilize commercial financing.

These findings make it clear that while it is important to consider financial mechanisms in detail, one size does not fit all. The same market may rely on several sources of financing. Attention to mechanisms should be balanced by attention to the need for capacity development for key stakeholders, such as service providers, financiers and local decision makers.

Furthermore, the capacity to obtain financing will only be useful if there is a context in which investments can be prioritized. The cities in the Eco-Energy network have developed energy plans that allow them to consider the relative benefits of various investments. Basic energy planning for municipalities can illustrate options for investment and can also strengthen the capacity of city administrations in dealing with private investors, who are likely to present options that may be most profitable for them. Energy plans also allow officials at the local level to step back from piecemeal energy efficiency measures and consider environmental issues, such as local and global emissions that may be generated under various scenarios. These plans can even look across the utility sector. For example, they can weigh the relative benefits of a combined heat and power plant against an investment in autonomous boilers and fully consider the impact on the power sector.

The issue of energy planning dovetails with the issue of management capacity at the local level. While several UNDP-GEF projects have addressed management issues, project activities have focused primarily upon restructuring, which is not tantamount to management reform. Heating utility staff may still need business-relat-

ed training in how to run their company, regardless of its ownership structure. In countries with many district heating systems, for example, the performance of heating companies in similar circumstances can vary widely. Management capacity development may seem somewhat intangible in project design, but it can determine whether a project succeeds or fails.

**Project networks:** National networks of municipalities or other institutions, such as schools, were an intermediate outcome of several heating projects, such as the Russian Educational Sector project and public sector efficiency projects in Hungary and Bulgaria. As the projects developed, it became clear that these networks were important to their success, particularly in terms of replication. When involved in the project early on, networks can establish rapport between participants and project experts, provide suggestions, copy successes quickly and ultimately serve as a lobbying group for policy change (see Box 5 for a case study on one such network that operates in a UNDP-GEF project in Bulgaria).

Specifically, the role of networks appeared to have an effect on project replication. Two project approaches were observed:

- Technology or financial demonstration followed by dissemination of results to a group; and
- Early establishment of a network for dissemination and training, followed by, or concurrent with, demonstration.

The latter approach seemed to increase the chances of replication substantially. One reason may simply be timing. Demonstrations frequently experienced delays, leaving little time to cultivate relationships with target groups that might replicate experiences (such as in UNDP-GEF projects in Latvia, Vladimir, Russian Federation, and Slovenia). In another case, the lack of a strong relationship with municipalities in Hungary made it difficult for the UNDP-GEF project to introduce a relatively unusual financial product, an audit fund; no municipalities applied for this support when it was introduced, and success with the fund was achieved only following a significant delay. While outreach is an important component of that project, the financial intervention occurred before the network of municipalities was functional.

The establishment of networks first also provides an important hedge against political and policy changes at the local and national levels. While a change of mayors caused a substantial delay in the UNDP-GEF project in Latvia, a similar change in a potential demonstration site in the Czech Republic was minimized because of the existence of other informed municipal partners in the network.

BOX 5

### An Energy-Efficiency Network for Bulgarian Municipalities [20]

Donor-funded district heating energy efficiency projects often include the establishment of some type of association of heat suppliers and/or municipalities, ostensibly to disseminate lessons learned. However, often these associations, or networks, are launched late in the project, precluding the opportunity to capture best practices in real time. In the case of the GEF-funded Energy-Efficiency Strategy to Mitigate Greenhouse Gas Emissions in Bulgaria, the creation of the EcoEnergy Network was a means of grounding other project activities and was key to the project's success. The active support of the network and early, real-time dissemination of results allowed the project to maximize its outputs during its lifetime and to leverage funding for its activities from a variety of sources.

*The key lesson learned is that the establishment of a network of energy consumers (in the case of the Bulgaria project, the 'EcoEnergy Network' of municipalities) is an important activity in and of itself rather than a secondary channel for information dissemination in the later stages of the project.* This approach promoted sustainable development at the local level in a cost-effective and innovative manner.

[20] The full title of project BUL/96/G31/1G is 'Energy Efficiency Strategy to Mitigate Greenhouse Gas Emissions. Energy Efficiency Demonstration Zone in the City of Gabrovo, Republic of Bulgaria'.

**Objectives**

This UNDP-GEF supported project was designed to overcome barriers to energy efficiency in Bulgarian municipalities and to reduce greenhouse gas emissions. At the outset of the project, an energy efficiency network (EcoEnergy Network) of over 30 municipalities was established, each tasked with developing municipal energy efficiency plans. In addition, the project also included municipal technical demonstration pilot projects (at a school, a hospital, a residential building, an industrial building and at several other sites).

*National conference of the Municipal Energy Efficiency Network EcoEnergy*

**Results**

By the end of the project, the EcoEnergy network covered 159 Bulgarian municipalities and 69 percent of the population. The benefits of the networking were evident both in and beyond the initial demonstration. The project completed its activities in Gabrovo successfully, and the city designed and financed an additional project in a city office building. Moreover, 18 other municipalities used the example of designing a more efficient lighting system and using low-energy lamps - generating savings in maintenance - to implement their own lighting projects. The city of Varna financed its project with a municipal bond (a technique taught in an Eco-Energy training course). Ten municipalities also launched efficiency projects in buildings, based on the experiences in Gabrovo and other European cities covered in training courses. Twelve municipalities that were part of the EcoEnergy network also implemented other types of efficiency projects (for example, in schools and hospitals). And 17 municipalities outside of Gabrovo also developed energy efficiency programmes, to identify and prioritize investments in the sector. The network will continue beyond the conclusion of the project (which ended 30 April 2004). Municipalities will pay membership dues in order to support some of the basic services provided by the network managers.

**Challenges and Opportunities**

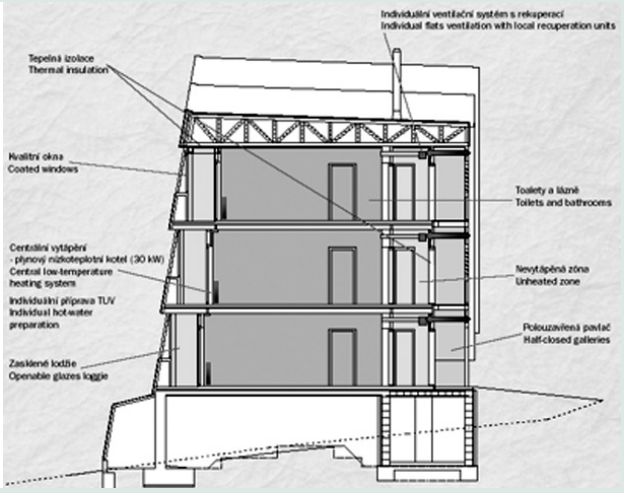
The key challenges to the project were closely linked political and economic conditions beyond the control of the project. First, fiscal decentralization, which would have benefited municipalities seeking to invest in energy efficiency, did not occur to the degree anticipated by the project designers. This lack of decentralization limited the types of financing municipalities could use to fund efficiency improvements (that is, low debt ceilings limited opportunities for commercial banks and energy service companies).

The EcoEnergy Network was instrumental in addressing these challenges in three ways. First, participating municipalities shared techniques that worked even under limited financing conditions (such as maintenance and relatively inexpensive lighting retrofits). As a result, the street lighting project in Gabrovo, which faced initial delays, served as a 'how-to' case study for others in the network and was copied in 18 other municipalities that were network members. Second, the network evolved to include an advocacy component, allowing municipalities to speak in a more powerful, united voice on the issue of fiscal decentralization (representatives of the network met with national policy makers to brief them). Finally, through the programmes and plans prepared by network members, an impressive pipeline of projects is ready to go as soon as the political and financial situation improves, even if the improvement is only slight.

**Lessons Learned**

- Establishing the network at the beginning of the project rather than waiting for results from a technical demonstration increased its effectiveness (for example, cities were able to develop their own lighting projects in tandem with the project in Gabrovo).
- Approaching the network as the core of the project rather than an afterthought for disseminating the results of the technical demonstrations led to better-than-expected replication of the investments.
- Strong, early attention to the network allowed the project to maximize investments in energy efficiency even in a difficult political and economic climate (successful ideas were replicated rapidly).
- While critical to successful project replication, municipal networks can also serve as a constituency for an advocacy group that can tackle larger barriers to project implementation by lobbying the national government on policy issues.

*Source: UNDP Action-Reflection Note (2004).*




*New Efficient House Plan for Susice*

*Efficient House under construction in Susice*

*The power plant in Gabrovo*

**Acting locally:** Municipalities, the most decentralized units of government in heat sector projects, have several advantages as partners: (1) they have a strong incentive to save energy, as they are often energy suppliers or underwriters of energy services; (2) they form a group that allows for high potential of replication; and (3) they maintain closer contact with constituents than regional or national governments. They are major energy consumers, overseeing schools, hospitals and other public buildings. However, in many countries, municipalities are also energy suppliers, owning the heat and power utilities that provide basic services to their residents. For example, the UNDP-GEF project in the Ukraine partners with the municipality of Rivne, which owns the local public lighting company that serves as the majority shareholder in a new energy service company. In the Czech Republic,

the UNDP-GEF project partnered with the municipality of Susice, which owned and developed public housing units as part of its activities.

However, it should be noted that working at the municipal level may also mean that projects are more vulnerable to financing barriers, especially lack of (or insufficient) capital and credit. Armenia and Georgia are two cases where these issues caused significant delays in UNDP-GEF project development. The problems were resolved by pairing the project with development banks (the German development bank, Kreditanstalt für Wiederaufbau, or KfW, and the IBRD, respectively). This pairing allowed the project to serve a national client, or an institution willing to and capable of providing a sovereign guarantee or other high-level agreement on work to be done under the project. In Rivne, where the energy service company has attracted a credit line but lacks sufficient capital for its pipeline of projects, the team will address the financing issue by opening a dialogue with multiple banks. [21]

**Partners outside of the energy sector:** More recent UNDP and UNDP-GEF projects have experienced success with ministries or agencies with 'social' portfolios rather than with traditional 'energy/environment' agencies. For example, in the UNDP-GEF Low-Energy Housing project in the Czech Republic, the Ministry for Regional Development, which is responsible for housing issues, provided critical support and co-financing that resulted in the replication of the project. In the UNDP-GEF Russia Energy Efficient Schools project, the Ministry of Education is using its funds to support energy efficiency measures through the project and to disseminate project training and results. And in a UNDP Thematic Trust Fund project for energy services for post-conflict returnees, the Area-based Development Programme - a post-conflict initiative administered by UNDP- provides funding for housing construction and retrofits.

Line ministries outside of energy and environment may be able to leverage relatively large amounts of money for heating-related investments. They also offer the advantage of an automatic network of facilities or sites for replication and uptake of best practice.

**Explicit activities to ensure sustainability:** Sustainability continues to be a key question for the heat sector portfolio. When UNDP-GEF projects create or enhance institutions, such as an energy service company or a revolving fund for investments in biomass energy, there is a clear measure of sustainability. Either the institutions continue to operate after the project, or they don't. Ongoing networking and training activities present a different challenge, because they are not provided with the equivalent of seed capital. UNDP-GEF heating projects have shown that beneficiaries are willing to pay for training on a fee-for-service basis. Unfortunately, fees that would also cover organizational overhead costs are too high for participants to afford. For example, Bulgarian municipalities have paid to send their employees to EcoEnergy trainings under the UNDP-GEF project there. However, these fees can only cover the expenses of the training workshops and are not sufficient to cover the network and the experts that maintain it. With a few notable exceptions, it is also difficult to identify sources of ongoing support for networks, in spite of the successes they have generated. In this situation, business planning training for project-related organizations, endowed funds for capacity development, and other possible means of improving sustainability should be considered to keep these valuable networks in place.

[21] UNDP. 'Climate Change Mitigation in Ukraine through Energy Efficiency in Municipal District Heating: Evaluation Stage I of Phase I (Final Report)', 2004, p. 6.

# Chapter 3

## FINANCING MECHANISMS

A major area of activity in UNDP-GEF heating sector projects in Europe and the CIS has been tackling financial barriers. The approaches used have taken the forms of *direct financing interventions*, including capitalization of funds or institutions for investment or project preparation, and indirect financing interventions, including feasibility studies, business plan development, legal/contract facilitation, training and various forms of brokerage. These approaches, and the UNDP-GEF projects in which they were used, is the subject of this chapter. An introduction on the nature and scale of financial barriers to be overcome, and the market-based barrier removal philosophy, is followed by an overview of the financing mechanisms used in UNDP-GEF projects. The chapter concludes with an overview of trends in financing for heating sector projects, and lessons learned from UNDP-GEF projects implemented in the region.

### BACKGROUND

Since the mid-1990s, GEF projects to mitigate climate change, while essentially grants to cover the global environmental benefits of energy efficiency or renewable energy, aim predominantly at market creation or market transformation through 'barrier removal' so that climate-friendly technology or techniques become the norm. Expanding or creating markets for energy saving or renewables is an effective policy pathway to reduce greenhouse gas emissions and improve local energy security. However, many promising technologies and techniques face cost barriers or other obstacles to commercial development. UNDP-GEF projects in the heating sector in Europe and the CIS aim to overcome these financial barriers as part of a more comprehensive barrier removal process, which often includes training, awareness-raising, and strengthening of institutional mechanisms.

As with nearly all energy-efficiency and renewable-energy policies worldwide, the policy goal of UNDP-GEF projects in Europe and the CIS has been to increase the share of energy efficiency and renewables in a sustainable way. UNDP-GEF projects have sought to create or transform markets, and 'unlock' commercial financing by 'levelling the playing field', improving profitability, and covering or reallocating various market/project-related risks to market players (or, exceptionally, government agencies), who are best able to manage the risks. The rationale for a market-based approach is that commercial financing means that scarce government resources have maximum impact (funding leverage), and that projects are efficiently planned and managed in terms of cost.

Major barriers to commercial financing of heat sector energy-efficiency or renewables projects worldwide include:

- First cost and related barriers: Because the external benefits of energy saving or renewable energy usually have no recognized monetary value, and the external costs of fossil fuels are not valorized, projects may be poor investments without policy support mechanisms.
- Weak end-user creditworthiness or limits of debt exposure of public sector entities such as municipalities.
- Shortage of investment capital as reflected in high interest rates.
- Lack of awareness and/or experience: the client – in many cases a municipality – may lack specialized knowledge and confidence in longer-term cost savings.
- Perception of high risk by banks due to:
  - Client's lack of specialist knowledge
  - Bank's inexperience in lending for efficiency or renewables
  - Perception of municipalities as a high risk in countries where governments may take unilateral action to cancel debt.

These barriers can be divided into two main groups:

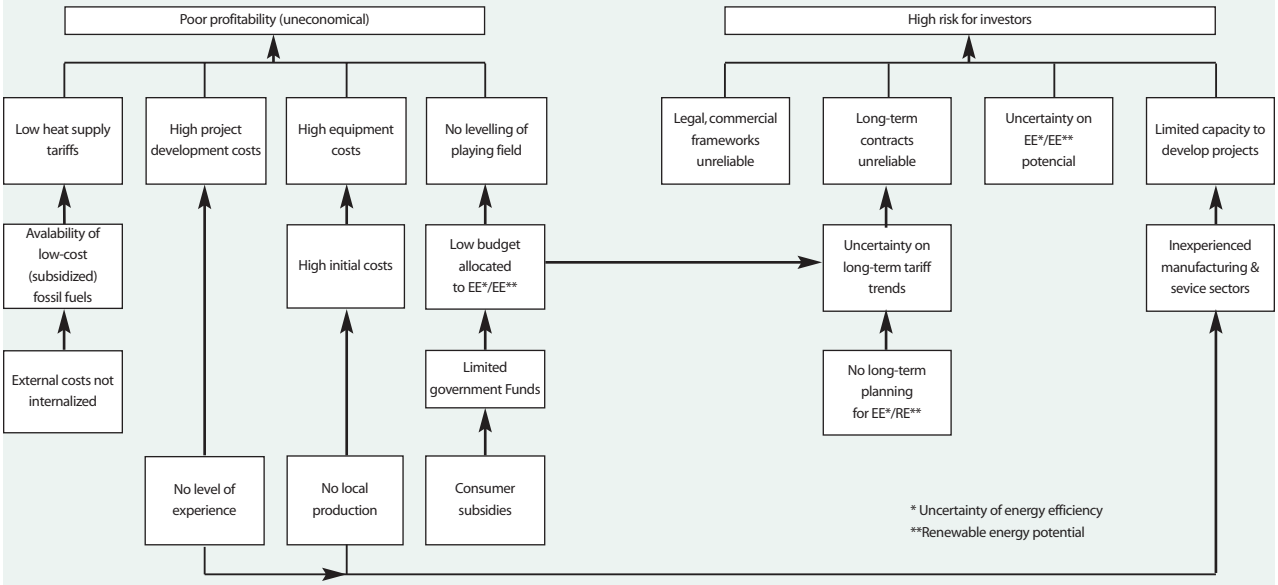
- Real and perceived risk; and
- Project profitability.

