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ENERGY EFFICIENCY IN MULTI-FAMILY HOUSING – A SOCIAL AND ENVIRONMENTAL NECESSITY

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EXECUTIVE SUMMARY

The state of multi-family housing in Latvia is critical: highly inefficient buildings from the Soviet and pre-war eras coupled with lack of proper maintenance for over fifty years has resulted in an economic, social and environmental hazard. The negative consequences of urban housing problems affect every level of society, from the state to the individual. Costly energy imports are a drain on the state economy, and the burning of fossil fuels pollutes the environment, thus contributing to the risk of global warming. Residents are unable to pay their high heating costs, let alone invest money in the maintenance of their newly privatized buildings. If no policies are devised now to address these issues in a holistic manner, social and economic conditions are likely to deteriorate, as is the state of buildings themselves, leading to increased social segregation and prolonged environmental pollution.

This paper explores energy efficiency retrofits as one way of beginning to solve this host of residential sector problems. Hence this paper addresses energy efficiency in multi-family housing not merely as a technical problem, but rather as a complex and multi-faceted issue, comprised of social, environmental, and economic aspects. The study examines only demand side options related specifically to space heating, focusing particularly on multi-family housing in small- to medium-sized urban areas, because these options have received limited attention to date. The paper seeks policy solutions that can complement existing initiatives and will facilitate energy efficiency retrofits on a wide scale, thus beginning to pave the path to a sustainable urban housing system.

The degree of policy integration among the housing, social, energy and climate change sectors is examined. The analysis shows that current policies in the sectors analyzed do not necessarily facilitate energy efficiency retrofits. Although recent policy initiatives, such as the Home Improvement Loan Program have made a range of options available for financing building renovations, these options are not readily accessible to all segments of the population. The two main policy gaps are a lack of clear incentives to achieve energy efficiency and a lack of targeted housing programs for low- to mid-income groups. In general, housing policies need to be more integrated with social priorities and placed in a larger environmental context.

The study reviews some of the main residential energy efficiency pilot projects and reveals that while most projects show high potential for significant energy savings, many of the first projects suffered from implementation problems. Problems stemmed from a lack of accurate data about energy use prior to the project, insufficient monitoring after the completion of the project, lack of understanding on the part of residents, and difficulties finding co-funding for projects. Most of these problems can easily be avoided by investing larger portions of initial project resources in informational and educational campaigns and pre-and post project monitoring. Financial problems have been at least partially solved by the recent availability of low-interest loans. The final problem is that building conditions are sometimes worse than expected, but this is a contingency that project developers must reckon with.

The author concludes that energy efficiency measures in multi-family buildings can begin a chain of social, environmental, and economic benefits that facilitate urban sustainability. A lack of public intervention, however, can lead to a worsening of the situation and can have long-term consequences, such as housing degradation, social segregation and urban sprawl. Thus, a transition period is needed from fully subsidized to fully privatized building maintenance, and the responsibility for this burden must be shared among the national government, local governments, NGOs and residents. Furthermore, a social safety net is essential for both low and mid-income residents in order for wide scale renovations to begin. It is also noted that larger environmental concerns must be taken into account when planning housing policy. Policies must be integrated across the various analyzed sectors and use various implementation methods.

Four types of policy interventions are examined as possible ways of solving the problem: need-based policies, reduced-consumption incentives, building-efficiency support programs, and incentives to change maintenance structures. Each of these policy types is evaluated according to social, environmental and economic criteria. It is found that need-based policies meet the most criteria in a positive way, followed by the building-efficiency policies, and the reduced-consumption incentives. Policies encouraging changed maintenance structure rate the lowest in attaining urban sustainability criteria on their own, but the best results will be achieved by combining all of the policy types.

A policy package is recommended that would combine the positive aspects of the various policy types. The package is based on a system of nested incentives for increasing energy efficiency. It is based on the principle that low-cost energy efficiency measures should be encouraged first, because they will demonstrate the possibility for all residents to save energy and money. Second, all residents should also be provided with the tools and the knowledge of how to actively reduce their own energy consumption and thus protect the environment. Therefore wide-scale information campaigns and personal advice must accompany all programs. Special emphasis must be placed on the low – mid income sector and on panel buildings, because these are the most socially

vulnerable. The combined results of such programs will be to stimulate first, interest in home improvements and energy efficiency and second, the formation of Homeowner Associations and use of private investment in the housing sector.

The recommended policy package includes two national programs, two municipal programs and one NGO component. The contribution of the national government in solving this problem is suggested in financing the installation of thermostatic radiator valves in all apartments as an incentive to reduce energy consumption, and secondly, in granting building-efficiency support for those panel buildings whose residents have agreed to take out loans for building improvement and energy efficiency projects. The municipal governments' role is to support low- to mid-income families, through a partially subsidized weather-stripping service and additional need-based support for low-income residents in buildings that take out loans for energy efficiency improvements. NGOs can continue a volunteer weather-stripping service for pensioners and socially disadvantaged residents. Finally, residents themselves have an important role to play in assuming greater responsibility for their buildings and undertaking further renovation investments and loans, using savings from the programs above.

Energy efficiency retrofits in multi-family buildings are a social, environmental and economic necessity and must be begun immediately in order to facilitate the balanced and sustainable development of Latvia's cities and towns.

CONTENTS

ABBREVIATIONS

LU	University of Latvia
BD	Building Department
CDM	Clean Development Mechanism
CO_2	Carbon Dioxide
EU	European Union
GHG	Greenhouse gases
HOA	Homeowner Association
IET	International Emissions Trading
JI	Joint Implementation
LVL	Latvian Lats
MARKAL	Market Allocation
MEPRD	Ministry of Environmental Protection and Regional Development
MWh	Megawatt hour
NGO	Non-governmental Organization
PHARE	Poland and Hungary Action for the Restructuring of the Economy
SAVE	Specific Actions for Vigorous Energy Efficiency
SCORE	Supporting the Cooperative Organization of Rational Energy Use
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change

1. INTRODUCTION AND METHODOLOGY

The state of multi-family housing in Latvia is critical: highly inefficient buildings coupled with lack of proper maintenance for over fifty years has resulted in an economic, social and environmental hazard. According to a government housing strategy, an estimated 11% of housing is in complete disrepair, and the housing stock could decrease by 40% in the next five years if investments are not made now (Cabinet of Ministers, 2001a). Studies and pilot projects show that up to 60–80% of heat energy that escapes through the outer constructions of residential buildings could be saved (MEPRD BD and "Vides projekti," 2000b; Greķis and Reķis, 2000), but this requires high initial investments.

Due to privatization, responsibility for maintenance has been transferred to individual apartment owners, but salaries remain low and social conditions poor. According to the Household Budget Survey done by the Central Bureau of Statistics (Central Bureau of Statistics, 2001c), 67% of urban residents have difficulty paying their regular rent and utility bills, leaving little to invest in building maintenance and restoration. Ministry of Welfare data show that 60% of Latvia's inhabitants are living below the "crisis subsistence minimum" of 55.78 LVL/month (Ministry of Welfare, 2000), thus unable to meet all basic needs.

The negative consequences of urban housing problems affect every level of society, from the state to the individual. Costly energy imports are a drain on the state economy, and the burning of fossil fuels pollutes the environment, thus contributing to the risk of global warming. Residents are unable to pay their high heating costs, let alone invest money in the maintenance of their newly privatized buildings. If no policies are devised now to address these issues in a holistic manner, social and economic conditions are likely to deteriorate, as is the state of buildings themselves, leading to increased social segregation and prolonged environmental pollution. How can urban housing blocks be rehabilitated in an economically sound way that will simultaneously reduce energy costs and environmental damage and improve social conditions?

Energy efficiency retrofits represent one way of beginning to solve this host of residential-sector problems. It reduces the costs of energy to the government and to consumers,

improves building conditions and reduces environmental pollution. Hence, this paper addresses energy efficiency in multi-family housing not merely as a technical problem, but rather as a complex and multi-faceted issue, comprised of social, environmental, and economic aspects. Because both energy and social welfare are the fundamental responsibility of government, yet building maintenance is now the responsibility of residents, this paper seeks solutions that will divide responsibility justly among all of these parties.

A number of technical solutions have been documented to address the problems of both energy efficiency and building condition, but these require high initial outlays and sometimes have long payback times. Recent state policy initiatives and programs have made more funds available for housing improvements through low-interest, guaranteed loans and mortgage programs. Such loans, however, address only a certain portion of the population, do not target the low- to mid-income population that could benefit most from energy efficiency retrofits, and thus will not help to alleviate larger social problems associated with housing policy. This paper will seek policy solutions that can complement existing initiatives and will facilitate energy efficiency retrofits on a wide scale, thus beginning to pave the path to a sustainable urban housing system.

The **main objectives** of this study are:

- to evaluate the effect of current housing, social, energy and climate-change policies on residential energy efficiency and urban sustainability;
- to assess the role that additional social policies can play in assisting low- to mid-income residents to participate in building renovations and energy efficiency projects;
- to develop recommendations for state and local policies for wide-scale retrofit programs in urban areas;
- to activate the public and involve NGOs in smaller cities and towns in housing and energy efficiency policy development and raise the public awareness of these issues.

Structure of Report

The second chapter of this paper describes the current state of housing and social and economic conditions in urban areas. The third chapter analyzes policies and legislation in the housing, social, energy and climate-change sectors, and the fourth chapter describes a few of the main studies and pilot projects on energy efficiency in housing. The main conclusions about the current state of policies and the main needs for the future are summarized in chapter five. Based on the conclusions, chapter six evaluates

four types of policies that could be used to stimulate energy efficiency retrofits. Finally, the last chapter recommends a policy package for multi-family housing energy efficiency retrofits that combines social and environmental priorities yet remains economically feasible. The paper suggests a clear division of responsibility for various aspects of the housing issue among the state and local governments, NGOs and residents.

Although potential exists for energy efficiency improvements on both the supply and demand side, this study will examine only demand side options related specifically to space heating, focusing particularly on multi-family housing in small- to medium-sized urban areas, because these options have received limited attention to date. Policy recommendations focus primarily on the role that the national and local governments can play in facilitating energy efficiency retrofits, rather than investigating additional private sector options (third-party financing). Multi-family housing is divided into two categories: concrete panel blockhouses and other multi-family residential buildings. Particular attention is paid to concrete panel buildings, because the necessity for retrofits is greater, from the perspectives of both energy efficiency and urban planning and design.

Methodology

This study has been supported by a grant from the Soros Foundation – Latvia Policy Fellowship Program and the East-East Program. It consists of both a research component and a public weather-stripping demonstration and information campaign. The research study was carried out from January 2001–March 2002, and the public information component is expected to continue through other sources of funding.

Research has been conducted on the current state of policy development and pilot programs at the state and local levels. Although this study draws on data and experience from implemented pilot projects throughout the country, it is not a technical study of energy efficiency. Rather, it seeks to place the issue of residential energy efficiency within a larger sustainable development context. Conclusions are drawn based upon the analysis of current policies, stakeholder interviews, comparative research of experience in other countries, and an evaluation of the costs and benefits of various policy options. The costs and potential efficiency of the policy recommendations were calculated with a computer optimization tool developed by the consulting company Ekodoma.

