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Common Policy Actions in Europe as a Response to Climate Change

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by

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Contents

1 Introduction

Since the fall of the communist regimes in Europe in 1989 and 1990, the main goal of the reform process in Eastern Europe has been to strengthen democracy and to introduce a market economy. However, there are a number of problems to overcome in the transformation process to a market economy (see, for example, Vasko, 1992). In this context, it is urgent that Western Europe and the European Community (EC) come to the fore and share their experiences by linking the two regions politically, economically, and institutionally. This will act as a trigger for the reform process and reduce the risk for a setback. An example of this linkage is the already advanced aspiration among East European countries to join the EC, which hitherto has resulted in associate EC membership for Poland, the former Czech and Slovak Federal Republic (CSFR), and Hungary.

Within the energy and environmental field, the legacy from the communist era in Eastern Europe can be characterized by hard industrialization, wasteful use of energy, and the resulting environmental degradation (Matlary, 1993). Generally speaking, the energy intensities (energy/GDP) in Eastern Europe are about double that in Western Europe. In addition, according to the IPCC carbon emissions in Eastern Europe in 1990 were 3.19 tons per capita; this is about 50% more than in Western Europe (2.14 tons per year and capita), and three times more than the world average (1.06 tons per year and capita). However, it is still about 40% less than the corresponding value for North America (5.08 tons per year and capita). The high emissions in Eastern Europe in spite of the low standard of living, and the more than double per capita emissions in North America compared to Western Europe with comparable standards of living, are signs of low energy efficiency (Bertilsson, 1993). These facts indicate that there is a potential to reduce CO_2 emissions with efficiency-enhancement and energy-conservation measures. Currently, there is a general recognition in Eastern Europe that a key priority for achieving the transition from a planned to a market economy is implementing energy-efficiency and conservation measures (Romig, 1993). This results from the realization in recent years that energy-efficiency and conservation measures actually reduce the costs of providing energy to society, and reduce local, regional, and global pollution (Sinyak, 1992a; Mills *et al.*, 1991b).

To accomplish an environmentally benign transformation, a whole range of common policy actions must be implemented, not only in Eastern Europe but also in Western Europe; this is based on the perspective of Europe as a "Common House."

2 The Energy and Environment Situation

2.1 In the West

2.1.1 Trends in energy consumption

Although energy-efficiency and conservation measures have been taken in the West during the past two decades, the total energy consumption in the West is increasing. This resulted in an annual 3.7% increase in per capita energy use in the EC during the 1980s (CEC, 1991). The electricity consumption has since the early 1960s doubled its share of final energy use. If this growth continues there will have to be substantial installation of power generating capacities, even though significant improvements in generating efficiency, end-use efficiency and energy conservation are accomplished (IEA/OECD/NOVEM, 1991).

In the EC there has been pronounced trends in the mix of primary energy sources during the 1980s due to change of policies after the first oil crisis in 1973. These policies induced a drastic decrease in the share of oil in primary energy from 54% to 45%. However, the share of natural gas increased from 17% to 18%, and is expected to continue to grow especially in utility power production and cogeneration by independent producers. This is due to both environmental concerns and advances in gas-firing technology. The share of nuclear power increased drastically from 4% to 14% during the 1980s, but the contribution of renewable energy sources is still approximately 2.5% of the primary energy used (CEC, 1991).

2.1.2 Trends in energy intensities and sectoral composition

Since 1973 there has been a significant reduction of energy intensities in energy-producing and energy-using facilities in the West. This has been accomplished by government regulations at a pace avoiding distortions in the market of energy, while simultaneously improving energy efficiency, energy security, and maintaining economic growth. For example, the overall energy intensity in OECD countries declined 1.7% annually between 1973 and 1990. The strive to reduce the oil dependence of OECD countries resulted in an even larger decrease in oil intensity (3.2% annually between 1973 and 1990) (IEA/OECD/NOVEM, 1991).

In OECD countries the manufacturing industries' energy intensity dropped 35% from 1973 to 1988, which resulted in a decreased share of its final energy use from 36% to 27%. This was not only accomplished by improved efficiencies in production processes, improved operation and maintenance, and retrofits, but also by sectoral change to less energy-intensive industries, and a shift to higher value-added products (Schipper *et al.*, 1992).