A simplified cause-effect diagram (a 'problem tree') for some of these factors is shown in Figure 2. The diagram highlights some of the complex, interrelated factors that are the root causes of financial barriers to energy efficiency and renewable energy investments in the heating sector.

In an ideal world where these market barriers do not exist, the financing of heating sector efficiency or renewable energy projects would be just like that of any other

FIGURE 2

The Root Causes of Financial Barriers to Energy Efficiency and Renewable Energy Investments in the Heating Sector




investment: Investors – be they government or the private sector – would finance projects through a combination of debt and equity, and repay commercial loans with cash generated through the successful operation of the project. However, heating sector investments for energy efficiency or renewable energy (in particular biomass energy) in the transition economies of Europe and the CIS are currently difficult to finance on a 100 percent commercial basis because of a number of more specific barriers.

- Competing (fossil) fuels/energy sources have received or are receiving visible or invisible subsidies (including, for example, infrastructures and economies of scale built up over decades of subsidized investments).
- In the case of biomass energy, competing fossil fuel suppliers have deep pockets and can thus provide excellent terms to municipalities and other investors, which are recuperated through their fuel supply contracts.
- Energy efficiency and renewable energy investments generally require relatively large up-front capital investments (they are highly capital-intensive with comparatively small running costs). This may require greater levels of debt and equity financing with correspondingly higher levels of risk.
- Energy saving and renewable energy in general, and biomass energy in particular, represent unknown risks for commercial investors who have little experience or knowledge of the technology and markets in question.
- Specifically in the case of biomass energy, the most common renewable energy for the heating sector, investments are typically too small to interest commercial project financing on a limited recourse basis, and too large for most small investors (such as municipalities) to be able to finance them 'on balance sheet'.

Due to these factors, financing heat sector energy saving in Europe and the CIS requires a combination of traditional commercial financing approaches and targeted policy measures to overcome barriers.

While many countries experience some or all of the 'generic' financing barriers described above, many of the specific financial barriers to energy efficiency that existed when UNDP-GEF began work in Europe and the CIS are still present. These include the following:

- A number of the countries in the region do not have market-based banking sectors.
- In countries without a 'hard currency' (for example, Uzbekistan), lending can be prohibitively difficult.
- In countries where perceived levels of political risk are high (as in Belarus and Turkmenistan), lenders and export credit agencies may be too risk-averse to become involved.
- In countries where inflation is relatively high, interest rates may be too high for potential borrowers, even when loan guarantees are available.
- In countries where fiscal decentralization has been slow to take root, cities lack the decision-making authority and/or confidence to allocate resources for efficiency projects.
- Currency exchange risk can cause difficulties for projects that are importing equipment. Such risk has developed when currencies were devalued (for example, in the Russian Federation in 1998) and now, when the dollar – the currency in which GEF grants are denominated – has depreciated significantly.
- Energy subsidies can keep the price of fuel (or competing fuels) low, which translates into very low returns on investments in energy efficiency.

## TYPES OF HEATING SECTOR FINANCING

In general, commercial heating sector project financing can be divided into three categories:[22]

- Commercial sources of finance (traditional finance);
- Performance contracting (financing through an energy service company);
- Emerging financing structures (public-private partnerships, carbon trading, etc.).

A significant number of heat sector projects in Europe and the CIS fall into the category of Official Development Assistance (ODA), in which non-commercial financing dominates. Most of the earlier GEF projects are a collage of non-commercial financing, either grants (from government, international financial institutions or other ODA) or soft loans (from governments and international financial institutions). In addition, nearly all countries in the region are spending money on heating upgrades, much of which is simply in the form of government grants.

While many of these ODA activities are not conducive to the creation of sustainable markets in the heating sector, these non-commercial financing mechanisms can potentially help make the case for more market-oriented policies in the heating sector. When supportive of the market, ODA measures are temporary and highly focused and address financing risks in some form or another. They also increase project profitability to make investments more attractive.

## COMMERCIAL SOURCES OF FINANCE

### Debt financing

Projects are traditionally financed using a combination of debt and equity,[23] with debt most commonly coming from a bank, and equity sourced from the investor(s). This relationship is shown in a very simplified form in Figure 3. Depending on a large number of factors (including the size of the developer/sponsor, impact of possible failure, and size of investment), projects either use bank loans secured against other parts of the developer's business or major assets (this is called 'on-balance-sheet finance'), or personal guarantees often linked to property owned by the developer. Another possibility is limited recourse project financing, whereby bank loans are secured largely against future cash flows rather than just physical assets, and involve a series of complex contractual arrangements.

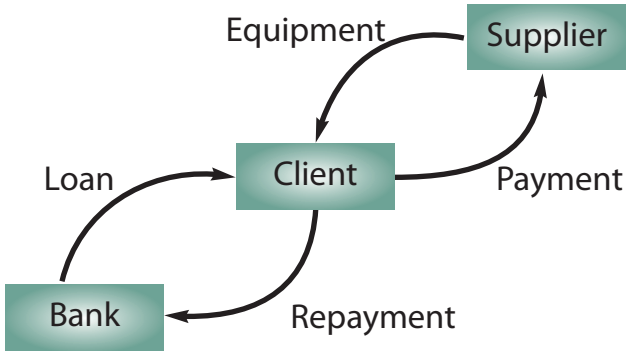
Debt financing traditionally comes from banks, although there are other sources of financing, including

[22] Other common financing approaches used in energy efficiency and renewable energy include (1) vendor finance programmes (a commercial finance technique that works best in mass market applications to finance sales of common equipment with large numbers of end-users. A vendor finance programme is a contractual relationship between an equipment marketer (vendor) and a financial services company to provide financing at the point of sale. The vendor is also the 'aggregator' of capital demand), (2) utility finance programmes (in which utilities implement renewable energy or demand-side management programmes). Neither of these approaches is common in the heating and hot water sector.

[23] Equity refers to ownership interest in the investment, usually comprising a cash or share contribution from the investor(s). Usually a minimum of between 20 percent and 30 percent equity in a project is required to obtain debt financing, depending on the company or customer's creditworthiness.

asset/income funds and bond markets. International sources of debt financing include lenders such as the International Finance Corporation (IFC) and the European Bank for Reconstruction and Development (EBRD), which generally aim to meet commercial standards for loans. They also include lenders such as the IBRD and the German development bank KfW, which are more flexible than the former group in requirements for risk assessment, grace periods and forgiveness.[24] The banking sector has evolved differently across the region, resulting in countries with a competitive, vigorous commercial banking sector to countries that may rely instead on development banks for the same types of investments.

FIGURE 3
Project Financing Structure




BOX 6

Using Equity, Debt and Soft Loans to Finance Biomass Heating

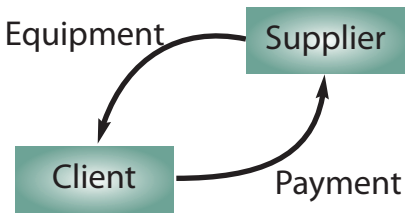
A UNDP-GEF project in Slovenia is promoting the increased use of biomass as an energy source by removing technical, institutional, informational and financial barriers. It is also reducing the implementation costs of biomass-based district heating projects in local communities and establishing long-term financing mechanisms to enable investments in biomass technology.

The project will complement government activities to promote the use of biomass by combining a technical assistance package that addresses barriers with a financial support scheme to leverage other sources of financing and to reduce the risk. It will also support the learning costs of the first demonstration projects. Selected biomass district heating projects are being supported using a project financing approach that consists of a GEF grant (25 percent), owner equity (25 percent), a grant from the Government of Slovenia (25 percent) and an Ecofund soft environmental loan (25 percent). In subsequent years, a revolving Biomass Energy Fund will be established to fully invest GEF equity funds of $2.5 million.

## Lease financing

In some heating sector projects, renewable energy equipment is leased for the supplier or a specialized leasing company (see Figure 4). Tax-oriented true leases and non-tax oriented finance leases are an excellent potential source of both on-balance-sheet and off-balance-sheet financing.[25] In a tax-oriented lease, the lessor claims and retains the tax benefits associated with equipment ownership and passes most of those tax benefits on to the lessee in the form of reduced rental payments. Since project companies do not typically generate sufficient earnings to cause income tax liability during their formative years, tax-oriented leasing offers the opportunity to indirectly obtain tax benefits associated with equipment ownership, which would not be available if the equipment were purchased.

FIGURE 4
Equipment Lease Structure




[24] Both IBRD and IFC are part of the World Bank group.
[25] Off-balance-sheet financing refers to joint ventures, operating leases, research and development (as described below) and other financing from sources other than debt or equity

BOX 7

### In Hungary, Homeowners Lease Energy efficiency Equipment

In the GEF project 'Hungary Energy Efficiency Co-Financing Programme', implemented by the IFC, transaction guarantees were provided for energy efficiency measures offered by local energy service and heat service companies on a lease-financing basis. Guarantees were for 50 percent, with lease terms ranging from 3 years to 7.5 years. A retail gas programme was also undertaken, with the commercial leasing firm Raifeissen providing lease financing in partnership with a local gas utility for individual homeowners to install new gas boilers and a range of building envelope improvements. A loss reserve was established to provide credit support for a portfolio of project leases. During the portfolio lifetime, many thousands of leases were given to homeowners for energy efficiency equipment.

BOX 8

### Targeting the End-user

Even a brief overview of the UNDP-GEF portfolio indicates that the model of an individual building resident that was anticipated when introducing apartment-level interventions, such as the installation of heat meters, has not developed as expected. In theory, end-use metering would seem to provide a strong incentive for savings. In addition, it may uncover overcharging in systems where district heating companies overestimate end-use and underestimate losses in transmission and distribution (for example, consumers save money not because they reduce the amount of heat used in the apartment, but because the meter determines that they received less heat than they were actually billed for). However, in practice, it may be most cost-effective to install building-level meters and forego the additional cost of reconstructing single-pipe systems and adding meters in every apartment.[26]

For example, although the UNDP-GEF project in Vladimir, Russian Federation offered the installation of free meters in pilot buildings (funded by the IBRD's Enterprise Housing Divestiture Project), the city was not able to afford the installation of apartment-level meters in most of its housing stock. Other data from the same country indicates that apartment-level metering might not be the most cost-effective option for municipalities (and might not be realistic for other municipalities). It should be noted, however, that it was not possible to explore the incentives generated by consumption-based building in the project in Vladimir because a variegated billing system was not introduced during the course of the project.

In countries where incomes are lower and non-payment rates are higher (for example, in Kazakhstan, Turkmenistan and Uzbekistan), problems surrounding the costs of controls and efficiency measures are magnified. In the case of the proposed UNDP-GEF project in Moldova, the project team found that even subsidized heat was not affordable for many consumers. Because of this finding, the project is unfortunately not moving forward in spite of the clear impact of energy saving on poverty.

Simply put, the provision of a certain standard of heat and hot water may not be something that can be financed in part or in whole by end-users on a fee-for-service basis in some of the countries in Europe and the CIS. As a result, the role of the end-user in the context of project design and activity should focus not on financing so much as on the creation of the right incentives (such as billing) and opportunities (such as controls) for this group.

[26] In at least one high-income OECD country, Denmark, building-level meters are seen as cost-effective and equitable from a social standpoint (since residents are not penalized for having a corner apartment). However, the economics of the various levels of metering vary depending on the relative costs of allocators and meters, which vary from project to project.

## NON-COMMERCIAL FINANCIAL SUPPORT FOR MARKETS

### Research, development and demonstration support

Direct support for research, development and demonstration is widely used to stimulate the development and market uptake of energy-saving technology and techniques, in particular those that are far from commercial exploitation. Research and development is generally supported through national short-, medium- and long-term research programmes. Research and development in the heating sector in Eastern Europe and the CIS currently focuses on issues such as:

- Socio-economic issues, policy support mechanisms and market mechanisms;
- Environmental and social issues – positive and negative impact;
- Energy planning, billing and value-chain creation;
- Demand assessment and prediction;
- Operation and maintenance;
- Optimum balances between district heating and building level systems.

Support for technology development can potentially lead to longer-term decreases in investment costs and system production and operation costs. Well-conducted demonstration programmes also have an impact on reducing overall project investment costs as well as reducing technology risks for investors. Moreover, the involvement of banks in demonstration projects can also serve to overcome many other financing risks. Demonstration projects are commonly enabled through financial support for investment combined with demands on monitoring and dissemination of results to market stakeholders.

### Investment support

Investment subsidies can help overcome the barrier of a high initial investment common for energy efficiency and renewable energy. In countries with developed market economies, subsidies are commonly used to stimulate the sales of less cost-effective technologies, thus aiming to bring competitiveness to existing distorted fossil-fuel dominated markets. Investment subsidies are usually 15-50 percent of eligible investment costs, and subsidy levels are set to reflect in some way the external benefits of the technology. Subsidies can improve the financial performance of projects, but, apart from that, have limited impact on the risk profile of an investment project.

Risk-guarantee funds and soft loans are a less direct way of providing subsidies. Assuming that risks are reduced as the market and technology develop, they are also a more cost-effective and market-oriented way of supporting investments. These approaches are fairly common for the stimulation of energy savings in the heating sector throughout the world, and particularly in donor-assisted projects. These approaches aim directly to reduce many of the real and perceived project risks – risk guarantee funds, in particular. In contrast, soft loans can improve project profitability.

Some countries support heating sector energy efficiency and renewables (biomass) by means of the fiscal system. These schemes may take different forms, ranging from rebates on general energy taxes, rebates from special emission taxes and lower value added tax (VAT) rates, to fiscally attractive depreciation schemes. These approaches are used in numerous European Union countries, such as the State Programme of Support of Energy Efficiency and Renewable Energy Sources Use in the Czech Republic. In most cases, these measures have clearly defined timescales and are commonly used in conjunction with other mechanisms.

Investment support has proved helpful early in the diffusion of a technology, when costs are still high; however, there are dangers to this mechanism. In some countries, such as the United States of America (California) in the 1980s, enormous tax breaks and a lack of technology standards encouraged fraud and the use of substandard equipment. This problem has also been seen in other countries where grants from donor-funded projects did not raise concern about maintenance and long-term performance due to a lack of standards (and potentially a lack of production-oriented incentives).

### Production tax credits

Production tax credits provide tax benefits against the amount of renewable energy produced and delivered to

consumers. They are designed to create competition between clean energy and conventional fossil fuel energy resources. Production tax credits increase the rate of return and reduce the payback period, while rewarding producers for actual generation of heat. As such, they are similar in nature to the production-based tariff system discussed below.

In general, production incentives appear preferable to investment incentives because they promote the generation of cleaner energy, thus encouraging installation at an optimal level for the society or community as a whole. These incentives also encourage the purchase of reliable systems, together with good maintenance, so as to maximize the proportion of clean and efficient energy as a percentage of overall energy produced. Production tax credits also seem to encourage a sustained industry, rather than rapid growth followed by decline once the investment subsidy is removed.

### Feed-in tariffs (pricing systems)

Production-based supply tariffs are also a form of support for renewable energy that is production oriented. The term 'feed-in tariff' is used both for a regulated, minimum guaranteed price per unit of produced energy to be paid to a producer, but also in some cases for a *premium* on market prices attracted by renewable energy. These mechanisms are sometimes referred to as 'pricing systems' as opposed to 'quota systems'. Regulatory measures are usually applied to impose an obligation on utilities or municipalities to pay the independent producer a certain price for generated heat (or electricity) as determined by the government or based on a various formulas. The tariff may be supplemented with subsidies to the producers from the state. But, in many cases, payment, and balance of payments, are the sole responsibility of the heat company, and thus the costs are passed on to the consumers, in some cases through a national fund pool to even out supply costs in areas with differing renewable energy potential. The level of the tariff is commonly set for a number of years (or following a clearly defined pattern) to give investors security of income for a substantial part of the project lifetime.

Supply tariffs are highly effective mechanisms to reduce off-take and sales risk, and improve a project's financial performance. The key characteristic is production-oriented support, which, in contrast to investment support, ensures strong incentives for efficient plant operation and maintenance.

### Bidding procedures

Bidding, or tendering, procedures can be used to select beneficiaries for investment support or production support (such as through supply tariffs). Potential investors or producers have to compete with each other through a bidding system. The criteria for judgement of the bids are set before each bidding round. Generally, proposals from potential developers are accepted starting with the lowest bid and working upwards, until the level of capacity or generation required is achieved.