The situation in Riga is necessarily different from that in other cities and towns in the country (larger urban area, higher rates of income differentiation, more housing shortages, etc.), and much more research and resources are now being devoted to the housing issue in Riga than in smaller cities. Therefore, this paper focuses more on the situation in other, smaller cities and municipalities, where living standards are lower

and municipalities have fewer resources at their disposal. A more in-depth follow-up study would be needed in order to make comprehensive policy recommendations for Riga.

Three smaller cities were selected for the NGO information campaign "Latvian Volunteers for Energy Efficiency" and the investigation of the situation at the local level – Rēzekne, Smiltene and Madona. Information and examples from these towns are presented here, but the towns are not meant to be statistically representative – rather they were selected on the basis of NGOs that were interested in getting involved in housing energy efficiency projects and participating in information campaigns with residents in their cities. Nevertheless, conclusions can be drawn from the three towns about general problems and possible solutions at the local level. The main component of the NGO campaigns is the demonstration of low-cost energy efficiency improvements, in this case weather-stripping. A full description can be found in Chapter 4.2.

2. BACKGROUND

When analyzing the state of housing and urban development in Latvia, the context of its transition to a market economy must be taken into account. Policies aimed at improving housing conditions must be particularly sensitive to the needs of the groups in society that have been left vulnerable during this transition period. This chapter reviews the current state of social and economic conditions, as well as the state of housing, energy end environmental issues related to urban development.

2.1. Social and Economic Conditions

Latvia regained its independence from the Soviet Union in 1991, after which the economy suffered a severe downturn. Although the economy is recovering and has experienced fast growth (around 6%) over the past two years, the social and economic conditions are still difficult for many of Latvia's residents, particularly outside of Riga, and income differentiation among social groups is showing trends of increasing. The official unemployment rate was at its highest in 1999 at 10.2%, then decreased to 7.8% in 2000, but is much higher in many rural areas and smaller towns (20–25% in Latgale) (Ministry of Economy, 2000). Actual unemployment rates are even higher, as many people do not register with the Unemployment Office if they cannot receive benefits (World Bank, 2000).

Poverty is widespread in Latvia, due both to unemployment and to the fact that many jobs do not pay enough to cover basic needs. A 1998 UNDP study on poverty applied three different measures of poverty (based on 1996 data): relative poverty (50% of average household expenditure/person (24 LVL)); income below minimum wage/person (38 LVL); and income below the crisis subsistence minimum/person (defined by the Ministry of Welfare as 52 LVL). Findings are summarized in Table 1. The most vulnerable groups are families with children (especially with single parents), and pensioners living alone (Gasmana, 1998).

Table 1. Poverty levels in Latvia (%)

Poverty indicator	Relative poverty – (24 LVL/person)	Below minimum wage (38 LVL/person)	Below crisis subsistence minimum (52 LVL/person)
Urban	10.46	37.48	65.37
Rural	16.14	47.02	70.56
Total	12.22	40.45	66.89

Source: Gasmana, 1998.

Conditions have not improved much since the UNDP study. The average monthly disposable income/member of household was 64.73 LVL (106 USD) in 1999, but the per capita income needed to acquire basic goods and services was calculated to be 83.18 LVL/member of household. Distributed by quintiles, 80% of Latvia's population is living below this level, therefore unable to meet basic demands, and almost 60% are still below the crisis subsistence minimum of 57 LVL/person. Data show income differentiation increasing, with income growth occurring primarily among higher income groups (Ministry of Welfare, 2000b). Social assistance is generally available only to those who meet the "relative poverty" definition (see Chapter 3.2. for more detail), thus a large segment of the population does not qualify for social assistance, yet does not have enough income to make ends meet. This trend poses a threat to the housing situation, as many residents are not able to contribute their own resources to building improvement.

2.2. Housing Sector

Almost 70% of Latvia's population is urban (30% in Riga), and 68% of Latvia's residents live in apartments. There were 31,471 residential buildings in Latvia in 2000; of those, 21,112 are buildings with 3 or more apartments (Central Bureau of Statistics, 2001b).

Table 2. Apartments in Latvia

	Apartments (units)	Floor space (thousand sq. meters)
Urban	484,661	23,445.4
Rural	75,155	3,627.2
Total	559,816	27,072.6

Source: Central Bureau of Statistics, 2001b.

One third of Latvia's housing stock was built before 1940 and the remaining two-thirds between 1958–1991. Since 1991, construction of new buildings has dwindled to a minimum, and many half-built buildings have been abandoned. The only buildings built now are those with private finances.

Historic Origins of Latvia's Housing Problems

Forty-one percent of all apartments are located in pre-fabricated concrete panel buildings, which were built in Latvia and all over the Soviet Union from the 1950s until the early 1990s. The buildings constructed in the late 1950s to early 60s were primarily 4- to 5-floor buildings. Beginning in the late 60s, many 9-floor buildings were constructed (MEPRD BD and "Vides projekti," 2000b). They are grouped in high-density clusters on the outskirts of cities, generally well-connected to the city center with public transportation. Some were surrounded by stores, but for the most part, true neighborhoods never developed in these areas, thus they are often referred to as "sleeping cars." Because of urbanization and centralization trends in the Soviet Union, even most small towns have a few of these housing areas.

The panel buildings were constructed very quickly and have typically very low thermal resistance and energy efficiency. They were built in a standardized fashion and are commonly referred to by series number. Even though the Soviet Union's thermal resistance standards were two times lower than Germany's and Great Britain's and about five times lower than Sweden's (Martinot, 1997), many of the panel apartment buildings were below even those efficiency standards. Low-quality building materials were used and construction errors permitted. Moreover, no preventative maintenance and very little upkeep was carried out in the intervening years. Problems with the panel buildings include below-standard heat resistance, condensation and molding inside apartments with outer walls, draftiness, deterioration and an unattractive outside appearance (MEPRD BD and "Vides projekti," 2000b).

The state of other types of multi-family buildings is also problematic. Even where construction is of higher quality, thermal insulation in older buildings may be lacking and the neglected maintenance has allowed buildings to deteriorate to the point where large investments are required for renovation. As a result, 11% of all buildings are already considered to be in an emergency state, and further deterioration must not be allowed.

Neither the Latvian State nor its residents can be blamed for the burden that these buildings have become. Nevertheless, the renovation of these buildings is absolutely essential and must begin as soon as possible; therefore, all affected parties must cooperate in the effort. Comprehensive energy efficient renovation packages will not only improve their efficiency, but also prolong the lifetime of buildings and improve their

outer appearance and general comfort level. Renovation of the panel buildings could also make these areas more attractive to small and medium businesses and make residents feel more at home there, helping to revive these "sleeping car" regions and transform them into vibrant urban neighborhoods.

Housing Fees

A rent ceiling in municipally owned buildings has kept housing costs artificially low. Most heating subsidies were removed, however, meaning that heating costs for residents rose sharply. According to the 2000 Household Budget Survey, average expenditures for housing rent and utilities make up 16.8% of the household budget in Latvia, 18.6% in urban areas, and 22.7% for pensioners. Due to the poor efficiency of buildings, heating costs now make up the largest part of these fees. Distributed by quintiles (five income groups), the highest portion of the household budget spent on housing is in the 2nd and 3rd quintiles (18.9% and 19.1% respectively) not the 1st (lowest) (15.5%). This possibly reflects the fact that the bottom quintile has already been moved to social apartments and houses, or apartments with fewer amenities, and thus has lower housing expenses. According to the Household Budget Survey, 67.2% of urban households have difficulty paying their monthly rent and utility bills, and 18.7% of urban households have debts for heating bills (Central Bureau of Statistics, 2001c).

Privatization

During Soviet rule, all apartments were state or municipally owned. In 1991 a process of denationalization began (returning entire buildings to their previous owners), and in 1995 mass privatization of apartments was initiated. Residents were granted privatization certificates by the government; the number received was calculated on the basis of age and years of residence in Latvia. The certificates could be used to privatize apartments previously rented from the state or municipality (as well as to buy shares in state enterprises). The process is still ongoing and the speed has varied in different cities. In 1996 only 32% of apartments were privately owned, now 70% are privatized. The Privatization Commission estimates that at the end of privatization, 80% of apartments will be privatized and 20% will remain as municipal property, but some municipal governments are already short on social and rental property to meet the demand of poorer residents (Cabinet of Ministers, 2001a).

Through privatization of individual apartments, ownership of common space was also divided among residents, and the responsibility for building maintenance has been transferred to the inhabitants. After privatization, previous rent agreements were renegotiated as maintenance agreements, and the overall fees did not change. At first, residents felt little difference. Residents were not initially provided with much information

on the pros and cons of privatization, however, and many people do not realize or understand the implications of private property ownership and their responsibility for their property. Buildings where privatization has been completed have the option of terminating the maintenance agreement with the municipal authorities, forming a Homeowner Association (HOA) and negotiating their own maintenance arrangements, but the rate of this process has been slow to date. Regardless of the maintenance structure, privatization has made it more difficult for municipalities to play a role in housing renovation, and many city officials feel it is no longer their duty to help facilitate building renovation.

Energy Efficiency in Housing

Eighty-three percent of households in cities are connected to district heating. While in recent years most residents have begun paying for electricity, gas, hot and cold water according to meters, this is not the case with heating. The district heating system is usually based on a one-pipe system connecting buildings, meaning that radiators have no temperature controls and cannot be switched off without switching off the heat for all subsequent apartments in the loop. Buildings at the beginning of the system are frequently overheated and residents keep windows open even in winter, while apartments at the end of the circuit are cold and drafty (Martinot, 1997). Most cities have recently initiated projects to install building-level heat metering (for instance, a World Bank project in Riga), but the situation varies in smaller cities and towns in this respect and must be looked at individually.

Of all household energy, 77% is used for space heating. Several studies of energy flows in concrete panel apartment buildings show that 60–80% of heat losses could be saved (see Chapter 4). As mentioned in the previous section, residents are paying a comparatively high proportion of their income for heat. In the Riga "Energy House" example, at today's heating prices, approximately 100 LVL (160 USD) is wasted per household per year (University of Latvia Physics and Mathematics Department and Berlin City Senate Development Department, 2000).

District heat pricing formulas vary among different towns and cities, but prices average from 15–17 LVL/MWh (Meijere, 2000). Prices rose sharply after major state subsidies were removed. In most cities where building-level substations and meters have been installed, the building is charged according to the meter and the costs are divided among residents according to floor space, but residents still don't have an option of reducing heat use, nor can they monitor their consumption. In some cities, however, all residents still pay at a predetermined rate, regardless of building efficiency and usage. In Madona, for instance, building-level meters were installed, but bills were still paid according to a uniform rate up until 2002 (metering may start this year, according to the City Council).

2.3. Energy and Environment

Latvia's total final energy consumption decreased dramatically in almost all sectors after the economic downturn of the early 1990s. Energy consumption in the residential sector, however, has decreased only slightly in real terms, and has risen in proportion to other sectors. In 1998, the residential sector comprised 57% of end-use energy, and was the largest end user of energy (Cabinet of Ministers, 2000). The only option for decreasing residential heat demand is by using it more efficiently, and preventing heat losses from the buildings. Up to 70% of energy efficiency improvements can be achieved by reducing losses and inefficiencies on the demand side (MEPRD BD and "Vides projekti," 2000b).

Many projects and programs have been initiated for energy efficiency improvements in public buildings, such as the Ministry of Environment's Public Building Energy Efficiency Program and the World Bank Education Project, which has done energy efficiency retrofits in school buildings. To date, however, only a few major pilot projects have been done in the residential sector (see Chapter 4), due to higher transaction costs and because it is comparatively easier for investors to work with one large client than with many small ones.