In OECD Europe the residential sectors' final energy use per capita increased 10% from 1973 to 1988 due to increased home area per capita, a higher level of heating equipment, and growth in appliance ownership. Water heat-

ing intensity increased 30% due to growth in clothes' washer and dish washer ownership. Furthermore, higher energy efficiency of appliances were partially offset by increased size and other features. The increase in final energy use would have been much greater, if space heating intensity had not decreased 28% due to increased electrification of home heating systems, retrofits of older houses, and turnover of the building stock. In the service sector energy intensity decreased 28% from 1973 to 88 due to a much higher increase in service value-added than in energy use (Schipper *et al.*, 1992).

During the past decade there have been indications of a plateau in energy intensities due to declining fuel prices, and that easy-to-cut energy-conservation measures were taken in the 1970s and early 1980s. The plateau seems to be more marked in consumer dominated sectors than in producer dominated sectors. The reasons are only a slight decline in home heating intensity since 1982, a slow-down in retrofits of older houses, and a slight increase in indoor temperature. On the other hand, producer dominated sectors continued to improve energy efficiencies due to competitive pressure and technological change (Schipper *et al.*, 1992).

2.1.3 The environmental situation

During the past two decades the environmental efforts in the West have been directed toward the local environment, and substantial improvements have been accomplished in reducing emissions of sulfur, suspended particles, lead, and other heavy metals. Problems remain in areas where urban and industrial growth continue without proper emission control. In recent years the environmental concern has focused on soil acidification and global warming. In the latter case the first action was to reduce CFC emissions, which now is switching to reduce emissions of CO_2.

2.2 In the East

Since the transformation process started in Eastern Europe, there has emerged an economic crisis unprecedented in the 20th century history of the region. This crisis is characterized by reduced industrial production, hyperinflation, enormous budget deficits, rapidly increasing foreign debts, and deterioration of international competitiveness. The reasons for the economic crisis are disruptions of technological and production links, loss of sales on traditional markets, reduced export earnings, and shortage of raw materials and intermediate products (Bashmakov, 1991).

2.2.1 The energy and environmental crisis in the Eastern Europe

The energy and environmental crisis in Eastern Europe has to have two major components, i.e., shortage of energy and severe environmental degradation. The environmental crisis has evolved from decades of extreme pollution result-

ing from wasteful energy production, transportation and utilization (Baudon, 1993).

The communist energy policies actually encouraged increased use of energy by officially announcing that energy was to become a cost-free commodity for the 1980s. Energy was subsidized to the extent that it became such a cheap production factor not worth taking notice of. The industrial policies in the 1950s emphasized production of heavy industrial goods, which did not have much natural basis in the region. The reason for the heavy industrialization was to produce more of these goods than the West. No real effort was made to reduce the energy use after the first oil crisis in 1973 for several reasons. First, it was considered that a higher oil price would be more costly to the West than the East due to the oil resources in the former Soviet Union (FSU. Second, the competitiveness of East European energy-intensive industrial products would increase on Western markets. Third, export of oil would bring hard currency to Eastern Europe. This was especially important because energy sales generated 50% of the total export earnings (UN, 1992).

In Eastern Europe there has been little concern of environmental issues during the past four decades, whereby the environmental conditions in large parts of the region are very poor. In recent years there has been a growing public concern of environmental issues, which naturally has been focused on the local air and water environment, and improving worker safety (Moe and Roland, 1991).

The shortage of energy, especially in the former communist satellite states, has emerged because energy imports from Russia now are paid in hard currency at world market prices (Baudon, 1993). The prices charged by Russia for oil and gas have increased a hundred-fold from 1990 to 1993. As a comparison, the prices of most other goods have increased tenfold or more, and in the Baltic nations the average wage increased between 2.4 and 4.3 times (O'Dell *et al.*, 1993).[1]

Most non-energy prices in Russia have been deregulated since the beginning of 1992, i.e., more than 80% of the total trade volume. This resulted in a twenty-fold increase of consumer prices in 1992, which is a twenty-two times higher increase than in 1991. Energy prices were not completely deregulated in order to avoid additional inflationary pressure. They were, however, raised tenfold during 1992 (IEA, 1993).

2.2.2 Trends in energy consumption

The annual growth rate of total energy consumption in Eastern Europe has steadily decreased from 4.4% in the 1970s to 2.2% in the 1980s. This was mainly due to decreased expansion of industrial output. A significant part of the growth in the 1980s was due to expansion of Soviet oil and gas production (Schipper *et al.*, 1992).

[1]See, for example, IIASA studies on regional energy balances and energy situations (Cofala, 1992) and (Cofala and Klimont, 1992).