The government decides on the desired level of supply by technology and/or fuel, their growth rate over time, and the level of long-term price security offered to suppliers. The bidding is accompanied by an obligation on the part of municipalities or utilities to purchase a certain amount of energy from given sources at a premium price (thus they are a form of quota system). In each bidding round, the most cost-effective offers will be selected to receive the subsidy. The mechanism therefore leads to the lowest cost options.

Bidding systems are relatively new (developed first in the second half of the 1990s) and have been used in Ireland and the United Kingdom (the Non Fossil-Fuel Obligation). The UK has now adopted a certificate-based renewable portfolio standard system. Ireland is also in the process of abandoning the bidding approach. The major criticisms of bidding systems are that they favour almost exclusively very large projects (which are generally not suitable – for a range of external factors – for heating projects), and that they produce a 'stop-and-go' (boom and bust) market.

### Renewable portfolio standards

An instrument that is commonly expected to gain momentum in the future is a quota system based on a

renewable portfolio standard. Under this mechanism, the government sets the framework within which the market has to produce, sell or distribute a certain amount of energy from renewable sources. The obligation is imposed on consumption or production. As with bidding systems, the government usually establishes 'technology bands' in order to protect technologies from strong competition by lower cost options. The quota system is coupled with a tradable green certificate, which is used to avoid market distortions.

The key difference between the bidding process and a portfolio standard approach is that for the former, each bidding round is a one-time competition for funds and contracts. In the latter, companies and projects must constantly compete in the marketplace, with existing and new projects, unless they have signed long-term contracts. This means that portfolio standards in most cases have a much lower impact on reducing off-take and sales risks than bidding systems (and even lower than production bonus systems).

Thirteen states in the US, covering 30 percent of the US electricity load, currently have mandated quotas through renewable portfolio standard laws. Quota systems are also in use in several other countries, including Australia, Italy, Japan and the United Kingdom, and they are being tested in China. Since these mechanisms have only been used since the late 1990s, less is known about the effectiveness and difficulties of renewable portfolio standards than for supply tariffs.

## FINANCING TRENDS IN UNDP-GEF PROJECTS

While there has been a shift from GEF-funded technical demonstrations to GEF-capitalized financial mechanisms, there are also some general trends in financing. A significant number of the projects have co-financed or financed demonstrations with the host government contribution coming directly from municipalities or from the national government through municipalities. In addition, a subset of projects using debt financing relies upon parallel financing from a development bank (most often the IBRD). Not surprisingly, UNDP has never been a source of large-scale investment funds or co-financing – this is simply outside of the agency's mandate.

When municipalities have funded projects, the type of funding has also evolved – even within individual projects. In the early years of its UNDP-GEF project, the City of Gabrovo, Bulgaria, used grants to carry out demonstration projects in a hospital. By 2003, the city was using its revenues to carry out an efficiency project in a municipal building. Other cities used training provided by the project to develop proposals for energy-saving projects that also used municipal equity, and – in the case of Varna, Bulgaria – municipal debt in the form of bonds issued by the city.

As donor financing has moved away from grants, the varieties of debt have expanded to reflect investment conditions and opportunities in the host country. For the UNDP-GEF project on biomass energy in the Slovak Republic, where there is some competition among commercial banks for municipal clients, municipalities joined together to apply for a commercial loan from a Slovak bank. In Slovenia, municipalities are taking loans from a designated line of credit for biomass projects created by the UNDP-GEF project within the Ecofund (a state environmental fund) for biomass. And in the biomass energy project in Belarus, facilities will take loans from the government (via a state bank), which still oversees most of the economy.

Options for equity investment have also expanded. For example, the UNDP-GEF project that established an energy service company in Rivne, Ukraine is more representative of current equity investments in the portfolio. The municipality will use local tax revenues to provide cash to a municipally owned company, which will in turn provide energy efficiency equipment and services.

Table 3 lists project-financing mechanisms from the UNDP-GEF portfolio in chronological order, grouped by years in which the respective project documents were signed. Both renewable energy and energy efficiency projects are included to give a broader sampling of the types of financing mechanisms that have been available.

## TABLE 3. PROJECT-BY-PROJECT SUMMARY OF FINANCING MECHANISMS

| Year | Project Short Title | Country | Types of Financing Mechanisms |
|---|---|---|---|
| 1998 | District Heating<br>(full project*) | Russian Federation | Grant for equipment<br>Municipal financing (equity)<br>IBRD parallel financing (debt/grant) |
| 1998 | Municipal Energy Efficiency<br>(full project) | Bulgaria | Grant for equipment<br>National Environmental Fund (debt)<br>Local and national government financing (equity)<br>Municipal bond (debt) |
| 1999 | Energy Efficiency Housing<br>(medium-sized project**) | Czech Republic | Municipal financing (equity)<br>Federal Housing Fund (grant)<br>Tenants repaid municipalities (debt) |
| 2001 | Municipal Energy Efficiency (full project) | Hungary | GEF-capitalized audit fund (partial grant)<br>IBRD parallel financing (guarantees) |
| 2001 | Biomass (medium-sized project) | Latvia | Grant from bilateral donor for equipment credit<br>National Environmental Fund (debt)<br>Municipal financing (equity) |
| 2001 | Biomass (full project) | Slovenia | GEF equity in Ecofund (equity)<br>Ecofund loans (debt)<br>Municipal financing (equity)<br>State grant for Ecofund projects |
| 2002 | District Heating<br>(full project) | Ukraine | Energy service company - to be created (equity)<br>Municipal financing (equity) |
| 2002 | Biomass (medium-sized project) | Poland | Municipal financing (in-kind equity)<br>National Environmental Fund (debt/equity) |
| 2002 | District Heating (medium-sized project) | Turkmenistan | Bilateral donor grant (confirm)<br>Municipal financing (equity)<br>Government financing (equity) |
| 2002 | Energy Efficiency in Schools (medium-sized project) | Russian Federation | Federal funds (grant)<br>GEF-capitalized loan funds (debt) |
| 2002 | Energy Efficiency Project Financing<br>(full project) | Romania | IBRD parallel financing (debt/grant)<br>Open to private investors (debt or equity) |
| 2003 | Biomass (medium-sized project) | Slovak Republic | Local commercial bank loan (debt)<br>Federal funds (grant) |
| 2003 | Biomass (full project) | Belarus | GEF-capitalized revolving loan fund (debt) |
| 2004 | District Heating<br>(full project) | Armenia | IBRD parallel financing (debt/grant)<br>Bilateral donor financing (grant) |
| 2004 | Renewable Energy: Geothermal/Hydropower (full project) | Georgia | KfW parallel financing (debt)<br>GEF-capitalized loan fund (debt) |
| 2004 | Barriers to Energy Efficiency (full project) | Croatia | IBRD co-capitalized loan guarantee<br>GEF contingent grant for audit<br>GEF co-capitalized loan guarantee<br>Other project financing (debt/equity) |
| _ | Residential Energy Efficiency (medium-sized project) | Moldova | GEF-capitalized audit fund (debt) |
| _ | District Heating<br>(full project) | Kazakhstan | Proposed energy service company - under discussion (equity)<br>GEF risk guarantee and technical assistance (grant)<br>District heating operator investment (equity)<br>Municipal investment (equity) |
| _ | District Heating (full project) | Uzbekistan | EBRD parallel financing (debt - proposed) |
| _ | Municipal Energy Efficiency (full project) | Belarus | Loan fund for municipalities capitalized by the national government |

* *Full projects receive GEF grants of more than $1 million.*

** *Medium-sized projects receive GEF grants of less than $1 million.*

BOX 9

## A Public-Private Partnership for Biomass Energy in Poland

The UNDP-GEF project, Integrated Approach to Wood Waste Combustion for Heat Production in Poland', seeks to foster the development of markets for wood waste-based (biomass) energy production as a renewable substitute for fossil fuels. The project focuses on the creation of public-private partnership in the municipalities of Jordanów and Bystra-Sidzina in southern Poland. It seeks to demonstrate how an integrated approach, combining fuel conversion with demand-side energy efficiency can be replicated on a wider scale in Poland.

**Challenges and Opportunities**

- Local authorities have the obligation to provide reliable public services at an affordable price and the challenge of investing in infrastructure with very limited resources. They are keen to create local jobs, but they must also meet environmental standards and energy-related targets. Local authorities typically do not have expertise in (biomass) energy, and staff members charged with taking on this integrated approach to heat energy supply and demand often have multiple responsibilities covering all infrastructure needs.
- Meanwhile, the Ministry of Environment is seeking the most cost-effective ways to meet renewable energy targets, and at the same time improve and protect local environments (such as dealing with).

The private sector aims to expand their business opportunities, reduce project risks related to fuel supply and heat demand, and access government and EU structural funds –possibly indirectly.

**Results**

- An inter-municipal public-private partnership called 'Biomasa BSK' was established in September 2003 between the cities of Jordanów and Bystra-Sidzina. Bio-Energia ESP (the private sector partner) has yet to join, pending final agreement on financing and of the supervisory body. Biomasa BSK plans to invest in a pellet mill, a new district heating network in the city, and four small boilers with mini-grids for the smaller villages. When implemented, biomass heating will cover 70 percent of the heat needs of the population. The private sector partner will provide a loan to Biomasa BSK, covering about 50 percent of the total needed investment. In return, it is the lead partner until the loan is repaid (approximately 5 years), at which time the lead partner will become the local authority.

**Lessons Learned**

- Public-private partnership can potentially provide a viable mechanism to meet multiple objectives since it is: financially viable (the private sector partner demanded a 10 percent return on investment; meets the needs of local communities for reliable, low-cost energy, improved 'waste' management and job creation; and meets the state government's national and global environmental needs.
- To come to agreement, it is important not to confuse the objectives of the various parties. In particular, the government must recognize that a private sector company exists to make a profit. This is desirable and a key element of a sustainable, efficient and growing market economy.
- Public-private partnerships are highly attractive to the private sector since they reduce risk of project failure due to supply and demand uncertainties. To get these benefits, the private sector is prepared to include project elements of interest to the local authority that are not directly profitable.
- It takes a long time to come to an agreement since partners need to learn to trust each other. This process cannot be rushed, and its importance cannot be underestimated. A non-governmental organization (NGO) was a key player in this trust-building process because it was impartial and did not stand to benefit financially from the partnership.
- The private sector partner in this project was instrumental in formulating a project that is financially viable – this means that in the medium- to long term, heat supply will not be a burden to local authorities.

- The local authorities need ongoing and impartial help from professional experts to negotiate effectively with the private sector. Without this, the partnership agreement reached could be a poor value for money from the local authorities' point of view, and will eventually self-destruct.
  If given the opportunity, NGOs are able to act as impartial brokers between local authorities and the private sector. Without NGO involvement, this public-private partnership would never have been established.

BOX 10

Helping Municipalities Work with Energy Businesses in Latvia[27]

Municipalities in Europe and the CIS have long dealt with centralized forms of government, and privatization and restructuring require new skills and approaches. Even when public institutions continue to be responsible for municipal services such as heating and power, energy supply, energy combustion and energy distribution increasingly involve a private company or companies. In a biomass project in Latvia, the lack of capacity at the local level in this area led to difficulties until special activities were added to an ongoing UNDP-GEF project. Modifying the project to include more training for local officials and the involvement of additional municipalities has taken the project from a rocky start to a situation where positive results are replicating quickly.

*The key lesson learned is that local capacity development activities should include the capacity of public officials to work with the private sector.* Modifications in the Latvia project have promoted improved awareness of the private sector's role in heat provision and strengthened ability to oversee public interest in municipal services.

**Objectives**

The Latvia biomass project was designed to remove barriers to the widespread use of wood waste for heat, hot water and electricity for local communities. The project sought to convert the city of Ludza to biomass energy using a boiler that was provided by a private company. The project also sought to promote policies that would encourage the use of biomass in other municipalities. The modifications to the project included interventions to raise the capacity of other municipalities to undertake similar projects. In addition, the modified project sought to identify financing for biomass energy in municipalities beyond Ludza.

**Results**

While the project is still under way, there are significant interim results. In the original pilot city of Ludza, a new biomass-fired boiler has replaced an old fuel-oil boiler system. In addition, eight other municipalities are installing biomass boilers with the help of a financial mechanism developed by the project: a financing package comprised of a government loan from the Latvian Environmental Investment Fund, a UNDP grant, and municipal co-financing. This mechanism allows for a lending volume that is higher than originally projected under the project. At the systemic level, the project has contributed to the National Strategy on the Promotion and Use of Biomass Energy. An action plan related to this strategy is currently under discussion. Global benefits include the reduction of more than 11,000 metric tons of $CO_2$ emissions each year in Ludza alone. Local benefits include cleaner air and less-expensive, locally produced energy, and increased access to financing.

**Challenges and Opportunities**

A significant challenge to the project appeared when the new boiler was installed in Ludza. The installation actually began before the UNDP-GEF project and its capacity support for the local government started, and was therefore conducted outside of the scope of the project. The original project involved a pre-selected investor that would install the boiler.

[27]The full title of the project LAT/00/G35/A/1G/99 is 'Economic and Cost-Effective Use of Wood Waste for Municipal Heating Systems in Latvia'

A change in local leadership resulted in a new mayor who was unhappy with the heat supply contract that had been negotiated. Payments to the investor decreased, public dissatisfaction increased, and mediation efforts with the private investor were complicated as the company's ownership changed during the course of the installation. While the apparent challenge to the project focused on a technical issue (boiler capacity), the root cause was related to administrative capacity – specifically, the city's ability to deal with the private investor and negotiate a workable partnership contract. Other areas of conflict included definitions and responsibility concerning the quality of water in the network, agreements on responsibility for the network, and the fact that heat wasn't getting through to a number of the buildings at the end of the network.
The project responded to this challenge in several ways. First, UNDP assumed the role of mediator between the Ludza city administration and the private investor. Second, the project was modified to include more pilot cities, which are receiving training in heat sector issues. Third, the project team developed a financing mechanism that allowed municipalities to finance biomass energy projects while maintaining control over the potential role of the private sector.

**Lessons Learned**

- Municipalities need training in order to become informed consumers, and the private sector needs training in order to become informed suppliers. Municipalities must deal with private companies in boiler conversion projects, and they need to understand technical and tendering issues—or know where to obtain impartial advice on these matters if there is no local capacity in these areas (often a problem with small municipalities).
- Capacity development activities with municipalities should also consider overarching policy questions, such as 'How will the private sector be involved in energy production and delivery in our city?' These questions are closely related to financing.
- Project developers must plan for the risks of delays in the project approval and implementation process. These timing issues are crucial when there is a partnership with a private entity or source of financing, because there are times when a private investor may have to proceed without the project for business reasons.
- Project developers need to consider the risks of involving a private investor, particularly when the investor is chosen prior to the project's start. An identification of potential liabilities or risks (such as the change in ownership in the Ludza investor) can help the project to respond quickly to problems if any appear and avoid the perception that the problems are related to 'the UNDP project'.
- Public perception of public-private partnerships and the perception of local decision makers are also critical to project success. Thanks to work with these stakeholders, the project team and the UNDP country office were able to make modifications in the project that improved its results. Project developers should understand that municipal officials might be wary of private investors for a variety of reasons.
- Project developers should plan for changes in local government during the execution of the project. The new administration will, in most cases, be suspicious of decisions of the previous administration. Therefore, additional capacity-building will be required.

*Source: UNDP Action-Reflection Note (2004).*

### Financing and market conditions

Miscellaneous factors in the business environment that affected projects included the following: delays in the decentralization of municipal financing, difficulties with extrabudgetary financing (for example, the elimination of 'ecofunds' in several countries), and currency fluctuation. However, projects with the existence of a 'consumer' (that is, someone willing and able to purchase the heat produced) and/or a network of consumers were able to forge ahead in spite of these difficulties.

### Financing and the policy environment

In countries where fuel and heating prices do not reflect full costs, or where certain subsidies or cross-subsidies are in place, it has been very difficult to proceed with investment in the sector. In short, these national policies directly or indirectly suppress returns on investments. These policies have generated significant delays for the proposed UNDP-GEF projects in Kazakhstan and Uzbekistan, which were originally proposed in the late 1990s. Likewise, in the UNDP-GEF projects in Armenia and Georgia, progress was stalled until significant soft

financing and/or grants were provided from the IBRD and KfW, respectively.