Environmental Impacts of Energy

Housing energy efficiency measures should be addressed in a holistic manner and seen in the larger context of the urban energy system. Often the best approach is to renovate several aspects of the system together or in succession, in order to gain the best results. The order of measures taken is also of paramount importance, however, as each part of the system affects the others. Reducing the energy demand in buildings first, or in conjunction with boiler renovation or replacement can help increase efficiency, because the size of the new district heating boiler will be matched to demand, thus minimizing excess heat travelling through distribution networks (Gula, 2000). Current estimates of energy demand in Latvia are very inaccurate because of great heat losses in both the networks and the buildings. Therefore, it would be best to reduce inefficiencies at the end-user level first, then reduce losses in the distribution system, and finally adjust the capacity of the boiler to meet demand and switch to a cleaner fuel. Some projects in Latvia have been done in the reverse order, because the easiest projects to implement are larger ones, such as fuel switching and distribution system retrofits. In several fuel-switching projects, the new boilers were larger than necessary because demand estimates were inaccurate (Aistars, 1998). Thus, the residential sector and other end-users should be taken into account when planning other renovations to the energy system.

Energy efficiency in residential buildings is also related to air pollution, greenhouse gas emissions and global climate change. The energy sector is the main source of Latvia's greenhouse gases (50% in 2000), which contribute to global climate change ("Vides projekti," 2001). Two ways of reducing greenhouse gas emissions are to switch to cleaner fuels and to reduce energy consumption through reducing losses. Rēzekne, for instance, still uses heavy fuel oil in the boiler house, which is one of the dirtiest fuels available, both in terms of greenhouse gas emissions and other air pollutants, such as soot and particulate matter. Even in cities that use wood chips and other cleaner fuels, reducing heat consumption will reduce local air pollution and reduce the need for fuel.

Energy Efficiency and Urban Development

Recent trends are for wealthier residents (mostly in larger cities) to build private houses on the outskirts of town. In the long run, if policies are not introduced to preserve existing residential areas, these trends are likely to lead to greater segregation according to income levels, as wealthier residents move out of the worst regions. This, in turn, will lead to further deterioration of lower-quality housing, as low-income residents who are left in these buildings have no financial means of renovating them. Concrete panel blockhouses are likely to be among the first areas to be abandoned by wealthier residents. Changing residential patterns in larger cities could lead to urban sprawl and traffic congestion.

As concern over global warming increases around the world, more and more emphasis is being placed on encouraging high-density urban living areas with easy access to high-quality public transportation systems. Thus, the issue of energy efficiency in housing is closely tied to urban planning, and the system must be viewed as a whole. This is one aspect of this paper that is especially relevant for Riga, but applicable also to other larger urban areas. From this perspective, a city with inefficient, compactly built multi-family buildings is still likely to be more efficient than highly efficient single-family homes spread over a larger area. This is due to several reasons: single-family homes tend to be larger, and thus consume more energy, and residents of suburban single-family homes will consume more energy for transportation than residents of multi-family dwellings in urban areas (Towers, 2001). Higher-density dwelling areas also mean that development infringes less on surrounding forest and agricultural land, which is an important aspect of sustainability.

Thus, from an urban planning perspective, the compact, high-density multi-family residential sectors in Latvian cities are an advantage in terms of reducing transportation needs and curbing urban sprawl. For this reason, it is important to maintain these high-density neighborhoods. In order to make this possible, however, it is essential to make

them more livable through renovations that will prolong the life of the buildings and improve their appearance, as well as through ensuring access to goods and services and public transportation. Another important aspect to making these urban areas livable is maintaining and developing green open spaces surrounding the housing blocks (as opposed to the current trend of building parking lots), adding children's playgrounds and parks. Encouraging residents to renovate and continue to live in multi-family dwellings can be a long-term sustainable urban development strategy; therefore, it is important to save money on energy, which could be invested in improving living conditions in other ways.

3. POLICIES AND LEGISLATION

Energy efficiency in the residential sector is affected by policies in the housing, social, energy and climate-change sectors. This section will analyze how successful the integration of these policies in Latvia has been to date, and where improvements could be made. As a basis of comparison, it will use the UN Habitat Agenda, the global plan of action adopted by the international community at the Habitat II Conference in Istanbul, Turkey, in June 1996. The main principles of this convention are to reduce poverty and promote sustainable development, and to integrate priorities from various sectors that affect housing and urban development.

3.1. Housing Policy

The Housing Policy Framework Document of 1996 identifies the following priorities for housing development:

- ensuring that housing maintenance costs can be economically recovered;
- improving energy efficiency of buildings;
- conserving energy resources through metering water, heat and gas consumption and decentralizing system regulation;
- humanizing existing residential areas;
- ensuring social housing assistance to low-income and socially disadvantaged groups;
- increasing the share of private houses, low-density living areas and owner-occupied apartments through privatization.

These priorities are quite comprehensive, and while certain elements have been satisfied through recent policies, serious shortcomings still exist. Recently, several main policy initiatives have been undertaken to address the main priorities defined in the Housing

Policy Framework Document. The three main programs analyzed here are: a State guaranteed Home Improvement Loan Program, a World Bank Housing Project, and a review of housing policy legislation funded by a grant from the Japanese government.

Home Improvement Loan Program

The development of a mortgaging program and stimulation of a private housing market have been the main focus of the government in designing its housing policies. The Housing Construction, Renovation and Modernization Long-Term Lending Framework Document, approved by the Cabinet of Ministers in November 1997, began this process. The main goal of this document is to stimulate building of private houses through making longer-term, lower-interest loans more readily available. It also proposes tax-cuts for loan-takers. In the area of multi-family housing, it delineates the main priorities for renovation, including energy efficiency measures. State support is recommended in the form of state guarantees, although an example is also given from pre-war Latvia, when partial subsidies were given as reimbursement after successful completion of renovation work.

While implementation of the goals of the Lending Framework Document will help to stimulate the economy in the building sector, it does not provide any assistance to low- to mid-income groups, and may be at odds with larger urban development goals, by replacing high-density living areas with single-family houses.

The Home Improvement Loan Program was approved by the Cabinet of Ministers in June 2000, and the pilot phase begun in December 2001. It makes guaranteed low-interest loans available for three programs: renovation and energy efficiency improvements of common space in multi-family buildings, purchase and renovation of apartments by first-time buyers, and completion of unfinished housing projects. It sets the ground rules for a 15- to 20-year program with a 3-year pilot phase in these areas and establishes interest rates below 10%. During the pilot phase, it is estimated that 560 multi-family buildings will be renovated, and 15,000 apartments renovated. Total financing for the program will be 25 million LVL.

The strength of the Home Improvement Loan Program is that it does provide low-interest loans to a certain segment of the population, and places more emphasis on multi-family housing than the 1997 Framework Document does. Energy efficiency improvements in multi-family buildings are named as the main priority for the Loan Program (it is estimated that 450–490 million LVL would be needed for renovation of the panel housing blocks). Only 20% of the initial funds are channeled to this aspect of the program, however, because the program estimates that there are not enough creditworthy housing associations. The Loan Program identifies two main causes for the

slow rate of formation of Homeowner Associations: high differentiation among residents' income levels and lack of interest among residents in taking on responsibility for home ownership. Rather than addressing these two causes, however, the program makes funds available only for creditworthy residents with relatively similar income levels who already are interested in forming HOAs, and taking loans. The declared intention is for other groups to learn from the positive examples, but no measures are taken to address the differentiation of income levels and no wide-scale information campaigns have been initiated to interest residents in solving housing problems. More direct incentives will be required in order to stimulate the desired effect of more rapid formation of HOAs and initiation of building renovations.

The multi-family building component is targeted at increasing the rate of formation of HOAs and mobilizing private financing for renovating and improving these buildings. According to Appendix 3 of the Program, the Loan Program will be available to 40% of the population (with the highest income levels) assuming that they pay up to 40% of their income for their loan repayment. It is interesting to note that this is the same percentage of the population that is currently above the crisis subsistence minimum. The Program states that public financing for multi-family building retrofits is not being considered at this time because it would require new budget commitments, which are unlikely. The first evaluation of public co-financing will be done at the end of the pilot phase in 2004, although these funds would be greatly needed immediately by the portion of the population that can not afford these loans. 2004 is much too late, considering the number of buildings already in a state of disrepair and the number of buildings that could fall into disrepair in the next few years.

Another problem with the Loan Program is, as stated in Appendix 4, that with the current specifications multi-family retrofits are not economically feasible. Taking the average cost of a 60,000 LVL loan at 9% interest for 8 years, expenses for loan repayment will be slightly higher than the combined economic effect of improved energy efficiency and building conditions. The document recommends a 25% subsidy from the government to co-finance these retrofits. It can be understood, however, that such an option will also not be considered before 2004.

Experience in Lithuania with a similar state-guaranteed housing loan program shows that expected loan levels could not be reached until a 30% grant co-financing scheme was announced by the government, after which interest in the loan program grew significantly (Kazakevicius et al., 2001). Furthermore, a study done in Latvia estimates that approximately 30% of building costs will return to the government in the form of taxes (Šnīdere, 2000). Thus, combining a partial government grant with the Loan Program may be one effective way of assisting a larger portion of the population, and should be initiated as soon as possible.

There is also still a large vulnerable portion of society that is above the poverty line but below the crisis subsistence minimum, that is not aided by any aspects of the Home Improvement Loan Program.

World Bank Housing Project

Currently, the government is negotiating a 2 million USD loan from the World Bank, which would provide guarantees to local banks giving housing loans. As part of this project, three financial products are being developed. The first is a guaranteed mortgage loan for first-time home-buyers, which would allow them to make a smaller down payment (10% as opposed to the 30% currently required by commercial banks), or allow homeowners to take out a second mortgage for home improvements (including energy efficiency). The second product is a reverse mortgage for pensioners, providing them with funds to enable them to participate in building renovation programs (Cabinet of Ministers, 2002). The third is a guaranteed loan for multi-family building renovation, similar to the state Loan Program.

Both the home improvement mortgages and the multi-family building loans have the same potential problem as the state Loan Program: they will cater mostly to the top segments of the population that are already creditworthy, but will not make it possible for the low- to mid-income portions of the population to participate in home improvement programs, thus saving money and improving their social status.

The reverse mortgage loan for pensioners is a mechanism that is intended to enable pensioners with limited cash resources to participate in home improvement programs. Under this scheme, pensioners can take a loan by mortgaging their apartment, and use the loan to participate in the renovation of their home or building. It will only be possible to use this money for participation in a building renovation scheme, not for other purposes. Once the pensioner dies or moves to a different residence, the used portion of the loan must be repaid by heirs; otherwise, the apartment is bought back by the bank, and the benefactor receives the difference in cash. The bank can then resell the apartment at market price.

While the reverse mortgage scheme would allow pensioners to participate in building renovation, it will not aid poverty reduction in the long term, and proposes equity concerns for family members. Pensioners often have financial difficulties because neither they, nor their children and family members have enough money for their support, and this scheme only passes the financial burden on to the next generation. The apartment can be renovated and then resold to a buyer who can afford it, while, if the inheritors lack money to repay the loan, they lose the rights to the apartment, the value of which could rise and be a financial asset in the future. Even if the pensioner has no relatives,

the savings from energy efficiency improvements may not accrue in time for the pensioner's economic conditions to be improved. The responsibility for a social safety net for these people should not be handled through a commercial loan program, but rather through targeted social assistance.