Total energy consumption and energy production have actually decreased since the transformation process started. In the FSU total energy consumption dropped 2% in 1991 and 4% in 1992 (IEA, 1993). Similarly, electricity consumption has decreased 1.6% since the reform process started (Grübler *et al.*, 1993b). The total energy production dropped 7% in 1992. The largest production decrease was in oil and coal industries with 13% and 3–4%, respectively (IEA, 1993). There was also a small drop in natural gas production (less than 1%). This was one of the smallest of decrements in any major industry in the FSU, and it is expected to recover from the 1992 drop in 1993. In hydroelectric and nuclear power generation there has been a slight increase of production in 1991 and 1992 (IEA, 1993).

The carbon emission per ton of oil equivalent (toe) of primary energy consumed is generally higher in Eastern Europe than in Western Europe. This is due to high reliance on low-grade coal. In the former GDR, former CSFR, and Ukraine between one and 1.2 tons of carbon are emitted per toe consumed. The corresponding value in Western Europe is 0.7 tons of carbon per toe. The only country in Eastern Europe with a similarly low value is Russia; this is mainly due to the importance of natural gas in the Russian primary energy mix (Grübler, 1993a).

2.2.3 Trends in energy intensities and sectoral composition

The energy intensity in Eastern Europe is about twice that of Western Europe. Before the transformation process started there had been a 10% decrease in energy intensity from 1973 to 1985. However, in Western Europe the energy intensity dropped 20% during the same period (UN, 1992). The high energy intensity in Eastern Europe is due to obsolete technologies, old economic structures, inefficient economic mechanisms, a high share of energy-intensive industries, and an inefficient energy-supply mix (Romig, 1993; Grübler *et al.*, 1993b). Since the transformation process started the energy intensity in the FSU has actually increased. This is due to a much greater drop in economic activity (17% in 1991 and 20% in 1992) than the drop in energy consumption (2% in 1991 and 4% in 1992) (IEA, 1993).

Manufacturing industry continued to be a dominating sector in the 1970s and 1980s due to the heavy industries established in the 1950s and 1960s. The sector consumed as much as 35% of the final energy use in the mid 1980s due to little or no technology change, isolated from competition, and administrated by government policies. The sectoral composition has somewhat shifted from steel and cement industries since the mid 1970s, but there are no signs of decreased energy intensity in these industries (Schipper *et al.*, 1992).

The energy intensity in East European agriculture sector is also about twice that of the West, with 0.92 toe and 0.47 toe per $1000 value of produced food, respectively (Romig, 1993).

East European passenger travel only accounted for 5% of the final energy use in the mid 1980s. This is due to a low level of automobile ownership, and

high use of public transportations. However, he reported passenger-km travel growth rate averaged 4–5% annually between 1973 and 1987. This growth will continue as the economic situation improves. The demise of the FSU will probably decrease travel within Eastern Europe, which probably will be countered by more travels between each nation and the rest of the world (Schipper *et al.*, 1992).

In freight transportation the activity and energy use have increased substantially during the past two decades mainly due to increased oil and gas shipments in the FSU. In the mid 1980s the sector accounted for 13% of the final energy use in Eastern Europe. Energy intensity in freight transportation is actually lower in the FSU than in Western Europe due to the dominance of rail transportation (Schipper *et al.*, 1992).

In the mid 1980s the residential sector in the FSU accounted for 20% of final energy use, whereof 15% is due to space heating, and 5% due to electricity use. The high share of space heating and the low share of electricity is explained by the cold climate in the FSU, and the low level of home appliances, respectively. The sector's energy-use growth rate averaged 1% annually between 1970 and 1985 mainly due to growth in district heating (Schipper *et al.*, 1992). There seems to be a slight decline in heating intensity in the FSU during the 1970s and 1980s; similar trends are indicated in Poland between 1980 and 1985 (Schipper *et al.*, 1992; Leach and Nowak, 1990).

In Eastern Europe the service sector accounted for approximately 6% of the final energy use, which in similarity with the residential sector mostly is due to space heating. The sector's energy use increased during the past two decades with an annual growth rate of 4% in the FSU. This was mainly due to increased floor area and indoor comfort level (Schipper *et al.*, 1992).