### Project benefits related to financing

Levels of replication vary substantially from project to project. One of the most promising trends has occurred in the UNDP-GEF project in Bulgaria, where more than 18 municipalities have funded the development and implementation of energy efficiency projects with their own resources and commercial loans, leveraging approximately $4 million in additional investment. In addition, 17 additional municipalities have launched energy efficiency programmes (2003 Project Implementation Review). The project has also leveraged EU money from the PHARE and SAVE II programmes for a regional energy concept, regulation equipment and support for municipal energy efficiency offices. Funding was also obtained from the US Agency for International Development (USAID) under its EcoLinks and Development Credit Authority programmes.

The evidence of this trend toward increased municipal financing for energy efficiency, spurred by the EcoEnergy network in Bulgaria, is described in a report on project implementation:

'These information dissemination efforts have catalyzed similar projects in other EcoEnergy municipalities:

- Stara Zagora, Varna and Gorna Oryahovitsa have implemented hospital retrofit projects.
- Rousse, Stara Zagora, Varna, Pernik, Kazanluk, and Pazardjik have implemented school building retrofit projects.
- Stara Zagora, Rousse, Sliven, Pazardjik, Pernik, Omurtag, Svishtov, and Blagoevgrad have implemented street lighting retrofit projects.
- A number of the above municipalities and other EcoEnergy members are developing additional projects in the hospital, education and street lighting sectors.
- In addition, three non-EcoEnergy members are using the information to develop similar projects'.[28]

In the UNDP-GEF project in the Czech Republic, the team has overseen contracts for not just one, but three multifamily apartment buildings. In addition, the architects trained under the project are incorporating the skills they acquired into their 'regular' commissions. For example, six row houses and a single-family home designed by a project-trained architect are already under way.

### Approaches in financing

The three most senior projects in the heat sector portfolio have had very different outcomes in terms of financing. While the UNDP-GEF project in Vladimir, Russian Federation used the originally proposed financing to deliver project outputs in a pilot municipality, the UNDP-GEF projects in the Czech Republic and Bulgaria used outreach and training activities to change the market for financing in the areas of efficient buildings and municipal efficiency projects, respectively.

Work on the business environment in the Vladimir, project, for example, included proposals to the heat company on tariffs and on agreements between municipal enterprises (the building owners) and the tenants. This work has led to a situation in Vladimir where the complex roles of the municipality, municipal enterprises, other enterprises and residents have been more clearly defined. The work has also allowed the project to determine the financial operating environment that can be expected in Vladimir. The link between such capacity-building interventions and the additional investment in the sector beyond the original project activities, however, is hard to establish.

The two other 'senior' projects in the portfolio focused instead on training in project preparation. In the case of the Bulgaria project, the training was provided to municipal employees for the preparation of energy efficiency projects for financing, including an overview of the types of financing available. The results are discussed in the following section, but one overall result was the training of municipalities to recognize internal sources of financing for efficiency improvements. Although not in the heating sector, one example of this outcome is that, prior to the project, Bulgarian municipalities had not pursued efficient lighting projects. As a result of project training (and by pointing to the demonstration project), municipalities were able to use their own funding for these projects.[29]

[28] 2003 Project Implementation Review for BUL/96/G31/1G: 'Energy Efficiency Strategy to Mitigate Greenhouse Gas Emissions. Energy Efficiency Demonstration Zone in the City of Gabrovo, Republic of Bulgaria'

While one municipality, Varna, used its training to issue municipal bonds for an efficiency project, this was not a market-level change, as few municipalities would be able to match its credit rating. However, the market for efficiency projects changed in that different municipalities were able to identify needs and finance projects to address them using what they had learned in training and through the examples of other actual municipal projects. In short, municipalities tapped into a heterogeneous market for financing energy efficiency projects where a market had barely existed, apart from a few bilateral grants and Bulgarian government grants.

The Czech project changed the market for financing in two ways. First, the team identified an area where funds were available for building construction – municipal multi-unit residential buildings – and 'harnessed' this capital for efficiency projects that reduced heat consumption. Technical training was offered to architects and civil engineers to allow them to provide a low-energy product to their clients (municipalities) at a competitive cost. The construction costs for apartment buildings in three Czech municipalities, for example, average 14,000-16,000 Ceska Korunas per square metre (approximately $520-$600 per square metre at May 2004 exchange rates). The reference cost for these buildings is approximately 15,000 Ceska Korunas per square metre, or $550 per square metre, while reducing operational costs by more than 40 percent compared to the average.

Second, the Czech team identified a further source of funding, albeit from government –the State Fund for Housing Construction, which provides subsidies to municipalities for these types of buildings. The team then worked with the fund in order to train its staff to recognize projects that were attractive from an energy and environmental standpoint. As a result, the State Fund has now decided to support at least one of the municipalities with a grant for construction costs.

## CONCLUSIONS AND LESSONS LEARNED

- While large-scale financing from development banks was often a prerequisite for large district heating projects (Armenia, Romania, the Russian Federation), the biomass projects in the portfolio found support from a variety of sources, including commercial banks, and drew support from bilateral donors, particularly from Scandinavia. Accession country targets for renewable energy use also provided the projects with strong support from their host governments.
- The trend towards fiscal decentralization throughout the region may actually strengthen municipalities as project 'clients'. The preliminary findings seem to indicate, however, that projects working directly with city administrations can spur investment in the heat sector even when fiscal decentralization does not occur at the rate assumed during project development, such as in the UNDP-GEF project in Bulgaria.
- While three UNDP-GEF heating projects developed in response to interest from the private sector, (in Georgia, Latvia and Poland), the relationships have been constrained by UNDP's niche and the very different expectations that public and private funders have for the same projects. In particular, the private sector has needed some guarantee that it would be rewarded financially for its work (often in the role of a sole partnership). However, it has not been possible for UNDP to direct the activities of the private investor.
- Training energy consultants on 'bankable' project identification and development is not enough; there is a need to combine training with assistance in creating a sustainable demand for their services. This is illustrated in the UNDP-GEF municipal energy efficiency project in Hungary, as well as the non-GEF 'Energy Efficiency Housing Pilot Project' in Lithuania, both of which provide some useful lessons. The projects created an additional demand for services by covering the costs of the audits implemented, thus reducing initial cost barriers and providing initial experience from project participants. However, a sustainable demand for energy consulting services cannot be maintained in the absence of attractive financial and institutional structures.
- Public-private partnerships require a supportive legal and regulatory framework. Laws regulating concessions are particularly important in reducing risk and attracting investment in countries where the commercial legal and regulatory framework may not be strong.

[29] It should be noted that public lighting projects are easier to self-finance than many heating sector investments because of the investment size.

# Chapter 4

## MANAGEMENT ISSUES

The following chapter addresses several key issues related to the management of the UNDP-GEF project portfolio – further 'mainstreaming' GEF projects in the heating sector into UNDP activities, project duration, monitoring and evaluation, co-financing and project performance, and internal networking. While some of the nomenclature may be specific to UNDP, the general issues addressed will be germane to any organization administering technical assistance projects in heating.

### AGENCY 'MAINSTREAMING'

Ideally, the heat project development process should be proactive: That is, UNDP and its country offices should decide in advance what kinds of projects would fit well with its work in-country and be ready to assess project proposals that it receives from various stakeholders. GEF project ideas and the portfolio should reflect the intersection of three sets: country office programming, country energy/environment issues, and GEF eligibility criteria.

However, UNDP internal funds do not seem to have been used in project implementation in any of the heat sector projects considered, even when country offices have stated these projects as a priority or supported related initiatives. In the one instance where a country office earmarked TRAC resources (that is, core UNDP funding), implementation problems and the accompanying delays resulted in the loss of that funding.

In addition, a review of the documentation indicated only two instances where country offices contributed to preparation: UNDP Belarus used internal Support for Policy and Programme Development (SPPD) funding to hire an employee from the UN Economic Commission for Europe to assist with project preparation; and the UNDP Liaison Unit used Project Preparation Fund (PPF) money to develop a project brief and project document for a proposal in Hungary that had not requested a grant for project preparation from the GEF (a PDF grant).

In spite of these findings, it would be misleading to assume that UNDP country offices are not involved or interested in the heating sector. At least two country offices – Kyrgyzstan and Uzbekistan – have co-financed feasibility studies for district heating projects. Two UNDP Thematic Trust Fund projects have focused on heating: biomass for heating and efficient construction in Bosnia and Herzegovina and efficient heating in Albania. And one of the UNDP Public-Private Partnerships for Urban Environment projects, located in the Russian Federation, also deals with heating issues.

In addition to activities that explicitly address heating issues, there are several agency initiatives that could partner with GEF activities in the heating sector. For example, Capacity 2015, which is designed to support networking and the exchange of ideas to promote sustainable development, is currently entering implementation following two-year national-level dialogues. While Capacity 2015 has not been explicitly connected to GEF project development, its interest in networks and partnerships and its prior experience with municipalities under Capacity 21, would seem to provide natural linkages.

Post-conflict programmes can also mainstream heating projects effectively because they are already spending relatively large amounts of money on housing construction and reconstruction. For example, the Area-Based Development project, which allows the most vulnerable population to return to their homes in Bosnia and Herzegovina, is serving as a key partner in the UNDP project entitled 'Energy Efficient Housing in Post-Crisis Communities'. The project, which is supported by UNDP Thematic Trust Fund efforts, is working to mainstream efficient construction and design principles into the Area-based Development Programme and includes a small pilot initiative to introduce biomass-fired boilers in rural areas.

Another key issue goes beyond mainstreaming heat sector issues in agency programming: it concerns mainstreaming heating sectors issues in the context of overall host country priorities. Country Cooperation Frameworks and Common Country Assessments can and should involve input from experts in energy and environment, as one or both of these fields are a high priority for nearly all countries in the Europe and CIS region.

UNDP also routinely contributes to the development of Poverty Reduction Strategy Papers, which are prepared by governments of many European and CIS countries in collaboration with the World Bank and International

Monetary Fund. These documents present a major opportunity to promote energy efficiency and related issues, such as utility restructuring, as a means to alleviating poverty. Poverty Reduction Strategy Papers also provide an overview of government strategy in the field of poverty alleviation that can be assessed for impact on fuel use and consequent local and global environmental impact.

## AGENCY CAPACITY AND SUPPORT

There appears to be a strong correlation between project success, the level of importance given to the project in the UNDP country office, and the capacity of country office focal points managing the projects. For example, countries where projects have moved relatively quickly have been notable for the support and involvement of the Resident Representative and the involvement of a focal point with a background in environment; the UNDP-GEF projects in the educational sector in the Russian Federation and in biomass energy in Belarus are two examples. In other countries, this type of capacity has allowed difficult projects to succeed, as is the case with the UNDP-GEF biomass project in Latvia. In cases where one or both of these elements is missing, even average projects can languish, and insufficient oversight can lead to problems that are difficult, time-consuming and expensive to fix.

The reasons for the influence of these two factors seem intuitive. The interdisciplinary nature of UNDP-GEF projects in the heating sector often makes it necessary to involve several different government agencies and NGOs in the plans of the project proponents and investors. Supportive and experienced country office staff can take on the labour-intensive work of consensus-building among these stakeholders that often requires multiple meetings and constant follow-up. In addition, capable country office staff can serve as mediators when difficulties in implementation arrive. In Latvia, for example, the UNDP office was able to work with the municipal administration of Ludza and a private investor to resolve their differences.

Strong country office staff can also play an important role in identifying promising areas for work. For example, the UNDP-GEF Small Grants Programme Coordinator in Poland noticed a biomass project in his portfolio that was successful, and resulting discussions led to the project that is now a UNDP-GEF medium-sized project, 'An Integrated Approach to Wood Waste Combustion for Heat Production'.

Furthermore, country office focal points should be able to identify linkages between UNDP-GEF heat sector initiatives and other ongoing national processes. In some cases, these national processes are sector specific, such as the development of national environmental action plans, climate change action plans, and national energy strategies. In other cases, the process involves mainstreaming heating issues into the more general national planning documents above, such as those involving Poverty Reduction Strategy Papers.

## EXECUTING ARRANGEMENTS

Heating projects in the portfolio rely on all of the traditional UNDP executing arrangements. The great majority of projects under implementation use national execution. One, the Romania Energy Efficiency Finance Project, is executed by the UN Office for Project Services (UNOPS). And two projects, in Bulgaria and in the Czech Republic, used NGO execution, as did two project development grants. Regional NGOs have also provided numerous experts who have served on contract during project development and implementation. It is worth noting that there are NGOs in the Europe and the CIS region working with heating issues that have a very high level of technical and administrative capacity.

## PROJECT DURATION

In nearly all cases, UNDP-GEF projects have not proceeded according to schedule either in the development or the implementation stage. In the preparation phase, including the time from GEF approval to project start, several projects have experienced delays of 3 to 5 years or more. In addition, all projects under implementation for more than 3 years have required an extension of at least 1 to 2 years. It should be noted that other similar portfolios, such as the energy efficiency portfolio at the World Bank-GEF unit, have also experienced delays (on the average of 1 year).[30] Delays in project development often resulted from a lack of co-financing, or from the lengthy amount of time necessary to confirm co-financing when it

is available. Other causes of delays included the seasonal nature of data collection (that is, baseline data from a complete heating season were often necessary, but could only be collected during a fall-spring cycle) and the need to collect additional data during the due diligence process conducted by other funders. Delays in implementation seemed to result largely from the fact that heat sector projects were more institutionally complex than originally anticipated. The complexity of preparing projects, the time required to identify and confirm co-financing, and the long-term nature of restructuring in the heating sector would all argue for longer project duration and more conservative estimates during the project development phase about the amount of time necessary to foster change and observe results.

## MONITORING AND EVALUATION

Monitoring and evaluation activities are usually listed in logical frameworks and project documents in three groups: developing and/or adapting a methodology for monitoring and evaluating the project outcomes (a project evaluation plan); developing and/or adapting a methodology for calculating energy savings related to the project (for efficiency projects); and developing and/or adapting a methodology for estimating direct and indirect mitigation of greenhouse gases. For example, only one project document in the portfolio – for the municipal energy service company in Rivne, Ukraine – mentioned methodology used by the Intergovernmental Panel on Climate Change when developing greenhouse gas estimates. In addition, only the municipal project in Bulgaria reported estimates of greenhouse gas mitigation in the 2003 portfolio-wide Project Implementation Reviews. In short, it has been difficult to extrapolate from existing project data and ratings as to whether 'successful' projects are having a significant impact on emissions.

Projects developed earlier in the portfolio often contained an equipment demonstration component. They therefore included direct reductions or offsets (from the installation of GEF-funded efficient or renewable equipment) and indirect reductions or offsets (from the project dissemination of the technologies due to the project). The UNDP-GEF project in Vladimir, Russian Federation, is an example of this type of summary. Later projects focusing on market transformation included estimates for indirect reductions or offsets (through projects completed due to a GEF-capitalized loan fund, for example).

However, it is difficult to compare estimates across projects for several reasons:

- Methodologies for initial estimates were not always included in the project document (often for reasons of space). Moreover, methodologies used by the Intergovernmental Panel on Climate Change for calculating emissions (and project-specific protocols) were mentioned explicitly only in the UNDP project document for the project in Rivne, Ukraine.
- With the exception of Bulgaria, estimated reductions were not listed in annual reviews of projects. It appears that the majority of the projects in the portfolio will conduct estimates at the end of the project lifetime (an approach that may have an impact on replication and dissemination strategies that has not been considered).
- Equipment lifetimes were not consistent across categories of technologies (this would be relatively easy to remedy, however).
- While at least one project, in Turkmenistan, proposed top-down monitoring, others looked at bottom-up techniques, such as the Russian Schools project and the project in Bulgaria.

Overall, there was a lack of consistency in the conception of what type of monitoring and evaluation would be necessary. Monitoring and evaluation practices, resources and budgets traditionally used for UNDP projects have not been sufficient to measure the outcomes of UNDP-GEF projects. Specialized measurements and calculations of savings, not to mention the development or adaptation of methodologies for measuring indirect greenhouse emission reductions, are far beyond the qualifications of the traditional local monitoring and evaluation officer. The UNDP-GEF project in Vladimir, Russian Federation, used a national expert on greenhouse gas inventories for their report on project impact, and this material could be informative for other similar projects. In general, the standard UNDP allocation for monitoring and evaluation would not seem to be adequate for the type of

[30] Source: World Bank GEF Energy Efficiency Portfolio Overview and Practitioners' Handbook. Thematic Discussion Paper. Washington, DC: World Bank, 2004.

work necessary under a UNDP-GEF project. Separate monitoring and evaluation activities are noted in some project documents, but not all.

The current development of a document supporting a standardized approach to greenhouse gas monitoring in projects by the GEF should address standardization concerns. However, adequate support for this work will have to be included in budgeting and personnel considerations. In addition, successful approaches and data should be shared across projects, even for projects outside of the heat sector.