Legislation Review

With funding from the Japanese government, a review of housing legislation has been undertaken by a governmental working group; some legislative changes have been made already, and others recommended. They include both institutional and policy changes, and are summarized in the Framework Document on Improvement of Regulatory Enactments on and Institutional Structure for Housing and Rents, approved by the Cabinet of Ministers in October 2001. The main legislative amendments are:

1. Proposed Establishment of a Housing Agency
Until last year, various housing policy functions were distributed among several ministries: the Ministry of Economics Energy Department was responsible for energy and energy efficiency policy; the Ministry of Environmental Protection and Regional Development Building Department (MEPRD BD), for setting building codes and developing housing policy; the Ministry of Welfare, for developing social assistance policies for low-income groups. The Residential Privatization Commission handles apartment privatization. In order to simplify matters, all of these functions (except privatization) were handed over to the MEPRD BD as of 2000, but the department did not receive any additional staff or funds.

The formation of a new Housing Agency under the supervision of the MEPRD BD has been proposed. The new agency would take over the funds from the Privatization Commission once privatization is completed (expected next year), but it is not clear when the new Agency will officially be approved. A comprehensive approach to housing policy can not be expected until adequate financing is available at the state level. Municipalities are responsible for the day-to-day housing matters in their jurisdiction (setting rents, privatization, providing social assistance, maintaining municipally owned housing), but also often lack adequate staff, funding, and professional training.

2. Changes in Rent Control
Until 2001, rent ceilings were set by municipalities. These rents were too low to cover maintenance costs of buildings, but did protect poorer residents. In 2001 the Law on Apartment Rents was amended, making it possible for apartment owners to charge higher rents to cover maintenance costs, as well as to make a profit. The rent ceiling is incrementally being raised.

The introduction of new mandatory maintenance fees can also be problematic for low- to mid-income residents. Without additional social support, these changes can significantly worsen the creditworthiness of low-income residents. While it is true that current rent and maintenance fees must be increased to cover costs, it is necessary to decrease other costs at the same time; otherwise, the changes will only worsen the social conditions of residents. Energy efficiency retrofits would make it possible to use money saved on heating bills for building maintenance, renovations and improvement of living conditions.

3. Other Proposed Changes

In addition, the Framework Document on Improvement of Regulatory Enactments on and Institutional Structure for Housing and Rents recommends several other changes to be incorporated into further legislative amendments:

- making the establishment of homeowner "communities" (instead of officially registered cooperatives) automatic for all apartment owners, meaning that all decisions taken with 2/3 majority (including taking a loan) would be binding for all residents;

- making a greater portion of housing maintenance costs obligatory for all apartment owners (until now, only "necessary" building maintenance expenses were obligatory; this would make also "recommended" renovation expenses binding for all residents).

While the proposed legal changes would ease the bureaucracy currently surrounding the formation of HOAs, such a law has grave social implications, because it essentially allows richer residents to vote poorer residents out of the building. If a decision is taken by the majority to take a loan, then those in the minority will be forced to relocate if they can not afford to pay back the loan. This will significantly increase social stratification and segregation. In addition, these policies would facilitate renovation and retrofits by those residents who are better off, but not for those who are currently in the greatest need of reduced utility bills. Any new regulations or laws governing HOAs must be accompanied by parallel legislation protecting the rights of the socially disadvantaged poorer residents. A targeted social assistance fund that would allow low- to mid-income residents to take out housing energy efficiency loans would help to maintain socially diverse neighborhoods, while still allowing retrofits to take place.

Another initiative currently being developed is a Danish grant to set up Housing Advisory Centers in various regions of Latvia. The Housing Advisory Centers would work hand in hand with the various lending programs to help Homeowner Associations on legal, financial and energy efficiency matters. Trained staff would help coordinate energy audits and bank loan requirements and spread information to other resi-

dents and homeowners (Blezūrs Consultants, 2001). The institutional basis on which to develop these centers has not yet been determined, but the overall model of housing advisory centers has been successful in Lithuania and is a very valuable idea. These centers could be instrumental in stimulating interest and motivation in home improvements and energy efficiency retrofits, and providing consultations to residents. It is of utmost importance that these centers are accessible to the public and gain the trust of residents, that they do not represent any interested parties (like construction firms, banks, etc.).

Housing Policy Assessment

Looking back at Latvia's Housing Policy Framework Document, it can be seen that inadequate attention has been paid to at least two priorities: providing adequate social assistance to the low-income sector and making residential areas more livable. Also, the installation of heat meters has only taken place at the building level, and not at the apartment level, where meters would provide residents with direct feedback on the amount of energy they use and could potentially save.

The overriding goal of the most recent policy initiatives in the housing sector has been to encourage residents to take on greater responsibility for their property in the form of HOAs, and to encourage greater use of private-sector money for housing programs. At the same time, the social inequalities and lack of interest in building maintenance pointed out as being the main causes of the slow formation of HOAs have not been addressed. Instead of making the formation of HOAs the main goal of housing policy, it may be a better short-term strategy to target energy efficiency and home renovation matters first. Small projects could be run through existing municipal building maintenance organizations, as a way of freeing up residents' resources for further improvements, as well as educating people about more comprehensive energy efficiency options that are available for whole building projects. This approach would create incentives for residents to form HOAs, thus reducing some of the social problems currently associated with the idea.

Each of the analyzed housing policy programs addresses certain aspects of Latvia's housing problems, but there is no unified comprehensive housing policy plan which establishes goals for all social groups and all types of housing. Hence, programs targeted at relatively well-off and creditworthy households have been initiated first, as well as some programs for social housing. This combination leaves a large gap in the middle segments of society (and those most in need of smaller utility bills resulting from energy efficiency), which do not yet have improved access to energy efficiency and home improvement measures.

The consequences of this incremental policy approach in the long term will be further deterioration of the buildings that are most in need of repair and renovation. This will lead to increased social stratification and segregation, which can lead to a deepening of social and health problems in poorer segments of the population. Segregation can also lead to urban sprawl and increased traffic congestion if richer residents move to new suburban developments. The energy efficiency issue will be addressed in some buildings, but only in a technical sense, while the larger social and environmental issues remain unsolved. The lack of sufficient policies to address these points means that energy efficiency and building condition will not be improved as much as it could be or in the places where it is most necessary. For these reasons, assistance to the low- to mid-income sectors of society for beginning energy efficient renovations must be made a priority in housing policy.

3.2. Social Policies

Energy efficiency policy cannot be addressed without a broader investigation of social conditions and social policy. As can be seen from the statistics on income and poverty levels mentioned in Chapter 2, housing policy must take into account the grave social problems and the high incidence of poverty in the country. The main social policies concerning housing are regulated by the Law on Social Assistance, the Law on State and Municipal Assistance to Residents in Housing Matters, and the Law on Social Housing. Under this legislation, social assistance is delegated entirely to the municipal governments.

According to these laws, municipalities have the responsibility of providing housing for all vulnerable and socially disadvantaged groups, defined as families with children, invalids, or pensioners who are not under the care of a family member. These groups may not be evicted for non-payment until another dwelling has been found for them. In these cases, families are usually transferred to apartments with fewer amenities (shared bathrooms, etc.) or to social housing. There are often waiting lists in municipalities for housing and social assistance. Other families may get evicted from apartments if they accrue debts over 300 LVL.

Municipal governments currently provide housing assistance to low-income residents in three ways. One is to grant monthly housing allowances to needy families to help cover rent and utility payments[1]. The second is to move the family to a municipally

[1] Inhabitants are eligible for social assistance if, for a period of three months, the income level/member of household is less than 75% of the poverty level defined by the Cabinet of Ministers. At this level, they are eligible for a basic monetary subsidy as well as a supplementary subsidy for housing needs, but this is determined by each municipality. In 2000 the poverty level established by the Cabinet of Ministers was 28.67 LVL/household member/month.

owned social apartment (often in buildings where some apartments are privatized), which reduces rent and utility costs (amount determined by each municipality) or to grant the family social apartment status in their place of current residence. The third is to move families to social houses, where residents receive 75% rent reduction and 25% reduction on costs for heating and utilities. In 2000, housing subsidies made up 38% of all social assistance for residents of large cities and 22% of social assistance for other residents. Total municipal expenses for housing subsidies were 4,594,222 LVL, granted to 171,621 residents. The distribution of benefits varies greatly among municipalities, ranging from 9.8 LVL to 38 LVL on average/recipient (Ministry of Welfare, 2001).

The above data demonstrate a major problem with the current social system as identified by the Ministry of Welfare (2000a): municipalities use the funds delegated by the state government for social assistance in very different ways. In many cases, not all socially disadvantaged people are officially registered and thus do not receive aid. This problem could partially be solved by the new Framework Document on Guaranteed Minimum Income accepted by the Cabinet of Ministers in 2000, which mandates that all municipalities ensure that each inhabitant has an income of at least 21 LVL/person/month, after which municipalities may pay additional subsidies and assistance at their discretion. This system is currently being tested in a pilot phase. This level, however, is still well below the crisis subsistence minimum and the statistical basket of goods and services, thus leaving a vulnerable middle-income gap.

In 2000, there were 748 social apartments in Latvia, 645 of those in cities, and 48 social houses, 33 of those in cities (Central Bureau of Statistics, 2001). Although social houses provide assistance to poorer residents, the focus on establishment of social houses is problematic because it isolates their residents from other members of society, thus providing them with less possibilities for integration and for overcoming their social situation. Isolation in social houses is likely to exacerbate other social problems. For these reasons, more emphasis should be placed on helping residents to pay their rent and utility bills, and lowering their bills through energy efficiency measures, while allowing them to stay in their places of residence.

In sum, social assistance policies leave a large part of the population vulnerable. Individuals with income levels above the established poverty level yet below the crisis subsistence minimum may not have enough to pay basic housing costs, but have no social assistance available to them. This means that they are also less likely to be creditworthy for taking out a loan for energy efficiency improvements that would save them money in the long run. Sustainable urban housing policy must address these needs more effectively.

Part of the 4.6 million LVL that municipalities spend on housing and heat subsidies could be used more effectively by investing in one-off basic energy efficiency projects that would reduce heating costs, as opposed to paying for monthly heat losses. This could be problematic at the municipal level because social budgets are administered separately and can not be easily switched to what are perceived to be technical issues. Therefore, it must be stressed that energy efficiency investments will help improve social conditions as well, and provisions must be made to include energy efficiency improvements as one type of social assistance. Implementation of simple energy efficiency improvements is also an ideal project for the Employment Office, where unemployed people could be trained in implementing low-cost energy efficiency measures, and the result would be a valuable service for both new workers and residents.

3.3. Energy and Climate-Change Policy

The main laws in the energy sector affecting residential energy efficiency are the Energy Law (Saeima, 1998), and the National Energy Efficiency Strategy (Cabinet of Ministers, 2000). Latvia is also a member of the Energy Charter, and several EU directives influence its energy efficiency policies.

According to Latvia's energy policies, district heating companies are under the control of local governments. The Law on Energy seeks to eliminate state subsidies in the energy sector, mandating that actual costs of energy supply be paid by consumers. This is significant as it marks a change in policy from subsidizing suppliers to targeting social assistance to the needy. This assistance to date, however, has not been adequate, as discussed in section 3.2.