## CO-FINANCING AND PROJECT PERFORMANCE

Co-financing is a requirement for UNDP-GEF heating projects. However, it is very difficult to draw conclusions about correlations between levels of co-financing and project replication or sustainability due to the very small number of completed projects in the portfolio. However, several rough trends seem to be apparent.

First, co-financing can be considered a proxy for the existence of a client and a market for heat services. Development agencies, commercial investors and governments are just some of the institutions that have provided financing in various UNDP-GEF projects. If none of these groups are interested, the issue at hand may not be market barriers, but lack of a market. Markets can emerge over time, and several UNDP-GEF projects developed in the late 1990s, for example, have simply waited until proper market conditions were present to obtain co-financing and continue. Projects lacking co-financing have simply not advanced from the development pipeline.

On a related note, the presence of co-financing for projects seems to be more important to successful project implementation than the actual ratio. The Bulgaria municipal energy efficiency project, which received the highest ratings in the portfolio, had a relatively modest level of co-financing. Finally, co-financing that would be defined by GEF criteria as 'co-funding' – funds contributed directly to the project budget – was present in only a small number of projects and in small amounts. Several projects with positive ratings relied almost completely on parallel financing. As more data become available from projects in the portfolio, it would be useful to examine in greater depth the relationship between the ratio and nature of co-financing and its effect on project performance.

## REGIONAL NETWORKING

The capacity development of project experts and project trainees has become an important phenomenon in the portfolio over time. While 'international' spillover of capacity is not currently captured in the evaluations, it has occurred in several projects. For example, experts from the Bulgarian project have conducted trainings in Moldova and Serbia and Montenegro, and Czech project experts have served as consultants on a new, similar UNDP project in Bosnia and Herzegovina.

This expertise has also spread beyond UNDP. Project design has seen some spillover: The Eco-Energy network created under the project in Bulgaria is being used as a model for the development of a renewable energy network for Southeastern Europe by the UN Economic Commission of Europe. Finally, more senior project teams have provided guidance to agencies implementing Project Development Facility grants through site visits and e-mail communications.

One explicit mechanism for this type of networking has been through targeted meetings of project managers and country office personnel for specific types of projects. For example, UNDP-GEF convened meetings for its biomass project portfolio in 2002 and 2004, and it organized a similar meeting for projects in the heat sector in 2004. These meetings allowed those involved with project management to discuss both technical and administrative issues, share experiences and best practices, and to gain a sense of how the portfolio functioned at a regional level. In addition, UNDP-GEF was able to provide the participants with access to international experts in a cost-effective way. That is, a single expert was able to meet with a number of country teams over a period of several days without having to travel to all participating countries. Participants were also able to network with one another and establish ongoing contact with their counterparts from other projects. While this type of networking has been both cost-effective and popular with projects, there is not currently a designated source of funding to provide these services at a regional level.

# Chapter 5

## CONCLUSIONS

*Because of the long lead-time and institutional changes that have been typical of heating projects, many lessons from the UNDP-GEF portfolio are emerging only now. In terms of project design, UNDP-GEF projects are consistent with the general pool of donor-financed technical assistance projects in terms of project activities. As an external study of the heat sector portfolio concluded, 'The analysis of the non-UNDP/GEF projects shows that there is a large correspondence with UNDP/GEF activities. There are no examples on barrier reducing activities from the non-UNDP projects, which in general do not appear among the UNDP projects, though of course the individual projects do not include all elements. Therefore, the lessons learned from the non UNDP/GEF projects confirm that the UNDP/GEF intervention strategy…is relevant'.*[31]

The pivotal role of heat in economic development, environmental quality and human security in the Europe and CIS region argues for a continued – possibly integrated and enhanced – role for heat sector projects at UNDP. There is also a strong role for heating projects to play in the future of the portfolio under new GEF strategic priorities, although they will not resemble traditional demonstration projects in struggling district heating systems.

What might future 'best practice' heating projects look like?

- They would be based on an underpinning of basic energy planning at the local, regional (in rural areas) or institutional level.
- They would be handled within UNDP as human security projects that can produce substantial benefits in the environment, economic development and governance, while improving standards of living.
- They would involve efficiency in supply and end-use (district heating, building efficiency) or efficiency combined with renewable energy (biomass).
- They would cooperate with 'aggregate' clients, which could include municipalities, social ministries and associations of individual end-users.
- They would probably not be limited to residential buildings or to district heating.
- They would undergo early screening to confirm that there is a client or clients for the project who have the ability and commitment to pay for heat.
- They would be likely to leverage financing from government line agencies outside of energy ministries, local banks (in-house or on-lending), or development banks targeting municipalities and other local stakeholders.
- They would include activities linked to other UNDP initiatives, such as rural development, Capacity 2015 and post-conflict programmes, thereby leveraging existing funding.
- They would focus on *building capacity to identify, prioritize and finance investments in heating*, rather than developing or promoting a specific financial mechanism. This would not preclude capacity-building projects that could complement a bilateral or multilateral donor financing facility.
- They would most likely last longer (at least 4 years).
- They would focus on early and continuous networking at the local level for the purpose of training, outreach, replication and advocacy.
- Their policy and outreach components would reflect guidance from UNDP-GEF on effective policy activities and outreach to policy makers and the public.
- They would include enhanced monitoring and evaluation efforts that would be comparable across the portfolio to capture environmental and other benefits.
- They would include continued networking across projects in the portfolio to spread successful mechanisms and share insights from experience.

The many reforms that the region has witnessed over the past 15 years have not reduced the need for an affordable and reliable supply of heat. However, they have increased the opportunity to address the issues related to heating projects in new and creative ways and to share these approaches openly across the diverse countries of Europe and the CIS.

[31] Source: Hansen, Elsebeth et al. Lessons learned from heating sector projects in countries with economies in transition. Unpublished study for UNDP conducted by Ramboll. Section 5.1, p. 30.

# Annex 1:

## REFERENCES


*Note:* A complete list of ongoing projects in the region is available through the UNDP-GEF website (www.undp.org/gef). Copies of project briefs, project documents and Project Implementation Reviews for specific projects in the region can be requested by contacting the regional UNDP-GEF team in Bratislava.

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*Other sources:* Project documents for all projects mentioned in this report and Project Implementation Reviews for all projects required to provide them were referenced as primary sources for this publication.

# Annex 2:

## UNDP-GEF PROJECTS REVIEWED FOR THIS REPORT

| Country | Project Title |
|---|---|
| Armenia | Improving the Energy Efficiency of the Urban Heating and Hot Water Supply in Armenia |
| Bulgaria | Energy Efficiency Strategy to Mitigate Greenhouse Gas Emissions: Energy Efficiency Demonstration Zone in the City of Gabrovo, Republic of Bulgaria |
| Belarus | Biomass Energy for Heating and Hot Water Supply in Belarus<br>Removal of Barriers to Improvements in Energy Efficiency in the State Sector in Belarus |
| Croatia | Croatia - Removing Barriers to Improving Energy Efficiency of the Residential and Service Sectors |
| Czech Republic | Low Cost, Low Energy Buildings in the Czech Republic |
| Georgia | Promoting the Use of Renewable Energy Resources for Local Energy Supply |
| Hungary | Hungary: Public Sector Energy Efficiency Programme |
| Kazakhstan | Removing Barriers to Energy Efficiency in Municipal Heat and Hot Water Supply |
| Latvia | Economic and Cost-effective Use of Wood Waste for Municipal Heating System in Latvia |
| Moldova | Improving Heating in the Residential Sector |
| Poland | An Integrated Approach to Wood Waste Combustion for Heat Production |
| Romania | Capacity Building for Greenhouse Gas Emission Reduction through Energy Efficiency Improvement in Romania |
| Russian Federation | Capacity Building to Reduce Key Barriers to Energy Efficiency in Russian Residential Buildings and Heat Supply<br>Low Cost Energy Efficiency Measures in the Russian Educational Sector |
| Slovenia | Slovenia: Removing Barriers to the Increased Use of Biomass as an Energy Source |
| Slovak Republic | Removal of Barriers to Creation of a Market for Biomass Energy in Slovakia |
| Turkmenistan | Turkmenistan - Improving the Energy Efficiency of the Heat and Hot Water Supply |
| Ukraine | Overcoming Market Barriers to the Implementation of Energy Efficiency Improvements and Renewable Energy Technologies in Ukraine, Phase I |
| Uzbekistan | Removing Barriers to Energy Efficiency in Municipal Heat and Hot Water Supply |

# Annex 3:

## SUMMARY OF ONGOING, NEW AND PLANNED PROJECTS

### BIOMASS ENERGY FOR HEATING AND HOT WATER SUPPLY IN BELARUS

Country: Belarus
Stage: Full project
Timeline: 2003-2007
Executing Agency: State Committee on Energy Efficiency and Control
Implementing Agency: UNDP/GEF

**Project Summary**
The project addresses the reduction of greenhouse gas emissions in Belarus by increasing the capacity of the government to support biomass energy projects and the capacity of customers to finance and implement them. The project has the following objectives: (1) strengthening institutional capacity to support biomass energy projects; (2) establishing a track record for investments in sustainable biomass energy projects, including both fuel supply and demand; (3) developing a straightforward financial 'starter' mechanism in a challenging investment climate that will allow continued financing of biomass energy and provide public and private investors continued financing of biomass energy projects; (4) overcoming negative perception of biomass energy and provide public and private investors with much needed market information.

INDICATORS MATRIX

| Objective | Indicator |
|---|---|
| Strengthen institutional capacity to support biomass energy projects | By the end of month 6, a twinning arrangement was established. |
| | By the end of year 3, study tours and exchange visits were conducted. |
| | By the end of year 3, on-the-job training took place in biomass resource planning within the information and awareness component. |
| | By the end of year 3, a Geographic Information System with relevant biomass planning data was functional. |
| | During the project lifetime, a 'best practice' guidebook is published. |
| | By the end of the project, a concrete and realistic plan for scaling up results was developed and disseminated, and next steps identified. |
| | Positive feedback from the Council of Ministers was received on policy recommendations. |
| | Funding for the conversion of biomass fuel grows after the completion of the project. |
| Establish a track record for investments in sustainable biomass energy projects, including both fuel supply and demand | By the end of year 3, the investment projects are operating as designed. |
| | Fuel savings, from all five projects total approximately 35,000 metric tons coal equivalent per year and emissions reductions of 72,000 metric tons per year have been achieved. |
| | By the end of year 3, the 'biomass fuel supply' project is operating efficiently and cost-effectively. |
| Develop a straightforward financial 'starter' mechanisms in a challenging investment climate that will allow continued financing for biomass energy projects | Investment briefs on 5 to 10 replication projects are available in the second half of year 3. |
| | Funding sources for the replication projects are identified and expressions of interest received. |
| | By the end of year 3, the revolving fund will be established using the appropriate charter documents. |
| | The government will leverage a certain percentage of its current funding for energy projects through the fund's mechanism. |

| | |
|---|---|
| Overcome negative perceptions of biomass energy and provide public and private investors with much-needed market information | Information leaflets, brochures and videos are published and distributed to target audiences each year. |
| | The project is mentioned at the council of ministers at least three times a year, and regularly in the press. |
| | By the end of the project, demand for biomass boiler installations has increased. |

| **Financial Data:** | |
|---|---|
| Cost of full project | $8.7 million |
| Co-financing | $2.2 million (Committee on Energy Efficiency)<br>$3.4 million (private sector) |

# ENERGY EFFICIENCY STRATEGY TO MITIGATE GREENHOUSE GAS EMISSIONS. ENERGY EFFICIENCY DEMONSTRATION ZONE IN THE CITY OF GABROVO, REPUBLIC OF BULGARIA

Country: Bulgaria
Stage: Full project (project completed)
Timeline: 1998-2004
Executing Agency: Centre for Energy Efficiency, Energy Efficiency, EnEffect
Implementing Agency: UNDP-GEF

**Project Summary**

The project's objective was to introduce and develop practices at the municipal level targeted at overcoming barriers to improved energy efficiency and reduced emissions of greenhouse gases and other environmental pollutants. The project had two components: (1) capacity-building and (2) supporting demonstrations. Capacity-building activities were the heart of the project. All other activities were designed to enhance them. These activities focused on municipalities and included municipal energy efficiency management, training and financing. Demonstrations at the municipal level in street lighting, district heating and building retrofit translated capacity-building efforts into real life. EnEffect, the project management team, supported these efforts and their rapid diffusion to other municipalities through the Municipal Energy Efficiency Network. The project has had on impact on over two thirds of all Bulgarian municipalities, which is a critical mass for ensuring that the reforms in the area of sustainable management of natural resources are well accepted throughout the country.

INDICATORS MATRIX

| Climate change performance indicator | Impact sheet metric |
|---|---|
| Improvements in energy production, savings or installed capacities | 9.5 million megawatt hours of energy per year saved<br>15,720 metric tons of $CO_2$ emissions avoided per year |
| Increase of financing availability and mechanisms | The project catalyzed $4.7 million in municipal energy efficiency projects, including $2.7 million in loan funding.<br>Mechanisms:<br>o Without affecting project objectives originally envisaged, grant co-financing was acquired through soft-loans.<br>o In Varna, for the first time in Bulgaria, municipal bonds were issued to finance a street lighting retrofit project.<br>o The municipality of Rousse signed the first energy service company contract.<br>o Mixed financing for an energy efficiency project (public funds plus a leasing agreement) was applied in the municipality of Dobrich. |
| Development of sectoral policies, laws and regulations that support project goals | The impact of the Energy Efficiency Act (2004) was national. The act envisages setting up of a National Energy Efficiency Fund and obligates municipalities to produce energy efficiency programmes.<br>By 2004, 37 municipalities had prepared municipal energy plans; 18 are under implementation. |
| Raised awareness and understanding of technologies among | Type of instrument: Capacity-building/demonstration<br>Number of people reached through the instrument: |

| | |
|---|---|
| producers and users | • 124 municipal officers trained in energy efficiency management and planning, development of municipal energy efficiency programmes, energy audits, preparation of business plans for energy efficiency projects, financial mechanisms.<br>• 54 municipal officers have been trained to use and maintain the energy consumption information and monitoring system.<br>• 1,050 people have participated in conferences, working groups and seminars on energy efficiency.<br>• At the household level, the activities of the EcoEnergy cover 159 municipalities (out of the total of 264), representing 69 percent of the country's population.<br>• Projects for energy efficiency retrofitting of school buildings have been developed for municipalities of Kazanlak, Karlovo, Bourgas, Omurtag, Yambol, Pazardjik, Razlog, Slivnitsa, Stara Zagora, Vidin, Belogradchik, Lovech, Aytos and Veliko Tirnovo. The total planned investment in these projects amounts to $490,000, the estimated savings are $166,000, with an average payback period of 3 years (1 US$ = 1.54 Bulgarian lev). |
| Replication effects triggered by the instrument | • Projects for energy efficiency of street lighting systems were initiated in the cities of Dobrich Kardjali, Pernik, Pazardjik, Varna, with payback periods of between 1.4 and 2.9 years.<br>• The Municipality of Pernik completed a project with an investment volume of $585,000 (including $194,000 in loan capital) and achieved savings of $237,000 for the following sites: reconstruction of the entire street lighting system of the city of Pernik, retrofitting of four schools, and three child- care centres and nurseries.<br>• The Municipality of Targovishte implemented a project with a total investment value of $509,000 (including $354,000 in loan capital) and achieved savings totalling $152,000 for the following sites: two administrative buildings, five schools, eight kindergartens and four nurseries.<br>• In the Municipality of Sevlievo, a project for energy efficiency improvement and regulation of energy consumption was implemented. The total investment was $469,000, including $205,000 for retrofitting two schools, two kindergartens and a local administrative building. The average savings achieved were in the range of $62,000, with a payback period of about 3 years. These projects were implemented by means of bank loans under the Development Credit Authority (a credit guarantee mechanism of the US Government). |

**Lessons Learned**

- *It is possible to obtain a substantial energy resource through energy efficiency at a very attractive cost, which would provide for improvements in the social sphere and reduction of subsidies through the reallocation of budgets.* The annual energy savings achieved through the retrofitting of the school building and the street lighting projects amount to 596 megawatt hours per year and 5,127 megawatt hours per year, respectively, providing for a corresponding cost savings of $22,260/year and $488,500/year, with simple paybacks of 2.5 and 1.6 years, respectively.

- *Systematic capacity-building activities and networking influence the establishment of a favourable environment for local level energy efficiency investment.*

Municipalities still face financial and investment constraints due to the Currency Board Arrangement, the existing regulatory framework and the overall economic situation in the country. The heightened awareness at the local level about the benefits from implementation of energy efficiency measures has had a significant impact on decision makers and as a result on energy efficiency policy. Self-sustainable mechanisms for project development have been tested and are under replication as a result of the powerful 'kick-off' effect that the UNDP-GEF project has had.

- *Increased stakeholder representation in project activities would provide operational flexibility and help avoid discontinuities in municipal management due to elections or other reassignments.* This lesson was learnt

from the Gabrovo demonstration and carried over to the EcoEnergy members, as well as to other stakeholders, such as the District Heating Company, the Electricity Distribution Company, and relevant ministries, whose management changed at least once during the project implementation period.

- *Close coordination among all partners, starting with project preparation, is a mandatory factor for success.* This is especially important for energy efficiency projects that rely on parallel financing or in-kind contributions to ensure timely implementation and quality results.

- *The demonstration projects were essential to identify and develop solutions to a number of generic technical and managerial issues.* Lessons in the technical sphere included the need to develop a specific baseline, conduct audits, systematically collect data on energy consumption and related parameters, involve and train operation and maintenance staff. Non-technical lessons dealt with procurement of equipment and services, and management of the installation process. Both positive and negative lessons have been documented as inputs to case studies to exchange experience.

| **Financial Data:** | |
|---|---|
| Cost of full project | $6.9 million |
| Co-financing | $2.6 million (Committee onEnergy Efficiency)<br>$1.8 million (bilateral donors) |

## LOW COST/LOW ENERGY BUILDINGS IN THE CZECH REPUBLIC

Country: Czech Republic
Stage: Medium-sized project (project completed)
Timeline: 1999-2004
Executing Agency: Charles University Energy Center, Government of Czech Republic
Implementing Agency: UNDP-GEF

**Project Summary**

The project is creating local capacity and state-of-the-art expertise in developing, designing and constructing low-cost, low-energy multi-unit apartment buildings. The buildings developed under the projects have investment costs comparable with (that is, not higher than) standard newly constructed buildings. At the same time, however, they consume significantly less energy (with savings of 30 percent or more). The project includes the following key activities: collection of up-to-date international experience; dissemination of this expertise among professional groups; the creation of concrete, hands-on experience with low-cost low-energy building development at the local level; construction of low-energy buildings in partnership with a local investor who covers full investment costs; dissemination of the experience among other stakeholders and investors; the development of new standards for low-cost, low-energy buildings; and strengthened capacity in developing and financing further low-cost, low-energy construction.

INDICATORS MATRIX

| Climate change performance indicator | Impact sheet metric |
|---|---|
| Raised awareness and understanding of technologies among producers and users | Number of people reached through publication, seminars, media slots:<br>• 77 professionals were involved in the design and construction of low-cost, low-energy buildings.<br>• 500 professionals and 250 students received education on low-cost, low-energy housing construction techniques.<br>• 20 international experts with expertise in low-cost, low- energy housing design and construction were introduced to Czech national experts |
| Change in consumption, fuel-use patterns and impact on end-users | Number of people with improved income as a result of project intervention:<br>• 70 tenants reduced their household fuel consumption for heating by 38 percent |

**Lessons Learned**

- Critical for the successful design of the low-cost, low-energy building are the professional capabilities of the project leader and project members. Working teams should be open to new approaches and new methods, but also have the capability to review and discuss rough drafts and first ideas with professionals of different background (such as early stages of communication between architects and technology/civil engineers).

- A well-developed design of a low-cost, low-energy building can address only a small fraction of a target audience. For wider dissemination, 'hands-on' experience in construction of a low-cost, low-energy building is critical.

- When selecting towns as potential investors, it is necessary to seek strategic partners capable of identifying themselves with the project's mission and leading ideas and actual designs to the implementation phase.

- The concept/design of low-cost, low-energy building is not based on specific high technologies (or technical equipment). The key for success typically lies in the combination of a good, energy-efficient architectural conception with optimized envelope structures and excellent building environmental facilities.

- To be successful, a project design team must have good communication skills in addition to professional skills.

- Good practice: Public hearings, public workshops as well as sufficient credit and copyrights for the authors of low-cost, low-energy buildings may help to overcome a potential barrier - the professional rivalry among individual architects, designers and other professionals.

| **Financial Data** | |
|---|---|
| Cost of full project | $2.2 million |
| Co-financing | $1.1 million (other)<br>$0.7 million (private sector) |

## PUBLIC SECTOR ENERGY EFFICIENCY PROGRAMME

Country: Hungary
Stage: Full project
Timeline: 2001-2005
Executing Agency: Ministry of Economic Affairs, Government of Hungary
Implementing Agency: UNDP-GEF

**Project Summary**

The project's objective is to improve the energy efficiency of its public sector, thus reducing the emissions of greenhouse gases, mainly carbon dioxide. The project seeks to remove the barriers for a sustained market of energy efficiency services and promote the implementation of energy efficiency projects in municipalities, hospitals and other public institutions. It is estimated that the project will directly help generate 45-75 projects, which will result in mitigating carbon emissions. It is estimated that conditions to implement the 2.5 million metric tons of carbon medium-term reductions potential in the public sector will be created with additional local and global benefits.

INDICATORS MATRIX

| Climate change performance indicator | Impact sheet metric |
|---|---|
| Improvements in energy production, saving or installed capacityNote: energy production issues are not covered by the UNDP-GEF project | Technologies applied in energy-saving projects:<br>• space heating upgrade<br>• hot water supply upgrade<br>• door-window upgrade<br>• additional external thermal insulation<br>• district heating upgrade (supply) demand side<br>• indoor lighting upgrade<br>• other technologies |
| Expansion of business and supporting services for renewable energy and energy efficiency | • Number of energy service companies cooperating with UNDP: 3<br>• Number of energy advisory undertakings: approximately 40 (universities, NGOs, companies and other professional associations dealing with energy efficiency)<br>• Number of regional energy advisory centres involved in UNDP programme: 13 |
| Increase of financing mechanisms and availability | Financing alternatives:<br>• third-party financing (energy service companies)<br>• state grant/support through national and European Union programmes targeting energy efficiency improvement<br>• preferential loan<br>• commercial credit<br>• project financing<br><br>Banks and banking institutions as partners to be considered for the above-mentioned financing modalities:<br>• OTP Bank Rt.<br>• International Finance Corporation<br>• Raiffeisen Bank Rt.<br>• Erste Bank Rt. |

| | |
|---|---|
| | • Magyar Fejlesztési Bank Rt<br>• CIB Bank Rt. |
| Development of sector policies, laws and regulations that support project goals | • An inventory of EU monitoring and evaluation approaches was developed and a mechanism put in place to monitor all funding systems operated through the Energy Centre.<br>• A methodology for monitoring and evaluating national/regional/local energy efficiency programmes in Hungary is under development.<br>• Improved coordination of energy efficiency policies: a comprehensive analysis is in preparation on the impact of and interrelationship between national energy efficiency programmes and the objectives defined by Hungary's energy policy. |
| Raised awareness and understanding of technologies among energy users | • Training courses for municipality energy managers, energy users and decision makers drew 542 participants.<br>• Development of energy audit standard system: A guide to audit has been developed and a guide to feasibility studies is in progress.<br>• Certification and training programmes were conducted for energy auditors.<br>• Participation in 11 energy-related events:<br>The UNDP-GEF project team regularly participated in energy efficiency conferences and related exhibitions and other events, disseminated information material and gave presentations. |
| Change in consumption fuel use patterns and impact on end-users | • Number of municipal institutions affected: 138<br>• Energy costs reduction at municipal institution level: $52,875/annually (1 US$ = 210 Hungarian forint) |

**Lessons Learned**

- The revision of funding support initiated in 2003 brought more than 100 applications, representing around 400-500 audit reports. Indicators (savings potential, expected CO2 reductions) have been developed in order to select projects with a higher implementation potential.
- In 2004, the incentives to realize the project were increased by enlarging the role of and investment. An important issue is overcoming barriers between audits and investment by offering information on funding opportunities for 40 projects.
- The project has strong connections with other energy efficiency programmes managed by Energy Centre (National Energy Saving Programme, Energy Efficiency Programme and KIOP.) The synergy among the different programmes and projects is expected to contribute to the sustainability of the project.

| **Financial Data** | |
|---|---|
| Cost of full project | $16.7 million - $20.6 million |
| Co-financing | $3.1 million (government)<br>$9 million - $13 million (private sector) |

## ECONOMIC AND COST-EFFECTIVE USE OF WOOD WASTE FOR MUNICIPAL HEATING SYSTEMS IN LATVIA

Country: Latvia
Stage: Medium-sized project
Timeline: 2001-2004
Executing Agency: State Projects Agency, Government of Latvia
Implementing Agency: UNDP-GEF

**Project Summary**
This project is designed to remove barriers to the widespread use of wood waste for heat and hot water delivery at municipal levels in Latvia. Its aim is to co-invest in four to six biomass-based municipal heating systems and to lay the foundation for future investments in other municipalities. The proposed project corresponds to all elements included in Latvian energy policy and is expected to assist the Government of Latvia with meeting its goal of achieving an 8 percent reduction in greenhouse gas emissions from 1990 levels by the year 2010.

INDICATORS MATRIX

| Climate change performance indicator | Impact sheet metric |
|---|---|
| Improvements in energy production, savings or installed capacities | New boiler house constructed; reconstruction of eight boilers in municipalities supported |
| | A 7-megawatt woodchip boiler installed in Ludza, eight boilers up to 1 megawatt will be installed during 2004 |
| | A 40-megawatt capacity was replaced by a 15-megawatt capacity unit in Ludza; total capacity replaced in eight smaller boilers will be estimated at a later date |
| | In total (nine municipalities), 14,200 metric tons of CO2 avoided per year |
| Reduction of technology cost trajectories | Cost of energy in eight smaller municipalities: average total price for final consumers $45/kilowatt hour |
| | Cost of equipment $977.26 /kilowatt |
| Expansion of business and supporting services for renewable energy and energy efficiency | Ludza Energy Department was created and later transformed into a company, indirect support to renewable energy sector provided, national strategy to support and promote use of biomass developed |
| Increase of financing availability and mechanisms | New municipality project financing scheme created in cooperation with Latvian Environmental Investment Fund, involving a government loan, UNDP grant and municipality co-financing |
| | Newly accessible lending volume for applications targeted by projects: $1.1 million over initial budget |
| Development of sectoral policies, laws and regulations that support project goals | National strategy to support and promote the use of biomass developed; action plan under discussion |
| | Scope of influence: national and local municipalities<br>Expected removal of barriers for additional installation of on-grid renewable energy generation capacity was triggered by policy changes. |
| Raise awareness and understanding of technologies among | Training seminars, public awareness-raising campaign, information exchange organized. Project support personnel for hands-on training and targeted capacity development in municipalities provided. |

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| producers and users | Public awareness-raising campaign covering at least 13 municipalities will be organized in second half of 2004. Four training seminars will be organized for municipal technical and administrative personnel (about 70-90 people); informational support to municipal administration and technical personnel in 13 municipalities. |
| | Replication effect: Initial project strategy assumed replication in four to six municipalities. Currently project has 13 partner municipalities. |
| Change in consumption, fuel-use patterns and impact on end-users | Number of people/households affected by improvements: In Ludza municipality, 5,000 people receive heating services from a new boiler house; in other 13 municipalities, approximately 100,000 inhabitants in total will benefit from improved heating services; awareness-raising campaign will have an additional impact on general public.<br>In general, efficiency of old boilers versus new boilers is 20-30 percent versus 60 percent, respectively. |
| | Project is affecting at least nine schools directly as well as a large number of other administrative institutions connected to the grid. |

**Lessons Learned**

- More attention should be paid to capacity constraints and their effect on project results.
- It is difficult to isolate project activities from political influences and manipulations. Good practice: Use of Memorandums of Understanding, regular meetings with counterparts, clear and concise messages on project possibilities. To improve the situation with Ludza municipality, a two-step approach was used: (1) convincing the municipality, and (2) changing the project strategy. The instruments used in first step were: regular meetings and discussions organized for the municipality and private investor with participation of the steering committee, UNDP and Ministry of Environment representatives; agreement on cooperation signed by three parties to ensure a step-by-step approach; distinction of political, technical and other problems provided by the project (international expertise). For the second step: The project strategy was changed in order to avoid political risks. A pilot project in one municipality was changed to parallel implementation in five municipalities.
- The original project design did not foresee rapid development in this sector and the impact of the market changes on sustainability. The flexibility to adapt the project to these changes was paramount to its success.
- Exchange of experience among UNDP-GEF projects provided useful contacts and exchange of information on related issues.

| **Financial Data** | |
|---|---|
| Cost of full project | $4.4 million |
| Co-financing | $0.8 million (government)<br>$0.2 million (bilateral donors)<br>$1.7 million (private sector)<br>$1.0 million (other municipal governments) |

# INTEGRATED APPROACH TO WOOD WASTE COMBUSTION FOR HEAT PRODUCTION IN POLAND

Country: Poland
Stage: Medium-sized project
Timeline: 2002-2005
Executing Agency: Agency: Ministry of Environment, Government of Poland
Implementing Agency: UNDP-GEF

**Project Summary**

The objective of this project is to remove barriers to, and promote the efficient use of, sustainably produced wood-waste for the production of heat, thereby reducing greenhouse gas emissions. The project is: (1) promoting the use of wood waste produced locally and in a sustainable way as fuel for space heating in order to eliminate the existing solid fuel boilers powered by coal; (2) enhancing the environmental and economic impact of such replacements and optimizing the use of wood waste by integrating fuel conversion investments with energy efficiency improvements on the demand side; (3) providing a replicable and economically viable example of such an approach by creating a local wood-waste market, operated on a commercial basis by a company buying wood waste from wood-processing industries or workshops, and managing this resource to provide thermal comfort to heat consumers; (4) providing an example of inter-municipal and public-private cooperation in managing renewable energy resources by creating an Inter-Municipal Public-Private Partnership Company; and (5) assisting in removing institutional, financial and information/awareness barriers to wider and more efficient use of wood waste for heat production.

INDICATORS MATRIX

| Climate change performance indicator | Impact sheet metric |
|---|---|
| Improvements in energy production, savings or installed capacities | 4.9 megawatts to be installed in a model investment project in Jordanów/Bystra-Sidzina. An additional pipeline of five projects of the same scale will be defined. |
| | 10,360 megawatt hours per year in calculated sales of heat and hot water is expected in the model investment project in Jordanów/Bystra-Sidzina. |
| | Emissions avoided:<br>In the model investment project in Jordanów/Bystra-Sidzina, baseline emissions were calculated on the basis of current fuel (mainly coal and coke); consumption for 42 buildings to be connected to heat grids is 5,618 megatons of CO2 annually. Expected emission is 110 megatons of CO2 annually after planned investment (emissions caused by oil consumption by peak boiler in boiler house in Jordanów). |
| Expansion of business and supporting services for renewable energy and energy efficiency | In the model investment project, one new public-private partnership, 'Biomasa BSJ', will be established to manage wood-waste biomass energy resources and to supply heat services. It is anticipated that a similar pattern will be followed in the pipeline projects. |
| Increase of financing availability and mechanisms | In the model investment project, financial availability was increased by private capital investment into the public-private partnership company. This financial engineering model of linking private and public funds will be replicated in pipeline projects. |
| | As part of the model investment project, a soft loan of $680,000 from the National Fund for Environmental Protection and Water Management is under consideration. This formula will be replicated in pipeline projects. |
| Development of sectoral policies, laws and regulations that support project goals | The scope of influence is local-to-regional, in the sense that the model investment project is focused on dealing with a local wood-waste problem and on generating benefits (reduced energy costs, more secure supply) primarily at the local level. The influence of the |

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|---|---|
| | project is national in two ways: (1) through the pipeline projects, experience from Jordanów/Bystra-Sidzina will be replicated in other local government situations throughout Poland; (2) input provided through the project will affect legislation, policy-making and regulations related to public-private partnerships to finance and otherwise support renewable energy and energy investment projects, especially in relation to a new public-private partnership law. |
| Raising awareness and understanding of technologies among producers and usera | In 2003, a Biomass Chamber of Commerce was established, which brings together both users and producers of biomass-related technologies. The work of the Chamber of Commerce will be supported by a specialized website. |
| | As of June 2004, the Polish Biomass Chamber of Commerce counted 143 member organizations, including producers, users and research organizations related to promoting the use of biomass in Poland. The number of people directly employed in the member organizations is approximately 10,000. The biomass website is expected to reach some 50,000 people. |
| | In Jordanów/Bystra-Sidzina, 370 households will benefit directly from connection to the heat grid; 209 households will also be supplied with hot water. |
| Change in consumption, fuel-use patterns and impact on end-users | In Jordanów/Bystra-Sidzina, six schools buildings, three kindergartens and five health services connected to the heat grid will be supplied with hot water in addition to heat. |
| | In Jordanów/Bystra-Sidzina, 12 new jobs will result directly from the project and incomes will be improved in a dozen households. Additional income generation in the local economy will result from the fact that local wood-waste producers will be able to sell their waste and a system of wood-waste collection from existing waste sites will be established. In addition, cost savings related to lower energy costs will benefit 1,500 residents affected by the project in the Jordanów/Bystra-Sidzina area. |

**Lessons Learned**

- For projects with big investment components at the beginning of project implementation, sufficient documentation and co-financing should be secured. Declarations are insufficient.