The Energy Law has an overall goal of increasing the efficiency of the energy system, but pays only cursory attention to energy efficiency at the end-user level and does not address existing buildings. This is to a great extent due to the division of responsibilities discussed in the housing policy institutional infrastructure section, whereby the Ministry of Economy is responsible for the energy sector, but mostly for the supply and delivery of power and heat. The MEPRD BD handles all matters concerning heat and energy use inside buildings. This division of responsibility creates an artificial break in the energy system and often hinders projects from focusing on both the supply and demand side of heat energy.

The National Energy Efficiency Strategy (2000) is the most comprehensive document regarding energy efficiency and sets the goal of improving energy efficiency by 25% by

2010. However, it provides no financing to reach this goal. It breaks new ground in that it mandates new building codes, as well as energy audit guidelines for building renovation. Since 1999 there is a revolving Energy Efficiency Fund, supported by PHARE and the Mortgage Land Bank of Latvia, which gives low-interest loans for energy efficiency projects. The total amount of the fund is around 3.5 million euro. The loans are primarily available to municipalities and small businesses, although they could be made available for housing projects too.

Harmonization with EU Policies

Energy efficiency is also a priority for Latvia for accession to the EU. Latvia has signed the European Energy Charter and the Energy Efficiency Protocol. The EU initiated the SAVE (Specific Actions for Vigorous Energy Efficiency) program in 1991 in order to help stabilize CO_2 emissions, reduce reliance on imported fuels and complement technical energy saving policies with non-technical measures. SAVE directive 93/76/EEC seeks to decrease CO_2 emissions by increasing energy efficiency and mandates energy audit and certification guidelines and monitoring of energy consumption (MEPRD BD, "Vides projekti," 2000b). In 2001 the European Commission proposed a new directive on energy efficiency in buildings, including existing buildings. The directive would require energy efficiency measures to be incorporated into any larger building renovation programs.

Climate-Change Policy

Increasing energy efficiency will also reduce greenhouse gas emissions, as the residential sector is currently the largest end user of energy, and the energy sector is the largest source of GHG emissions. Latvia is a party to the UN Framework Convention on Climate Change (UNFCCC), resolving to reduce greenhouse gas (GHG) emissions to 1990 levels by the year 2000. Latvia is also currently undergoing the ratification process of the Kyoto Protocol, which, if implemented, would mandate an additional 8% reduction from 1990 levels in the time period from 2008–2012. Latvia's emissions are currently less than half of 1990 levels, and Latvia does not expect to have any problems meeting its commitments. Nevertheless, climate-change mitigation projects are a good source of potential funding for energy efficiency projects.

Because emission reductions in developed countries often involve costly technology change, the Kyoto Protocol includes three "flexible mechanisms" which provide industrialized nations that have emission reduction commitments with least-cost options to reduce emissions. These are Joint Implementation (JI), the Clean Development Mechanism

(CDM), and International Emissions Trading (IET)[2]. Central and Eastern European countries are a very attractive target for JI projects.

Currently, an inter-ministerial working group has been established to devise Latvia's national criteria for Joint Implementation projects. Energy efficiency in buildings is one possible project type. Although implementation of projects like the Berlin-Riga "Energy House" (see Chapter 4) project through Joint Implementation has been discussed, this option has not been utilized yet (none of Latvia's 24 pilot phase AIJ projects were in the residential sector). The process of devising a national JI policy is a lengthy bureaucratic process, but is also complicated at the political level, because Latvian officials feel that if the criteria are too strong, investors will choose neighboring countries to invest in instead. It is crucial, however, that the programs are carefully designed in a way that will maximize emission reductions, yet also provide other local social and environmental benefits.

The other Kyoto Protocol flexible mechanism that could be used to finance energy efficiency improvements by establishing a revolving fund from the proceeds of selling excess emission reductions is Emissions Trading. International guidelines have not yet been established for this procedure, however, and Latvia is also not likely to develop its own rules and start applying the mechanism until a much later date.

In general, Latvia's approach to climate-change policy has not been very active to date. Project choice has been dependent almost entirely upon the investors, and Latvia has not taken advantage of this opportunity to implement high-priority projects, such as residential energy efficiency.

3.4. Sustainable Urban Development: Missing Links

In sum, current policies in the sectors analyzed do not necessarily facilitate energy efficiency retrofits, which would help attain other urban sustainability goals. Housing and energy efficiency policies have begun to be integrated through attention to energy efficiency measures in the Home Improvement Loan Program, but current social poli-

[2] JI is a mechanism whereby countries with emission reduction commitments can invest in emission reduction projects in other countries that also have commitments, but where reduction costs are cheaper. The CDM is similar to JI, but investments are made in developing countries that do not have emission reduction commitments under the Kyoto Protocol. IET refers to the establishment of a global market on which emission reductions from one country could be sold to a country that has exceeded its reduction commitments.

cies in the housing sector leave a large part of the population vulnerable, and no energy efficiency programs are currently targeted at helping the low- to mid-income sector. Possibilities for financing these programs through other energy sector programs (Energy Efficiency Fund, Joint Implementation projects for climate-change mitigation) have also not been taken advantage of sufficiently. The two main problems are a lack of clear incentives for residents to implement energy efficiency measures (insufficient information about the economic, social and environmental benefits), and a lack of targeted programs for low- to mid-income groups.

In a broader context, the sustainability of Latvia's housing and urban development policy can also be assessed by comparing it to the broader context of the UN Habitat Agenda (1996), where sustainable human settlements are defined as:

> "societies that will make efficient use of resources within the carrying capacity of ecosystems and take into account the precautionary principle approach, and by providing all people, in particular those belonging to vulnerable and disadvantaged groups, with equal opportunities for a healthy, safe and productive life in harmony with nature and their cultural heritage and spiritual and cultural values, and which ensures economic and social development and environmental protection, thereby contributing to the achievement of national sustainable development goals."

More specifically, the Habitat Agenda mandates commitments to the issues of:

1. Adequate shelter for all (especially vulnerable groups) and social development, including eradication of poverty, creation of employment, social integration and gender equality;

2. Environmentally sustainable, healthy and livable urban settlements, including sustainable land use, energy and transport, and rehabilitation of cultural heritage;

3. Improved urban economics, domestic financial resources and economic interests;

4. Capacity building and institutional development, relating to balanced development of settlements in rural regions, strengthening of local authorities and popular participation and civic engagement, technology transfer, information exchange and international cooperation.

Although many of these ideas are incorporated to some extent into the Latvian Housing Policy Framework Document and other documents, in practice they have not been fully implemented. The following observations and recommendations can be made:

Adequate Shelter and Social Development

This is the weakest element of Latvia's urban housing policies and requires immediate attention. As stated in the Poverty Reduction Framework Document (Ministry of Welfare, 2002), programs in various sectors are often not coordinated, and many programs do not necessarily help the poor. Current policies surrounding residential energy efficiency are one example, as lending programs will make energy efficiency possible for more residents, but not to the lowest income sectors that need it most. Immediate attention is required to the need for state support programs for low- to mid-income residents to run parallel with existing crediting programs. These would make it possible for residents to stay in their current apartments and participate in building improvement, thus promoting social integration. Carefully designed programs could also be a way of creating meaningful employment.

Environmental Sustainability

While increasing attention is being paid to energy efficiency, other environmental issues, such as sustainable land use and transportation, are often not considered along with housing policy development. For instance, several housing documents refer to the fact that per capita floor space is much lower than in Western European countries, thus justifying the priority to build more private houses (Cabinet of Ministers 1996b, 1997). These are incorrect indicators; instead, a broader sustainable urban development perspective must be used, giving priority to renovating and modernizing existing higher-density urban areas to make them more livable (humanizing them) and ensure high quality goods, services and public transportation. This would encourage residents to live in these neighborhoods, thus preserving surrounding open space and preventing urban sprawl. An alternative to new single-family homes is buying and joining together two apartments in order to increase floor space, and investing in the establishment of green open space and community gardens and children's playgrounds around existing neighborhoods.

Urban Economics

The use of economic instruments and state support in the form of guaranteed home improvement loans is a good beginning, but these policies are still aimed only at a certain segment of the population. The aim of state support should be to care for those who do not have access to private and commercial capital, but current policies do not meet these criteria. More emphasis should also be placed on job creation and use of local companies and resources through more wide-scale programs.

Capacity Building, Institutional Development, and International Cooperation

Certain reforms have been made in the area of institutional development and capacity building. The Danish Housing Advisory Centers, if approved, will also improve this area greatly. To date, civic engagement levels on issues related to housing have been low, however. This could be improved both by provision of more information to residents and more active involvement by NGOs in continuing programs like "Volunteers for Energy Efficiency" (see Chapter 4.2.). Advantage should be taken of international cooperation to help with technology transfer for the training of skilled energy efficiency laborers and companies, especially already existing programs like JI.

In conclusion, while Latvia's housing, energy, and social policies each touch on certain elements of the complex urban sustainability system, they still exist as three separate entities. The policies in all of these sectors are not integrated to form a comprehensive sustainable urban housing and development framework. Housing policies need to be more integrated with social priorities and placed in a larger environmental context. Options for doing so are further analyzed in Chapter 6 and specific policy recommendations are made in the last chapter.

4. ENERGY EFFICIENCY POTENTIAL

As attention to the problems of energy efficiency in housing has grown in recent years, a few major studies have been done to show the possible technical solutions to the problem, and some pilot projects have been implemented. This chapter will review the most important of these.

4.1. Technical Studies and Pilot Projects

Most of the panel apartment houses in Latvia are of seven different types, identified by series number (103, 104, 119, 318, 464, 467, 602). A comprehensive evaluation of the energy efficiency of each of these "series" was completed in 2000 by the environmental project agency "Vides projekti" with support from the Dutch government. The report concludes that insulation and energy efficiency retrofits would reduce energy dependence on other countries, reduce emissions of GHG and other pollutants, and reduce costs of district heating renovation due to a decreased amount of transported heat energy. Furthermore, it would create a market for locally produced construction materials used in insulation and create new jobs in both the construction industry and in a new energy efficiency specialty. For residents it would greatly reduce costs of space heating, increase the comfort level of apartments and decrease health problems.

The "Vides projekti" study ranks various building insulation measures for each type of building according to saved energy, costs, and payback time, with specific technical instructions for each. The study can serve as a good handbook for municipalities in planning investments.

Another major study, "Potential CO_2 Emission Reductions from Energy Efficiency Projects in Buildings," funded by the Dutch government as part of the SCORE program, used the computer model MARKAL to evaluate the optimum energy efficiency packages in different types of buildings. The Latvian Development Agency Energy Department carried out the project, comparing achievable effects of three different packages of renovations. All packages include elements of improving heat resistance of the building envelope, heating system improvements and upgrade, hot water system

improvements, and improvements in the ventilation system, but the packages vary in the extent of the measures.

This study shows the potential for various degrees of efficiency and savings that are possible in one building by combining elements. Results are presented of a study for a five-story panel building in Valmiera (Series 103). The total costs for the simplest package would be 84,670 LVL, costs for the medium package would be 179,605 LVL, and 285,150 LVL for the most extensive package. Energy savings are 44%, 53% and 64%, respectively. Costs per square meter range from 28 to 94 LVL.