- Projects involving significant hard-investment components should focus on goals and objectives, specifying desired outcomes. Specifications as to the means of achieving desired outcomes should not be part of the project document, but part of operational implementation plans subject to approval and oversight by the Project Steering Committee. Such an arrangement would avoid the 'locking in' of a project to solutions that cannot be implemented effectively, as has been the case in this project.

- Projects should never focus on one model investment project when seeking to achieve regional or national impact at the policy and planning level. All the external circumstances and conditions leading to project delay or failure cannot be predicted in advance. As a result, the overall goal to influence policy goal can be jeopardized unnecessarily for reasons beyond the control of the executing or implementing agencies. A fundamental lesson is that projects aiming to influence policy must always focus on a portfolio of investment projects, not just a single effort.

| **Financial Data** | |
|---|---|
| Cost of full project | $2.86 million |
| Co-financing | $0.1 million (NGO)<br>$0.2 million (other) |

## CAPACITY BUILDING FOR GREENHOUSE GAS EMISSIONS REDUCTION THROUGH ENERGY EFFICIENCY IN ROMANIA

Country: Romania
Stage: Full project
Timeline: 2000-2006
Executing Agency: Ministry of Industries and Trade, Government of Romania
Implementing Agency: UNDP-GEF

**Project Summary**

This project presents an innovative approach to Romania's lack of investment in the field of energy efficiency in the municipal and industrial sectors. The project will assist Romanian industries and enterprises in obtaining commercial investments for energy efficiency projects from international and national financial institutions, such as the Romanian Fund for Energy Efficiency. It will also provide limited partial funding for selected energy efficiency projects in the public sector to demonstrate their capability to leverage financial resources from other sources. It will provide technical assistance and undertake other capacity-building activities to improve local capacity for leveraging investment financing for energy efficiency projects in future.

**Lessons Learned**

- Get a financier (for example, a bank) committed to financing energy efficiency studies before such studies are undertaken. Include the financier in all major decisions.
- Hire banking and finance staff for energy efficiency investment projects (in addition to technical staff).
- Make the division of responsibility between the chief technical adviser, UNOPS, UNDP-GEF and UNDP Romania clear.

| **Financial Data** | |
|---|---|
| Cost of full project | $1.3 million |
| Co-financing | $2.9 million (government) |

# CAPACITY BUILDING TO REDUCE KEY BARRIERS TO ENERGY EFFICIENCY IN RUSSIAN RESIDENTIAL BUILDINGS AND HEAT SUPPLY

Country: Russian Federation
Stage: Full project
Timeline: 1998-2005
Executing Agency: Ministry of Science and Technologies of the Russian Federation
Implementing Agency: UNDP-GEF

**Project Summary**
The project will enhance capacities in both the private and public sectors of the Russian Federation to overcome barriers to energy efficiency investments in residential buildings and related heat-distribution systems. The project will: (1) develop a prototype system for consumption-based metering and billing that will create new incentives for tenants, tenant associations and district-heat distribution companies to invest in energy efficiency; (2) study and demonstrate the technical, economic, institutional and geographic feasibility of developing autonomous (building-level) heat supplies; and (3) develop the skills to conduct the economic and financial project analyses required by private and public sector financing institutions for energy efficiency investment projects. Experience gained in the city of Vladimir will be disseminated to other cities in the Russian Federation and CIS countries through a network of energy efficiency demonstration zones and World Bank projects.

INDICATORS MATRIX

| Climate change performance indicator | Impact sheet metric |
|---|---|
| Improvements in energy production, savings or installed capacities | Installed capacity (autonomous boilers):<br>49 Diktora Levitana Street: 1.3 megawatts<br>62 Lenina Prospect: 1.3 megawatts<br>9v Bezymenskogo Street: 1.4 megawatts |
| | The cost of heat production decreased by 3-10 percent compared to block heating stations. |
| | As a result of monitoring and billing measures introduced within the project zone (microdistrict of Vladimir), the fuel savings amounted to 613.9 metric tons/year.<br>The fuel savings due to the autonomous boilers were 276 metric tons/year.<br>In total, the fuel savings amounted to:<br>889.9 metric tons/year and, in 20 years, 17,798 metric tons. |
| | Reduction of greenhouse gases emissions:<br>725 metric tons CO2/year due to the boilers and 1,728 metric tons CO2/year due to monitoring and billing.<br>In total: 2,480 metric tons CO2/year<br>In 20 years: 49,606 metric tons CO2 |
| Reduction of technology cost trajectories | Energy cost: $ 12.20 per kilowatt hour. Increasing the number of autonomous boilers operating from one dispatching centre reduces heat production costs. |
| | Cost of equipment $72.18 per kilowatt (1 US = 29.10 Russian rubles) |
| | The cost of heat energy production decreased by 3-10 percent compared to block heating stations. |
| Expansion of business and supporting services for renewable energy and | Private operation and maintenance company for autonomous boilers was established (Vladesco). Monitoring and billing service was established in the city of Vladimir. The above-mentioned enterprises gave rise to competition on the municipal housing heat |

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|---|---|
| energy efficiency | supply market and in metering of actual heat consumption by tenants. |
| Development of sectoral policies, laws and regulations that support project goals | Methods for calculating actual heat consumed by municipalities were worked out. Guidelines for the introduction of autonomous boilers, for norms calculation and determining tariffs for autonomous boilers were developed. |
| | Local-level regulations were developed with a potential for replication throughout the Russian Federation. |
| Raised awareness and understanding of technologies among producers and users | An information campaign aimed at improving tenants' awareness and understanding of energy-saving technologies. The campaign was carried out through the mass media in Vladimir (TV, radio, newspapers). |
| Change in consumption, fuel-use patterns and impact on end-users. | Heat through autonomous boilers supplied to three apartment buildings with a total of 1,400 tenants. Budget expenses were decreased by 3-10 percent. |

**Lessons Learned**

- The project demonstrated that energy-saving projects could serve as an engine for reform in the housing and municipal services sector because of the specificity of their objectives. In addition, they can help catalyze institutional and legal changes that can be used to reform the housing and municipal services sector.
- Good cooperation between the project team and the national implementation agency was instrumental to the project's success.
- Practical knowledge on many aspects of autonomous heat supply systems was gained and could be shared with other regions of the Russian Federation. However, it is important to consider how large amounts of data and information can be shared with other municipalities in a format that they can use.

| **Financial Data:** | |
|---|---|
| Cost of full project | $3.5 million |
| Co-financing | $0.4 million (government)<br>$0.2 million (other) |

# COST EFFECTIVE ENERGY EFFICIENCY MEASURES IN THE RUSSIAN EDUCATIONAL SECTOR

Country: Russian Federation
Stage: Medium-sized project
Timeline: 2002-2005
Executing Agency: Ministry of Education of the Russian Federation
Implementing Agency: UNDP-GEF

**Project Summary**

The objective of the project is to contribute to the abatement of greenhouse gas emissions by improving the energy efficiency of Russian educational facilities. Apart from direct energy savings, the educational sector has the potential to influence the general public through educational programmes and to provoke behaviour change in connection with energy use. The project is developing replicable models for low-cost energy efficiency measures in both municipal secondary schools and federal educational buildings. This is being achieved through awareness-raising, training and capacity-building, a demonstration programme and models for sustainable administrative and financial solutions.

INDICATORS MATRIX

| Climate change performance indicator | Impact sheet metric |
|---|---|
| Improvements in energy production, savings or installed capacities | Capacity created for the development of energy-saving projects.<br>A number of business plans for energy savings in schools and university buildings developed.<br>Zero- and low-cost energy efficiency measures for implementation in schools and households developed. |
| Expansion of business and supporting services for renewable energy and energy efficiency | Energy service company in Apatity established.<br>University Energy Efficiency Centres now able to perform energy savings consultancies. |
| Increase of financing availability and mechanisms | Revolving financing mechanisms for energy savings in municipal buildings and federal universities are under development. |
| Development of sectoral policies, laws and regulations that support project goals | Recommendations on revolving financing mechanisms, once implemented, will lead to changes in regulations and laws in the field of budgetary funding.<br>Changes to be made at local and regional levels, and within national system of federal education institutions. |
| Raised awareness and understanding of technologies among producers and users | Approximately 50 municipal, regional and university experts reached by capacity-building; 500 students reached by awareness-raising activities.<br>University experts trained will train other experts.<br>Students will disseminate energy-saving measures in their households. |
| Change in consumption, fuel-use patterns and impact on end-users | Approximately 500 households affected by improvements.<br>Fifty secondary schools and four universities in pilot regions affected by improvements. |

**Lessons Learned**

- The main lesson concerns the organization of project activities. Project activities are arranged by three working groups headed by the institutions most competent in the fields of education and energy efficiency. Though located in three different places, these institutions sustain progress more effectively than if the project were to be implemented by a single institution.

- To attract partners, leverage funding and obtain support from authorities, public relations activities must be actively carried out. The public should be made well aware of project objectives and outcomes, reached or expected. The dissemination of information about the project should not be limited to groups directly connected to project goals, but to as broad a public audience as possible. The public relations aspect is this project could be improved and is affecting progress.

| **Financial Data** | |
|---|---|
| Cost of full project | $2.9 million |
| Co-financing | $0.9 million (government)<br>$0.4 million (multilateral donors: Nordic Environment Finance Corporation)<br>$0.6 million (NGO) |

# REDUCING GREENHOUSE GAS EMISSIONS THROUGH THE USE OF BIOMASS ENERGY IN NORTHWEST SLOVAKIA

Country: Slovakia
Stage: Medium-sized project
Timeline: 2003-2007
Executing Agency: Ministry of Environment of the Slovakia Republic
Implementing Agency: UNDP-GEF

**Project Summary**

The aim of the project is to create a sustainable market for biomass energy for heat generation in northwest Slovakia by addressing institutional, financial, and informational market barriers. The project is focusing on: (1) construction of a central processing unit for wood pellet production from wood-waste residues; (2) the reconstruction of 44 boiler rooms in schools and public buildings; (3) the replacement of the existing coal/coke boilers by pellet ones, in order to provide a replicable, economically viable and environmentally friendly source of heat. The overall objective of the project is to reduce greenhouse gas emissions and to promote the adoption of renewable sources.

Through information dissemination that will be carried out, the project has the potential to be replicated in different parts of Slovakia and expanded into the Czech Republic, Poland and other Central and Eastern European countries.

INDICATORS MATRIX

| Climate change performance indicator | Impact sheet metric |
|---|---|
| Improvements in energy production, savings or installed capacities | Installation of biomass boilers with a capacity of 6.35 megawatts by the end of 2004. Annual consumption expected to equal 33,830 gigajoules. |
| | Emissions avoided: No emissions avoided as yet. |
| Raised awareness and understanding of technologies among producers and users | • Organized international conference for 130 people<br>• Organized eight seminars for 120 local decisions makers<br>• Brought 80 visitors to boiler houses<br>• Presented at 2 international workshops, 6 international seminars and 4 national and regional seminars<br>• Generated 24 national and regional news articles on the project, 4 TV slots, 8 radio slots<br>• Produced a website that received 9,000 hits this year |
| | Twenty-five households, 4 schools and 2 municipal offices and a health institute will be supplied by boilers by the end of 2005. |

**Lessons Learned**

- Procedures need to be clear and agreed upon by all parties from the project's inception.
- Permanent partnership-building requires daily communication and contact with crucial partners.
- Project manager must have a broad competency for problem-solving during daily implementation.

| Financial Data | |
|---|---|
| Cost of full project | $12 million |
| Co-financing | $1.2 million (government)<br>$0.8 million (bilateral donors)<br>$1.0 million (multilateral donors)<br>$3.3 million (regional banks)<br>$4.3 million (other) |

## REMOVING BARRIERS TO THE INCREASED USE OF BIOMASS AS AN ENERGY SOURCE

Country: Slovenia
Stage: Full project
Timeline: 2001-2005
Executing Agency: Ministry of Environment and Spatial Planning
Implementing Agency: UNDP-GEF

**Project Summary**

The project is facilitating the increased use of biomass as an energy source in Slovenia, in order to achieve national greenhouse gas mitigation targets, by: (1) removing technical, institutional, information and financial barriers to increased use of biomass as an energy source and reducing the costs of biomass-based heating projects in local communities by implementing at least three demonstration district heating projects and enabling equity financing through the biomass energy revolving fund; (2) training local professionals in planning, designing, installing, operating and servicing relevant installations; (3) establishing long-term financing mechanisms to enable investments in biomass technology and (4) preparing a cross-sectoral national biomass programme.

INDICATORS MATRIX

| Climate change performance indicator | Impact sheet metric |
|---|---|
| Improvements in energy production, savings or installed capacities | Impact sheet metric |
| | Biomass district heating |
| | 7.7 megawatts being installed |
| | 21,000 megawatt hours/year to be delivered |
| | Foreseen emissions avoided: 5,000 metric tons of CO2 annually |
| Reduction of technology cost trajectories. | Cost of energy: $.06 per kilowatt hour |
| | Cost of equipment: $780 per kilowatt (total investment) |
| Expansion of business and supporting services for renewable energy and energy efficiency | Number of additional businesses with project-related purposes: 4 (two biomass district heating service companies/utilities, biomass exchange, biomass supplier) |
| Increase of financing availability and mechanisms | Financing modality: equity financing through a revolving fund |
| | Newly accessible investment volume for applications targeted by projects: $1.25 million |
| Development of sectoral policies, laws and regulations that support project goals | Development of power sector policies favourable to renewable energy and energy efficiency: National Energy Plan adopted with $8.5 million allocated to biomass heating |
| | Scope of influence: national |
| | Expected additional installation of on-grid renewable energy generation capacity triggered by policy changes: 50 megawatts |
| Raised awareness and understanding of technologies among producers and users | Type of instrument: capacity-building |
| | Number of people reached with the instrument: 300 |
| Change in consumption, fuel-use patterns and impact on end-users | Number of people/households affected by improvements: 9,000 people comprising about 1,400 households |
| | Number of social services affected, such as schools, health services, etc.): 37 |
| | Number of people with improved income as a result of project intervention: 300 |

Lessons Learned

- The appropriateness of setting-up and implementing an innovative financial mechanism for biomass district projects, such as equity financing and its associated legal structures and administrative mechanisms, should be evaluated by taking a number of issues into consideration. These include: the level of design and implementation costs in relation to the sustainability of the financial mechanism (the range of provided funds); foreseen environmental impact and its relevance to national greenhouse gas reduction plans (type, size and number of projects to be supported within specific time framework); and market transformation needed (organizational/ownership status of municipal utilities or public services).

- The revolving fund cannot operate sustainably at its current level of capitalization. It currently faces a gap of 3 to 5 years in its ability to promote and invest in new biomass district heating projects. Therefore, new financing mechanisms should be designed to encourage market transformation even within the project's lifetime and not just to establish occasional demonstration case studies.

- Commercialization of municipal infrastructure and services and private sector involvement required a substantial - and unforeseen - level of technical, financial, legal and managerial assistance of the part of the project to municipal clients in the development, structuring and appraisal of investment operations. This comprehensive set of capacities should be inherent to project implementation units in order to speed up realization of investments and provide the necessary capacity-building.

| **Financial Data** | |
|---|---|
| Cost of full project | $6.4 million |
| Co-financing | $1.4 million (government)<br>$0.5 million (private sector)<br>$1.6 million (other Ecofund)$1.0 million (other municipal) |

# IMPROVING THE ENERGY EFFICIENCY OF THE HEAT AND HOT WATER SUPPLY

Country: Turkmenistan
Stage: Medium-sized project
Timeline: 2001-2005
Executing Agency: Cabinet of Ministers, Government of Turkmenistan
Implementing Agency: UNDP-GEF

**Project Summary**
The project aims to remove existing barriers to the improvement of the heat and hot water supply systems in Turkmenistan, thereby reducing their energy consumption and associated greenhouse gas emissions. Some key components of the project include: (1) implementation of a pilot project in Turkmenabad, thereby gaining practical experience in new technologies and approaches to heat and hot water supply; (2) facilitating the preparation of feasibility studies and master plans for participating municipalities, providing a basis for the long-term development of heat and hot water services according to sustainable development principles; and (3) assisting the government in the establishment of a supportive institutional and financial framework for energy efficiency investments.