Pilot Projects

Despite the documented potential for technical solutions, the implementation of multi-family building retrofits has been slow, due to the barriers discussed in previous sections. A few projects in multi-family residential buildings have recently been financed through the Mortgage Land Bank. Several pilot projects have also been implemented though technical assistance programs and have demonstrated the real costs and results that are possible with various energy efficiency measures, as well as some of the potential problems. Three of these projects are reviewed below, as well as an NGO project.

SCORE

The Netherlands SCORE program co-financed and implemented renovations in 12 residential and 4 public buildings in 1997, with grants of up to 30% of renovation costs. These were all partial renovation programs – some buildings had building-level substations and heat meters installed, others had some of the outside walls insulated, and one was a complete renovation package. Of the residential projects, 11 of the projects were in panel buildings and 1 in an older pre-war building. Eight projects included only building-level substations and meters, but the other 4 projects included more complex packages of renovations (MEPRD BD and "Vides projekti," 2000a).

Since these were among the first energy efficiency pilot projects, they experienced many problems. The most comprehensive retrofit package was not finished because additional funding could not be obtained. In the eight buildings where substations were installed, they should also have controlled the hot water for the building, but workers discovered that the hot water system was too corroded and would have required much larger renovation investments.

By 2000, only two of the projects had quantified results – in both, the costs were approximately 40 LVL/m^2. It was not possible to quantify the results in some of the other projects due to poor data. These projects were very useful, however, in bringing energy efficiency to the consciousness of the public, and showing the first real experience with residential energy efficiency.

Ludza

Another residential project financed by the Dutch government was retrofits in two concrete panel buildings in Ludza (Series 318 and 467). This was one part of a larger energy efficiency project which included renovation of the district heating system (supply side) and efficiency improvements in the school. Of the two residential buildings, one was a comprehensive package, where the heating system was balanced and renovated, individual controls and meters were installed on radiators, windows were replaced in some of the apartments (and in some not, as a control experiment), and a ventilation system was installed. The other was less extensive, but combined the most essential elements of heating system balancing and upgrading (without installing controls on the radiators), water system and ventilation retrofits.

The costs of the projects were significantly lower per square meter than in the SCORE projects – 26.3 EUR/m^2 in the more complex package and 8 EUR/m^2 in the simpler project. Efficiency data from post-project monitoring, however, is not available. The Ludza project was also the first project which conducted some resident surveys on their opinion of the heating system and the need for improvements. The survey results indicated that 73% of town residents were informed about the project (mostly through the local paper). Residents saw the main priority of the project as improving the quality of the heating system; the second priority was lowering heating costs, and the last was switching to an environmentally friendlier fuel. Residents were more interested in energy efficiency after seeing project results (88%), but only 4% would be willing to invest their own money in energy efficiency retrofits (Ekodoma, 2001b).

The project had several problems, however, both technical and social. On the technical side, some residents did not use their new ventilation systems, which resulted in mold forming on the walls. Some residents also ended up paying more for heat after the temperature controls and heat meters were installed. This was due to the inherent inaccuracies of paying according to floor space before the project, because apartments with outer walls will always need more heat than inner apartments. On the social side, many residents were confused as to the way in which the buildings were selected and felt cheated that their building was not selected. Also, the residents of the selected buildings felt it unjust that some apartments had more work done in them than others (Ekodoma, 2001b).

Berlin-Riga "Energy House"

The most comprehensive project to date has been the Berlin-Riga partner project "Energy House," funded as a gift from the city of Berlin. The project consisted of the complete retrofit and renovation of almost identical buildings in Berlin and Riga (Series 602). Detailed feasibility studies were carried out before the work was started. The reconstruction occurred during the summer of 2001, and the first heat savings are being recorded during this heating season.

In this building, all outside walls, the roof and the basement were insulated and refinished, windows replaced, and heating systems changed to an individual control and meter system. This is the largest residential building that has been retrofitted as a pilot project, but also the most expensive. Expected costs for the project were 230,640 LVL in total or 58.31 LVL/m^2, and projected energy savings were about 60% (University of Latvia Physics and Mathematics Department and LU Foundation, 2000). Monitoring results from the first months show an average of 45% savings (as compared to a similar control building), with February showing 55% savings. Actual costs came to 80 LVL/m^2.

NGO project "Latvian Volunteers for Energy Efficiency"

"Latvian Volunteers for Energy Efficiency" is a joint project with NGOs from Rēzekne, Madona and Smiltene, initiated by the Public Policy Institute as a means of raising awareness about residential energy efficiency measures. The program was developed in close conjunction with the International Energy Brigades, an NGO network that has been working on similar projects in Central and Eastern Europe since 1994. Volunteers from each of the Latvian cities were trained in window and door weather-stripping, using specially adapted carpentry tools and silicon strips. Average energy savings are 10–20%, depending on the building. The advantage of using silicon strips is that they last at least 10 years, can be removed and put back again after painting windows, and allow windows to be freely opened and closed for ventilation throughout the heating season. Weather-stripping can be done in any individual apartment to increase temperatures and comfort levels, reduce noise and dust from outside. Economic benefits, however, are only possible if all apartments are treated and there is a heat substation in the basement where the heat supply to the building can be regulated.

During the pilot project, one small multi-family building in each of the three towns was weather-stripped. The first results show temperature increases in apartments of approximately 2 degrees Celsius. The future aims of the program are to provide a free volunteer service to pensioners and socially disadvantaged groups. The service will also

be available to other residents who are able to pay for the cost of the silicon strips (0.45 LVL/m).

As a part of the program, a resident survey was also conducted in the three cities (100 people in each city). The main findings from the survey are that 35% of residents are only partially satisfied with their heating system because they are not able to control temperatures in their apartments. 59% of respondents said they have large gaps in the windows and 48% feel that weather-stripping and insulation are very necessary in their apartments. 80% have at some point tried to weather-strip their own windows using either glue-on strips or other materials, and about the same percentage would be interested in professional long-lasting weather-stripping (of those, 44% only on low-price conditions). Insulating or replacing windows were the first priorities of residents as types of energy efficiency measures, followed by the installation of heat controls on the radiators, and then by insulation of outer walls. Ranking of reasons for interest in energy efficiency measures reveal that people see energy efficiency primarily as a means of saving money, increasing temperatures and improving the appearance of the building; environmental protection is the last priority.

35% of residents feel that the maintenance of multi-family buildings should still be the responsibility of the municipalities, but an almost equal number believe that it is their own responsibility. Approximately 10% of residents would be willing to take out a loan for insulation projects, but only at very low interest rates. 42% feel that they do not have enough income to take a loan, 26% feel that it is not their responsibility, and another 10% have other higher priorities.

There is great potential for expanding such NGO volunteer weather-stripping programs in conjunction with municipalities, and training unemployed people as part of State Employment Office projects, in order to reach as many residents as possible.

On the whole, the results of the various pilot projects have been mixed. While most show the potential for significant energy savings, many of the first projects suffered from problems with lack of accurate data about energy use prior to the project; many projects have also done insufficient monitoring after the completion of the project, so that efficiency could not be measured. Most projects also suffered from insufficient information and awareness-raising efforts for residents, which resulted in both social problems (dissatisfaction from residents who weren't selected) and technical problems (improper use of newly installed technologies). These problems could easily be overcome by investing larger portions of the initial project financing in informational and educational campaigns, as well as monitoring. Financial problems resulted both because building conditions were worse than imagined and because of lack of possibilities to secure co-financing from other partners. The first issue is a contingency that

must be reckoned with; the latter is an issue which has been at least partially solved by the new availability of low-interest loans.

General lessons from the pilot projects are that comprehensive retrofit packages are most beneficial, but that it is very important that controls are installed first in order to insure that residents have both an incentive and a means to reduce heat consumption.

4.2. Categorization of Energy Efficiency Measures

As this chapter has shown, various technical solutions exist for multi-family building retrofits, both low-cost and more expensive ones. In general, the various components of possible multi-family building retrofits can be broken down into three categories according to costs and payback times:

1) Low-cost measures:
   a) weather-stripping windows;
   b) reflective pads behind radiators;

2) Medium-cost measures:
   a) building-level substations (already implemented in many buildings);
   b) heat system balancing;
   c) thermostatic radiator valves;
   d) heat allocator meters on each radiator;

3) High-cost measures:
   a) insulation of outer constructions;
   b) replacement of windows;
   c) reconstruction of heating system to two-pipe system;
   d) automatic ventilation system.

The exact savings possible from each measure will depend to a very great extent on each building's specific characteristics. For policy evaluation purposes, however, certain assumptions can be made. It can be assumed that the low-cost measures can be implemented in individual apartments and can save up to 20% of energy. These measures may increase warmth and comfort if implemented individually, but will not reduce heating costs if they are not implemented in the whole building and there are no possibilities for reducing the amount of heat coming into the building.

The medium-cost measures already require more coordinated technical action in the whole building and will have longer payback times, but, if implemented along with the low cost measures, could produce up to 40% energy savings. These measures make it

possible to reduce consumption and to pay according to consumption, and can thus produce incentives to increase efficiency. It must be emphasized, however, that the effect of thermostatic radiator valves will depend on how residents use them. These measures require that adequate information on their use be supplied to residents, and require active participation (for instance remembering to turn radiators down at night and when rooms aren't being used) for any effect to be had. Hence, the use of heat allocator meters, which allow payment according to consumption, may either increase or decrease costs for residents. Although installation of the allocators is not expensive, separate consumption-based bills must be prepared by a company, which produces an extra cost for consumers.

Comprehensive retrofit packages that include low-, medium-, and high-cost elements require coordinated action and high financial investment, but may save approximately 60% (in some cases even more) of energy, depending on the combination of elements, and sometimes the payback time is just as short as for smaller projects.

The benefits of comprehensive energy efficiency retrofits include many non-energy related benefits, such as improved comfort levels inside apartments, which positively affect residents' health and welfare. Prolonged life of buildings and a renovated and improved outer appearance are other such benefits. The combined effect will make these residential areas more livable for residents and more attractive for businesses to invest in developing goods and services, thus promoting sustainable urban development.

5. CONCLUSIONS

Energy efficiency measures in multi-family buildings can begin a chain of social, environmental, and economic benefits that facilitate urban sustainability. The effects are summarized in Figure 1.

Although current policies and programs in Latvia have begun to solve some of Latvia's housing problems, the urban sustainability chain shown in Figure 1 has not been started. Energy efficiency is currently not emphasized enough as a means of achieving the multiple goals of urban sustainability. Also, a gap exists for low- to mid-income groups, where no safety nets or incentives currently facilitate their participation in home improvement programs or energy efficiency upgrades.

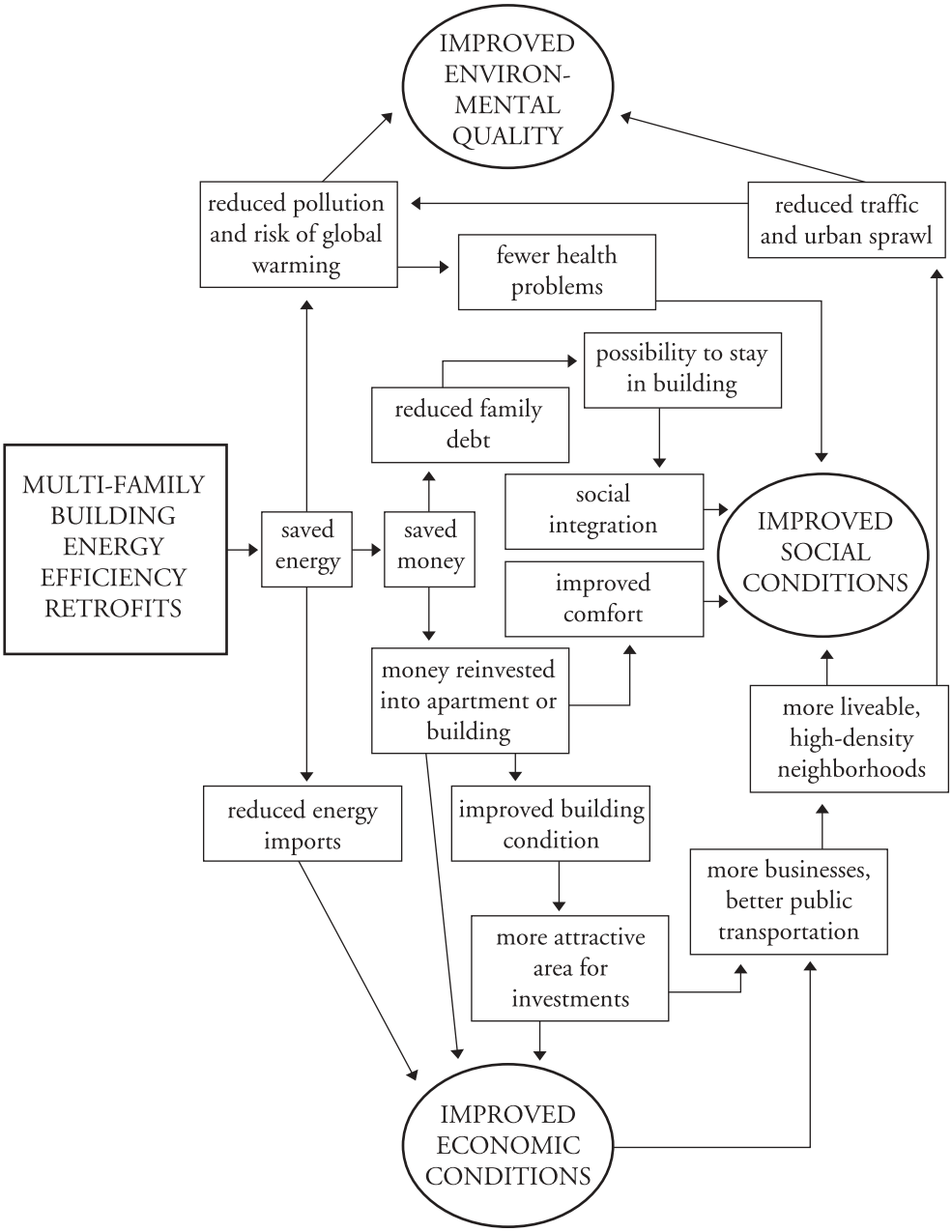
Requirements of future policies

There is a natural reluctance to spend public resources in the private housing sector, in the hopes that private resources and market forces will resolve the problems. This study shows, however, that lack of public intervention can lead to a worsening of the situation and have severe long-term consequences, such as housing degradation, social segregation and urban sprawl. Active state involvement is necessary to help overcome the barriers that are currently preventing certain segments of the population from participating in housing renovation programs.

Thus, several main conclusions can be drawn regarding the need for future policies:

1. A transition period is needed in housing policy.
The transition from fully subsidized public housing and heating to a private housing market can not occur instantly. Despite privatization, there is a need for a transitional housing policy period, beginning with greater public intervention designed to address immediate social needs and produce incentives for further action by other inhabitants using their own resources. After an initial period, when the most pressing problems have been resolved and the first savings have accrued, public funding can be incrementally withdrawn and replaced by private resources. Public funding should initially

Figure 1. Urban sustainability diagram



be widely distributed in moderate amounts, in order to provide incentives for further funding from private sources. Separate targeted funds should be developed for groups with specific needs.

2. Responsibility for the burden must be shared.
Responsibility for the problem must be shared among the state government, local governments, NGOs and residents. The new Housing Agency should take on coordination and monitoring of each agency's functions. The national government must take on partial responsibility for housing problems, because energy imports and security of supply, the mitigation of global climate change and the social welfare of the country's inhabitants are all national issues. According to national law, municipal governments are responsible for social programs and assistance for low-income and disadvantaged sectors, therefore municipalities must assume responsibility for the low-income programs. NGOs also have a role to play in solving the problem, both with practical projects, as the program "Volunteers for Energy Efficiency" has already shown, and as a communication bridge between the government and the public.

3. A social safety net is essential for both low- and mid-income residents.
Even though new lending policies are making energy efficiency retrofits available to a larger portion of the population, they do not minimize inequities, and housing problems remain unsolved for a large portion of the population. For the purposes of assisted energy efficiency retrofits, a wider definition of need should be applied, such as the crisis subsistence minimum defined by the Ministry of Welfare. Small-scale support in this area can help these residents save money in the long term, hence allowing them to move out of their disadvantaged state and improve their living conditions. The regulations of the safety net, even though implemented by municipal governments, must be stipulated by law and coordinated at the national level.

4. Larger environmental concerns must also be taken into account in housing policy.
With no policy interventions targeted at the currently neglected segments of the population, more and more buildings will deteriorate and be abandoned over time, while cities spread into surrounding open spaces in single-family neighborhoods, encouraging more car use and traffic. Allowing this model of development is a shortsighted approach which will require costly fixes later. For this reason, it should be a priority to revitalize and develop existing urban residential areas, as opposed to creating new housing developments in areas not served by public transportation.

5. Policies must be integrated across sectors and use various methods.
Finally, all of the policies must be designed together to explicitly target social, environmental and economic concerns. Policies that do not integrate all of these aspects will solve only one part of the problem, but may worsen others. Furthermore, no one policy

can address all needs, but there is a need for targeted interventions aimed at various segments of society and at different building types. Policy approaches must be creative and must provide a string of incentives for further improvements. A variety of instruments must be used that combine awareness-raising, capacity-building and legal and economic instruments.

Various opportunities for combining all of the above priorities are evaluated in the following chapter.

6. ALTERNATIVE POLICY SOLUTIONS

A transition period in housing policy will require investment of some public funds in housing and energy efficiency policies. Given the scarcity of public funds, it is important to evaluate how to target and invest those funds in order to have the best effect socially, environmentally, and economically.

6.1. Policy Options

Which types of energy efficiency solutions will become available to which segments of the population depends largely on the types of policies that will regulate the sector in the future. Current policies, as described in Chapter 3, are likely to facilitate some partial and full retrofit projects funded through loans, but most of the population will have available only low-cost measures if they initiate them individually. The poorest residents will be moved to social houses. Current policies, however, do not encourage wide-scale improvements in the majority of buildings, because some low- to mid-income residents live in almost every building, and they will not be able to help finance the retrofits. Development in this area is likely to remain fragmented unless public funds are also contributed, at least in the form of initial assistance. Public funding can be targeted in different ways in order to help and provide incentives to a variety of different groups:

1. *Need-based policies* for low- to mid-income sectors;
2. *Building-efficiency support* for residents in buildings with very low energy efficiency;
3. *Reduced-consumption incentives* that support ways of actively reducing energy demand;
4. *Changed maintenance structure incentives* for residents of buildings that organize to take on responsibility for their own building maintenance.

Descriptions and examples of possible policy instruments targeting each of these groups are given below. Policy instruments focus on two broad categories: economic instruments and awareness-raising instruments.

1. Need-Based Policies

The current policies and initiatives underway that could be qualified as need-based policies are housing subsidies, social houses and apartments, and the reverse mortgage scheme for pensioners. The current subsidies and social apartments and houses are a direct impediment to efficiency, however, because subsidies can be used only to pay for heating bills and not for energy efficiency improvements, and social houses do not facilitate social integration, so that they are in conflict with sustainable development. The reverse mortgage scheme is the only one that may directly encourage energy efficiency retrofits, but it potentially passes problems on to the next generation, as noted in Chapter 3.

Additional need-based programs could be developed by directly providing energy efficiency services to low- to mid-income residents, or by paying housing subsidies to low- to mid-income families to pay for energy efficiency improvements. For example, programs similar to "Latvian Volunteers for Energy Efficiency" could be developed at the municipal level to provide low-cost measures such as window-stripping and reflective pads behind radiators as a social service to those who are most in need of saved money from reduced energy bills. An additional benefit would be if programs created jobs through the Employment Office or other unemployment benefit programs.

For low- to mid-income residents living in buildings whose residents wish to take energy efficiency loans, the heat-related part of housing subsidies could be redirected to help cover their part of the loan (with an upper limit). This would allow these residents to invest in both low- and medium-cost measures that would help save more money, which could be further reinvested in home improvements. Such a program could also be developed as an incentive for apartments with debts, with a payment plan as a prerequisite for this social assistance.

In terms of awareness-raising, it is essential that the lowest-income segments of the population receive information on low-cost measures that exist to help them, as well as on any social services that may help provide these funds. Information could be distributed through Housing Advisory Centers, if they are set up, as well as through municipal social services departments. This would require capacity-building measures to train municipal social workers in energy efficiency options, so that they could advise residents on money saving options. NGOs could also take on a considerable role in distributing information about energy efficiency options. Most important, however, would be for the volunteers and/or municipal workers that implement weather-stripping and other low-cost measures in people's homes to be trained to advise on other measures that can save energy and money and make their homes more comfortable. A study in the US showed that a low-income weatherization program saved an average 16.3% of energy, while weatherization plus advice saved 25.7% (Harrigan et al., 1995).

2. *Building-Efficiency Support*
Current policies do not differentiate between types of housing or set efficiency standards for existing buildings. This is one option, however, for ensuring minimum energy efficiency standards. Under this approach, residents in buildings that do not meet a certain standard could receive services regardless of their income level. Setting a standard could be costly, because it would require energy audits to be carried out in each building simply to determine eligibility. The process could be simplified by targeting building types. It must be noted that the disadvantage of this type of policy is that it focuses only on building conditions and does not encourage changes in residents' behavior or stimulate education of consumers about energy efficiency and environmental issues, which can help ensure better results.

On the whole, concrete panel apartment buildings have the largest problems with energy efficiency; therefore, they require special assistance. Furthermore, from an urban sustainability point of view, they are likely to be the first buildings that higher-income residents will move out of if they are not improved; therefore, resources should be invested in renovating them at once. This would make them more comfortable and attractive and prolong their lifetime, thus preventing them from becoming socially-segregated areas for poorer residents. In order to accomplish this, however, they require comprehensive energy efficiency packages and high-cost investments. Targeted panel housing programs could be run with partial grants provided by the state government to residents of buildings that take out low-interest loans for building renovations and retrofits. Feasibility studies and energy audits could be undertaken to prepare several standardized packages for each series of panel buildings in order to reduce costs.

For awareness-raising, the availability of grants and standardized packages must be widely advertised, and good examples and success stories with results must be made widely available to the public in order to popularize the idea and show possible effects. Energy audit specialists must be trained, because even if a standardized package is chosen, each building will be slightly different and will need to be examined before work is done. Furthermore, the energy auditor can give other useful information and advice on energy saving.

3. Reduced-Consumption Incentives
Currently, no policies actively encourage reductions of energy demand, nor do many residents have the option of altering their consumption patterns. The introduction of building-level metering in many cities was the first attempt at making it possible to regulate consumption at all, but this does not give a direct monthly feedback loop to apartments. Introducing the possibility of actively participating in energy savings can be a very useful tool for encouraging residents to feel more responsible for their buildings and their homes.