Indicators Matrix

| Climate change performance indicator | Impact sheet metric |
|---|---|
| Development of sectoral policies, laws and regulations that support project goals | Impact sheet metric<br>The project has conducted prefeasibility studies and assessed the current situation in heat and hot water supply systems, with the goal of introducing new institutional mechanisms and incentives to reduce energy consumption on the demand side. |
| Raised awareness and understanding of technologies among producers and users | Twelve experts, including key project staff, will participate in a June 2005 study tour. The tour will expose local experts to modern technologies available in industrial countries.<br>Awareness of local decision makers will be raised regarding technical options and measures available to improve the energy efficiency of heat and hot water supply systems, and their economic, social, financial and environmental impact and benefits. |
| Change in consumption, fuel-use patterns and impacts on end-users | Monitoring equipment will be installed in September 2005 to cover the next heating season. The data acquired from the programme will be crucial since it will shed light on losses occurring within the system.<br>Incentives will be introduced with the aim of defining the change in heat, gas and water consumption and impact on end-users. |
| Increase of financing availability and mechanisms | A new approach will be recommended to enhance the capacity of the government and local municipalities to structure financing for energy efficiency projects, encouraging investments in energy efficiency (when economically feasible) instead of 'oversubsidizing' the operation of the existing and inefficient heat and hot water supply systems. |
| Improvements in energy production, savings or installed capacities | Emissions to be avoided:<br>Long-term reduction of greenhouse gas emissions of 0.2-0.5 million metric tons of carbon over the next 20 years. |

**Lesson Learned**

- The executing agency of the project has recently been changed (from the former Ministry of Energy to the Research Institute of the Municipal Economy Methodology and Development under the Cabinet of Ministries of Turkmenistan). Transferring the project to the new government institute looks like a logical move towards creating a more solid basis for project implementation and its sustainable follow-up.

| **Financial Data** | |
|---|---|
| Cost of full project | $1.7 million |
| Co-financing | $0.4 million (government)<br>$0.5 million (private sector) |

# CLIMATE CHANGE MITIGATION IN UKRAINE THROUGH ENERGY EFFICIENCY IN MUNICIPAL DISTRICT HEATING (PILOT PROJECT IN RIVNE) STAGE 1

Country: Ukraine
Stage: Full project
Timeline: 2002-2004
Executing Agency: State Committee for Energy Conservation, Government of Ukraine
Implementing Agency: UNDP-GEF

**Project Summary**

The project addresses a key issue in the reduction of greenhouse gas emissions through large-scale improvements in energy efficiency in Ukraine's communal heat supply sector. These improvements will result from a four-part approach: (1) capacity-building to create the basis for systematic energy efficiency activities at the local level; (2) an integrated approach of supply and demand-side improvements to achieve maximum fuel savings and emissions reduction; (3) attraction of external investment resources for an energy efficiency programme in a pilot city; and (4) project-specific replication measures including development of relevant procedures, guidelines, information materials and their dissemination, and public awareness-raising through the involvement of NGOs, in particular those concerned with environmental and energy efficiency problems.

The project consists of two main components: (1) establishment of a municipal energy service company and (2) demonstration of the energy-saving programme. The potential municipality selected, in consultation with the government and executing agent, is Rivne. Implementation of the energy-saving programme will be carried out in two phases; (1) implementation of the demonstration programme through funding available in this project and (2) implementation of the citywide energy-saving programme in Rivne and its replication in other cities through the additional allocation of investments. The full project is divided into the two stages. Stage 1 includes establishment of the municipal energy service company, demonstration implementation of energy efficiency measures, and part of project replication and dissemination activities. Stage 2 will start upon successful completion of the stage 1 and includes implementation of a citywide energy efficiency investment programme and larger replication activities. Reference to stage II has been included in this project document to provide information on the context of the larger project; however, the financial commitments included in this project document are limited to stage I activities only.

INDICATORS MATRIX

| Climate change performance indicator | Impact sheet metric |
|---|---|
| Improvements in energy production, savings or installed capacities | Electric Power Production:<br>2 turbine-generator sets, totalling 5 megawatts<br>Heat power production:<br>Three boiler units, totalling 66 gigacalorium |
| | During a 7-month period (December 2003 to June 2004), electrical power production of 10,977 megawatt hours and heat production of 127,616 megawatt hours, resulting in a savings of 4,636 metric tons of coal equivalent |
| | Emissions avoided: During the same 7-month period, 6,852 million metric tons of $CO_2$ were avoided |
| | Cost of energy:<br>Electrical power production: $0.027/kilowatt hour<br>Heat production: $14.13/megawatt hour |
| | Cost of equipment:<br>$568.48/kilowatt (only electrical output counted) |

| | |
|---|---|
| Expansion of business and supporting services for renewable energy and energy efficiency | Number of additional businesses with project-related purposes: None in addition to the energy service company |
| Increase of financing availability and mechanisms | Financing modality: Co-financing<br>Municipality: $70,000<br>KomunEnergia: $1.2 million |
| | Newly accessible lending volume for applications targeted by projects:<br>$90,000 is allocated in the city budget for the applications targeted by project;<br>$95,000 of KomunEnergia's own funds are allocated in the city budget for the applications targeted by the project.<br>Total commitments: $185,000 |
| Development of sectoral policies, laws and regulations that support project goals | Development of power-sector policies favourable to renewable energy and energy efficiency:<br>The municipal administration made the decision not to decrease the energy tariffs for the duration of the demonstration project. |
| | Scope of influence: Regional |
| Raised awareness and understanding of technologies among producers and users | • Website of the energy service company in Rivne, ESCO-Rivne, was created (http://www.esco-rivne.com).<br>• Awareness campaign was launched in local and national newspapers.<br>• The ESCO-Rivne information booklet was published for distribution to potential clients.<br>• Training for teachers and pupils has been performed in cooperation with SPARE project Coordinators from Ukraine and Norway.<br>• In June 2004, the Prime Minister of Ukraine, Mr. Yanukovich inaugurated the power plant, which was rehabilitated with UNDP assistance. |
| Change in consumption, fuel-use patterns and impacts on end-users. | Number of people reached through the instrument:<br>The visit of the prime minister was broadcast on major Ukrainian TV channels and given wide coverage in the newspapers. About 80 percent of Ukrainian population were reached.<br>Replication effects triggered by the instrument<br>• Written request for services (letter of interest) has been received by ESCO-Rivne from the municipality of Ostrog City.<br>• Negotiations started with another two municipalities (Kamenets Podilskiy and Kostopil City). |
| | Number of people/households affected by improvement and magnitude of the change:<br>The everyday life of 70,000 of inhabitants of Rivne has been affected.<br>Increased quality of services to Rivne inhabitants:<br>• Hot water and heat supply to the central part of Rivne (20,000 inhabitants along with commercial, business, administrative buildings)<br>• Hot water supply to the Pivnichniy district in Rivne (40,000 inhabitants)<br>• Hot water supply to the Fabrichniy district in Rivne (10,000 inhabitants)<br>Note: While Pivnichniy and Fabrichniy have their own boilers for heat supply in winter, they had only erratic hot water supply during the heating season and no hot water supply during the non-heating season. |
| | Number of social services affected:<br>City hospital with a 3,500-bed capacity will be covered by the end of the project. |

Number of people with improved income as a result of project intervention

- Approximately 100 employees of the power plant and supporting facilities have increased their incomes.
- Approximately 60 new jobs have been created (through ESCO-Rivne, the power plant and supporting facilities).

**Lessons Learned**

- The project document specifies setting up the municipal energy service company first, then proceeding with the demonstration project. However, because of administrative delays in registering the company and pressure from project authorities to have the demonstration project operational by the start of the heating season in mid-October 2003, the executing agency proceeded to implement the demonstration project without a self-sustaining energy service company. For this reason, the energy service company missed out on a valuable experience.

| **Financial Data** | |
|---|---|
| Cost of full project | $1.7 million |
| Co-financing | $0.4 million (government)<br>$0.5 million (private sector) |

## ARMENIA - IMPROVING THE ENERGY EFFICIENCY OF MUNICIPAL HEATING AND HOT WATER SUPPLY

Country: Armenia
Status of Project: Under preparation
Executing Agency: Ministry of Nature Protection of the Republic of Slovenia
Implementing Agency: UNDP-GEF

**Project Summary**
The objective of the project is to reduce greenhouse gas emissions resulting from the current heat and hot water supply practices in Armenian cities. This will be accomplished by: (1) strengthening the role of condominiums in collectively organizing and managing heat and hot water supply services at the building level; (2) supporting the restructuring and capacity-building of the existing district companies to improve both their service quality and operational efficiency; (3) supporting the new decentralized service providers to commercially run, market and diversify their businesses, in order to promote the use of environmentally clean and energy-efficient technologies and to structure financing for the required investments in areas that do not sustain the centralized district heating services; and (4) utilizing the results, experiences and lessons learned for advancing the sustainable development of the heat and hot water services in Armenia with a specific emphasis on the greenhouse gas emission reductions. The proposed capacity-building and other technical assistance activities will complement, and will be implemented in close cooperation with the activities of the other donors, including the World Bank/IDA-funded Urban Heating Project, the Government of Netherlands-funded Industrial District Heating Development.

**Projected Impact**
- The CO2 reduction costs to the GEF based on the estimated overall replication and greenhouse gas reduction potential can be assessed at $0.3 per ton of CO2 reduced over the next 20 years.
- Overall greenhouse gas reduction potential for Armenia, over the next 20 years, has been estimated at 9.6 million metric tons of CO2

## CROATIA - IMPROVING THE ENERGY EFFICIENCY OF MUNICIPAL HEATING AND HOT WATER SUPPLY

Country: Croatia
Status of Project: Under preparation
Proposed Timeline: 2005-2008
Executing Agency: Ministry of Nature Protection of the Republic of Slovenia
Implementing Agency: UNDP-GEF

**Project Summary**
The project aims to remove the key barriers to the implementation of economically feasible energy efficiency technologies and measures in the residential and service sectors in Croatia, thereby reducing energy consumption and associated greenhouse gas emissions. The initial focus of the project will be on the counties of Istria and Rijeka, after which the activities will hopefully be replicated in other parts of the country. In that regard, the project will cooperate closely with a related World Bank/GEF-financed energy efficiency project in Croatia.

**Projected Impact**
- The overall potential to reduce country's greenhouse gas emission by the selected measures and within the targeted end-user groups within the next 20 years has been estimated at approximately 2 million metric tons of CO2.
- The project will have a direct effect on energy saving, as shown in the chart:

| | | Energy Savings | Greenhouse gas reduction potential |
|---|---|---|---|
| Households: Energy-saving light bulbs | | | |
| | Croatia | 0.5 TWh/year - electrical energy | 0.25 million metric tons of CO2 |
| | Istria | 20 GWh/year - electrical energy | 8,000 metric tons of CO2 |
| Energy-efficient refrigerators and freezers | | 300 kWh/unit - electrical energy | 35,000 metric tons of CO2 |
| 3-tariff meters, peak-load management and reactive power compensation | | | |
| | Istria | 4.5 GWh/year - electrical energy | 2,000 metric tons of CO2 |
| Water saving systems | | 2 million litres - fuel oil for water heating | 7,000 metric tons of CO2 |
| Heating systems | | | |
| | Hotels | 20 percent fuel (gas, fuel oil) | 13,000 metric tons of CO2 |
| Solar panels for water heating | | | |
| | Hotels | 5 percent fuel, 3 percent electrical energy | 3,000 metric tons of CO2 |
| Energy management and monitoring measures | | | |
| | Hotels | >5 percent total energy | 5,000 metric tons CO2 |

## GEORGIA - PROMOTING THE USE OF RENEWABLE ENERGY RESOURCES FOR LOCAL ENERGY SUPPLY

Country: Georgia
Status of Project: Under preparation
Proposed Timeline: 2005-2008
Executing Agency: Ministry of Environment and Natural Resources, Government of Georgia
Implementing Agency: UNDP-GEF

**Project Summary**

The objective of the project is to remove the key barriers to the increased utilization of renewable energy for local energy supply. The project is expected to achieve this goal by (1) addressing the legal and regulatory barriers in order to provide fair and competitive access to the market for renewable energy producers, to ensure the collection of payments and to encourage investments into renewable energy; (2) introducing and leveraging financing for a pilot renewable energy fund/credit line so as to overcome the key financial barriers in Georgia, and (3) addressing the existing public-awareness and capacity barriers so as to provide a basis for the general development and implementation of renewable energy projects. The initial focus of the project will be on promoting the use of geothermal resources for hot water and later heat supply and the use of small hydropower for local power generation in Georgia. After successful implementation of the first demonstration projects in these sectors, other renewable energy sources can be considered. In addition, the activities will hopefully be replicated in the regional context. A specific emphasis throughout project implementation will be leveraging additional financial resources for the capitalization of the proposed Renewable Energy Fund so as to sustain its operations and to enhance its capacity to support renewable energy investments.

**Projected Impact**

- The overall greenhouse gas reduction potential of the suggested demonstration projects has been estimated at 0.5 million metric tons of CO2 over the next 20 years, while the overall greenhouse gas reduction potential in Georgia by improving the utilization of country's renewable energy resources can be estimated at several million metric tons of CO2 annually.

## REMOVING BARRIERS TO ENERGY EFFICIENCY IN MUNICIPAL HEAT AND HOT WATER SUPPLY

Country: Kazakhstan
Status of Project: Under preparation
Executing Agency: Not yet specified
Implementing Agency: UNDP-GEF

**Project Summary**

The objective of the project is to reduce greenhouse gas emissions from the municipal heat and hot water supply systems in Kazakhstan and to lay the foundation for the sustainable development of these services, taking into account local as well as global environmental considerations. Within this framework, the project will (1) assist the Government of Kazakhstan in reviewing and improving the legal and regulatory framework dealing with the heat and hot water supply sector, with a specific emphasis on the tariff issues and consumption-based billing to motivate energy efficiency; (2) build the capacity of the local heat supply companies to develop and manage their services on a commercial basis and to attract financing for the investments needed; (3) build the capacity of the local tenants and homeowner associations to manage the heat and hot water supply services and to implement cost-efficient energy-saving measures at the building level; (4) introduce and gain experience on new institutional and financing arrangements such as energy service companies and reduce the risks and uncertainties of energy-efficiency investments in the heating sector by facilitating the implementation of selected pilot activities, and (5) monitor, evaluate and disseminate the project results and lessons learned, thereby facilitating their effective replication.

**Projected Impact**

- In the incremental cost analysis conducted for the project, it was estimated that by facilitating the gradual development of the energy efficiency of the heat and hot water supply services, baseline emissions could be reduced by up to 4.6 million metric tons of CO2 per year, or approximately 46 million metric tons of CO2 over the next 20 years, by gradually improving the system.

- While the costs of a heat metering programme for the whole district heating area of Almaty city are estimated at about $15 million, the capitalization of the municipal energy service company to cover the first pilot investments, primarily in heat metering and improved heat regulation, has been proposed at $1.5 million. It has been estimated that investing this amount into those selected energy efficiency measures would result in direct fuel savings of 19,400 megawatt hours per year and a corresponding CO2 emission reduction of 3,350 metric tons a year, or about 100,000 metric tons of CO2 equivalent over the next 20 years with an average simple payback period of 7.4 years (without considering the greenhouse gas benefits of the project). Services for other demand-side and, as applicable, supply-side energy efficiency measures will be offered depending on the needs and the financing capacity of the energy service company.

- The implementation of the energy efficiency components of the project described above would reduce the use of coal at the boiler house by some 75,000 megawatt hours per year, and the use of electricity by 3,060 megawatt hours per year. The corresponding total reduction of the CO2 emissions would constitute about 28,600 metric tons of CO2 equivalent a year, or some 570,000 metric tons of CO2 equivalent over the next 20 years. The total investment costs of the project have been estimated at $6.8 million. The simple payback period for replacing the pumps is around 3 years, while energy savings alone cannot justify replacement of the magisterial pipes.

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Authors: Susan Legro and Grant Ballard-Tremeer

Editors: Lois Jensen

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For further information please contact:
Global Environment Facility
Energy and Environment group
Bureau for Development Policy
United Nations Development Programme
304 East 45th Street, 9th Floor
New York, NY, U.S.A. 10017
E-mail: juha.uitto@undp.org
http://www.undp.org/gef