The possibility of regulating heat consumption is the first prerequisite for effective energy management. Thermostatic valves can be installed with existing one-pipe heating systems, thus providing residents with the possibility of turning down their radiators as opposed to opening windows. Approximately 15% savings can be achieved by switching from building-level to apartment-level control (Greķis and Reķis, 2001), although the exact level of savings depends on the behavior of each individual resident. The initial savings from this program would provide an incentive for residents to invest their savings in further energy saving and home improvement projects. For the government, the investment would help to reduce the amount of money spent on fuel imports. Heat allocator meters on individual radiators are not recommended, however, because they require an extra cost for professionally reading the meters, which is often done only at the end of the season.

The policies targeting reduced consumption require the most information and awareness-raising of any program, but can also bring the longest-term results, if they bring about behavior change. If residents are provided with a tool to save energy and understand the potential of energy efficiency to save money and improve comfort levels, then they are more likely to invest in further home improvements, which will ultimately make urban residential areas more livable. Initial information campaigns that accompany, for example, a thermostatic valve installation program, could be run though the media and advertising, but individually targeted information is also required, which provides feedback on the building's levels of energy consumption. Even if apartment-level heat meters are not installed, it is still essential that each resident of the building receive information about changes in building-level consumption. Instead of stating only the price for heat, bills could include a special section that shows the fluctuations in heat use and outside temperature during the season. It could also state the amount of heat used in the whole building in the current month compared to the same month last year. Seeing the direct correlation between heat consumption and bills can help motivate energy savings as well as home improvements.

4. Changed Maintenance Structure Incentives

The lending programs currently in place and the proposed changes to legislation are examples of programs targeted at changing maintenance structure by encouraging residents to form HOAs. The success of HOAs in promoting more care for the building and improved social conditions depends greatly on the relationships among residents beforehand and on the quality of organization and leadership. Changing maintenance structure and availability of loans will not necessarily provide incentives to increase energy efficiency. Combined with the informational programs described above and need-based policies to ensure the rights of low-income residents, however, they may be very effective in promoting long-term housing solutions.

6.2. Evaluation of Options According to Urban Sustainability Criteria

As asserted at several points throughout this paper, in order to be effective in the long run, policies must meet more than economic efficiency criteria; they must cater to sustainable urban development goals. Each of the types of policy interventions mentioned above will be evaluated according to social, environmental and economic criteria in order to judge what kinds of policy interventions are likely to have the most balanced effects.

The criteria used below have been selected in accordance with the goals set out in the UN Habitat Agenda, and have also relied on the methodology established by the UN Environment Program for estimating indirect costs and benefits of greenhouse gas limitations (Markandya, 1998). The following are criteria for policies to encourage sustainable urban housing development:

Social

- provision of a social safety net for those living below the crisis subsistence minimum;
- preservation of socially diverse and integrated neighborhoods and buildings;
- stimulation of neighborhood development (more goods, services, open space and public transportation);
- equal rights for all to participate in decision-making (in building, neighborhood, city, etc.);
- improved indoor comfort;

Environmental

- high energy efficiency or energy savings and reduced air pollution;
- preservation of high-density housing to conserve open space and limit urban sprawl;
- raised awareness of energy efficiency options and benefits;

Economic

- facilitation of economically efficient projects (low payback times);
- minimized administration and transaction costs;
- creation of employment;

- positive effect on income distribution/poverty reduction;
- creation of local markets and support of local businesses (production of technological equipment and materials).

Each of the targeted policy options named above are evaluated according to these criteria and results are presented in Table 4. Positive (+) and negative (–) impacts are shown; spaces with 0 indicate a neutral or undeterminable impact.

Table 3. Evaluation of policies according to urban sustainability criteria

	Need-based policies	Building-efficiency support	Reduced-consumption incentives	Changed maintenance structure
SOCIAL				
safety net	++	0	+	–
social integration	++	+	0	–
neighborhood development	+	++	0	+
equal rights to participation	++	0	+	–
increased indoor comfort	+	++	++	0
ENVIRONMENTAL				
increased energy efficiency, reduced pollution	+	+	++	0
preservation of high-density housing	++	++	0	+
raised awareness	+	++	++	0
ECONOMIC				
economic efficiency	0	–	0	+
low transaction costs	–	+	–	+
employment	+	+	+	0
poverty reduction	++	+	+	–
market development	+	++	++	+
	+15	+14	+11	+1

As can be seen in the table, the need-based policies meet the most criteria in a positive way, followed by the building-efficiency support policies and the reduced-consumption incentives. The changed maintenance structure policies rate the lowest in attaining urban sustainability criteria on their own, because they can have the negative social effect of social segregation and will not necessarily encourage poverty reduction and

equal participation, unless they are balanced with other policies (for instance need-based). It must be noted that they can work well combined with other policies, because these also often indirectly motivate residents to take on more responsibility for their housing problems.

To date, Latvian policies have placed the most emphasis on creating incentives for changing maintenance structure, but this policy evaluation reveals that other policies must now be given priority. The best results will be achieved by combining all of these different types of policies in a way to maximize their benefits. Recommended policy combinations are described in more detail in Chapter 7.

7. RECOMMENDATIONS

This study began by asserting that lack of attention to the housing problem will result in social, environmental, and economic consequences, and the intervening chapters have described the current problems and trends, as well as their potential solutions. Here follows a recommended package of policies that would complement existing initiatives in order to address a broader spectrum of social and environmental needs.

The basic premise of the policy package is that it must be based on nested incentives, combining the policy options discussed in the previous chapter. The package has been developed using the following guidelines:

1. Low-cost energy efficiency measures should be encouraged first, because they will demonstrate the possibility for all residents to save energy and money.

2. All residents should also be provided with the tools and the knowledge for actively reducing their own energy consumption, thus also protecting the environment.

3. All programs must be accompanied by wide-scale information campaigns and incorporate elements of personal consultations and feedback on levels of energy consumption, as well as advice on other available options.

4. Special emphasis must be placed on the low- to mid-income sector and on panel buildings, because these are the most socially vulnerable.

5. A system of quality information and targeted financial incentives will help to stimulate: *first*, interest in home improvements and energy efficiency; *second*, the formation of homeowner associations and use of private investment in the housing sector.

As the burden for solving housing problems and implementing new programs must be shared among the national government, municipalities, NGOs and residents, Table 4 shows recommended policies arranged according to implementing agency.

Table 4. Recommended Policy Package

	All multi-family buildings	Concrete panel apartment buildings
National Government	*Reduced-consumption incentive:* installation of thermostatic radiator valves in all apartments and wide-scale information campaign about energy saving and energy efficiency	*Building-efficiency support combined with changed maintenance structure policy:* 30% grant for concrete panel building residents who take out loans for housing and energy efficiency improvements; training of energy auditors and consultants
Municipal Governments	– *Building-efficiency support:* weather-stripping and low-cost measure program for all interested residents at cost of silicon strips/materials only (Employment Office program), supplemented with targeted advice and information – *Need-based policy:* support for families below the crisis subsistence minimum to participate in whole-building improvement loan programs	
NGOs	*Need-based support:* continued volunteer program of weather-stripping and low-cost measures for pensioners, invalids and disadvantaged groups that cannot pay for the strips, supplemented with targeted advice and information	
Residents	Assumption of responsibility for their buildings; further renovation investments and loans, using savings from programs above	

Results and costs

Energy and CO_2 savings and costs of measures were calculated by the consulting company Ekodoma using the computer optimization model "Maja." Options were calculated for four of the most common building types: Series 103, 318, 468, and 602 (Ekodoma, 2002)[3]. *Estimates do not include costs of training, information campaigns and personal consultations;* they include only energy efficiency measures.

[3] Data available upon request.

Programs for All Residents

1. Building-Efficiency and Need-Based Support: Weather-stripping
All residents should be encouraged to undertake low-cost measures, such as weather-stripping, which should be partially or completely subsidized for low- to mid-income and disadvantaged groups. Resulting energy savings in the four building types range from 11–19%, with resulting CO_2 savings ranging from 16–33 tons/building/year. Calculated at market prices (offered by local companies at 6 LVL/m^2 including labor[4]), costs for one building range from 3,600–5,100 LVL and payback time ranges from 2.2 to 3.4 years. It must be noted that if the work is done either by volunteers or by Employment Office programs where municipalities cover the salaries of workers, then residents pay only for materials (2 LVL/m^2) and payback times would be well below one year.

2. Reduced-Consumption Incentive: Thermostatic Radiator Valves
As mentioned before, the effectiveness of thermostatic radiator valves will highly depend on how much they are used, but wide-scale information campaigns and personalized instruction should provide residents with the knowledge needed to save energy by using them (if apartments were too warm beforehand). In the model, energy savings were calculated assuming a baseline of an average temperature of 18 degrees. After installation of radiator valves, average temperatures are assumed to be reduced to 16 degrees during the night and times when most people are at work. Assuming that all apartments undertake weather-stripping of windows and install thermostatic radiator valves, resulting energy savings range from 22–33%, CO_2 savings from 35–58 tons/year. Costs range between 6,300–8,164 LVL and payback times from 2.2 to 2.8 years. If temperatures remain at an 18 degree average, then there is little effect, and payback times are 3.6 to 5.5 years.

As can be seen, the resulting energy savings from just the recommended state and municipal programs result in energy savings up to 33% for all residents, from which the money savings can be invested in other home and energy efficiency improvements.

Targeted Programs

1. Building-Efficiency Support: Panel Housing Incentive Grants
A 30% grant provided to concrete panel building residents who form Homeowner Associations and take energy efficiency and home improvement loans would serve as

[4] This price is also used in the following calculations. If only the cost of the strips is used, then payback times for all of the packages will be shorter.

an incentive to form the associations, as well as stimulate the building sector, which would bring revenue back to the state government.

Costs for comprehensive retrofits of panel buildings will vary greatly, and although they may have relatively short payback times, they will require higher initial outlays. A package that includes weather-stripping, radiator valves, and insulation of all outside constructions can save from 50–94% of energy and have payback times of 3.6 to 5 years, but costs are between 22,000–42,000 LVL. Grants would help to make the loans more attractive, thus encouraging urban sustainability.

2. Need-Based Policy: Municipal Safety Net for Low-income Residents
In addition to assistance to low-income residents in implementing low-cost measures, assistance in covering loan payments of comprehensive packages will prevent social segregation and will help residents to improve their living conditions.

To summarize, the cumulative effect of the implementation of the recommended packages will give a great boost to the idea of energy efficiency and serve as an incentive for residents to invest in further improvements themselves. The effect of the specialized programs suggested for low-income residents and panel apartment buildings will be address the problems in current housing policy identified earlier. The low-cost programs will help residents accrue the first savings and provide a safety net, so that they don't have to move. The panel-housing program will give an added incentive for the renovation of these buildings in order to help integrate them into the modern urban landscape and make them more attractive to residents in the long term. Differentiation of their outer appearance will also help to make neighborhoods more liveable and make them more attractive areas for shops and other businesses to move into. The residents will also have a greater sense of ownership towards their building and their neighborhood. Investments in multi-family residential energy efficiency retrofits are a social, environmental and economic necessity and must be begun immediately in order to facilitate the balanced and sustainable development of Latvia's cities and towns.

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