3 Existing Policy Actions in Europe

3.1 Policy Actions Within the EC

After 1973 the market economies adjusted their energy and economic policies to achieve higher energy efficiency and to implement energy-conservation policies, and in recent years a renewed interest in energy efficiency has been raised due to the fear of climate change. Integration is a crucial objective in the European Community's environmental policy, not simply to satisfy a treaty obligation, or because it is a tool for environmental protection, but because it is crucial for establishing sustainable social and economic development patterns (CEC, 1992a).

In EC policies it is acknowledged that efficiency enhancement and energy conservation are cost-effective means of decreasing harmful effects of energy use. These measures are in the general interest and should be left to the users' decision; direct market interference is avoided as much as possible. Furthermore, it has been recognized that there are barriers which prevent energy-efficiency measures from being taken. Therefore, governmental policies are

directed to diminish these barriers and make it attractive to users to invest in energy efficiency. Four categories of policy instruments have been identified in EC policies (UN, 1992).

- Public awareness and education have been encouraged, i.e., knowledge of energy-conservation possibilities, educational information packages, training of maintenance and installation technicians, and product information and labeling.

- Regulations and voluntary agreements have been applied to standards to raise efficiency of consumer appliances and other equipment, to the building sector to increase thermal efficiency of buildings, and to the transportation sector to increase fuel efficiency.

- Financial instruments such as taxation schemes, soft loans, and government grants to increase the penetration of certain technologies, such as for cogeneration and renewable energy technology, better insulation, heating and lighting systems, have been established.

- Funds for R&D on energy-conservation measures have been made available. In 1991 a specific research program on the environment was adopted under the Community Research and Development Framework Program; it covers four major areas, global climate change, technologies and engineering for the environment, economic and social aspects of environmental issues, and technological and natural risks (CEC, 1992a).

Possible future instruments have been considered to enhance the role of utility companies, regional and local administrators, and legal establishments specializing in energy-conservation agencies (UN, 1992).

A recently adopted instrument is the carbon/energy tax in the EC, which is designed to be 50% carbon tax and 50% energy tax; currently it amounts to approximately $20 per toe or $3 per barrel of oil. Until the year 2000 this carbon tax will increase to $1 per barrel of oil annually; thus by the year 2000 it will equal $10 per barrel of oil. Other countries in Europe that have already introduced a carbon/energy tax are the Netherlands, Finland, and Sweden with a carbon tax corresponding to $1.30, $6.10, and $40 per ton of carbon, respectively (Barret, 1991).

The EC agricultural policy is also of major environmental concern. The full integration of environmental considerations with agricultural reform policies is, however, yet to be developed, but will involve modification of some fundamental mechanisms of the Common Agricultural Policy such as securing rural living standards, respect for the environment, and the management of the Community's contrasting regions (CEC, 1992a).

A European Energy Charter has been established to broaden cooperation between Eastern and Western Europe in the energy field, and thereby facilitating other economic and political integration processes in the region. To create an energy market where the actors have incentives to use energy efficiently and

to take energy-conservation measures; the Energy Charter will encompass the environmental concerns according to the following (Moe and Roland, 1991):

- Fuel protocols defining minimum performance standards for various fuels.
- Emission performance standards for energy-using equipment, with priority to coal power plants and automobiles.
- Reformation of energy prices in Eastern Europe to introduce marginal-cost pricing, and in the longer-term to include social and environmental costs in the energy price in both Eastern and Western Europe.
- Establishment of governmentally backed funding mechanisms for the additional costs involved when more stringent environmental standards are applied; the scarcity of capital should not limit investment in environmental measures.
- Transfer of technology and know-how and establishment of institutions specialized in energy conservation and efficiency enhancement.
- Establishment of common rules in energy pricing and trade that avoid environmental dumping through trade in energy and distortion in trade with energy-intensive goods.

3.2 EC Policy Actions and Eastern Europe

The associated EC agreements taken 31 December 1991 with Poland, the former CSFR, and Hungary provide long-term frameworks within which relations between the EC and these countries will develop. Similar agreements with Romania and Bulgaria are currently being negotiated, and trade and cooperation agreements with the Baltic states and Albania are in preparation (EC, 1992). Considering the energy and environmental cooperation, the fundamental lack of environmental policies in Eastern Europe in the past could be an advantage when adapting to EC standards; it is often easier starting from scratch than dealing with the legacy of the past (Matlary, 1993).

Already, environmental standards are tied to all financial aid to Eastern Europe; this is the first time the EC has imposed environmental standards outside itself, and has acted on behalf of other regions. The financial support given by the EC equals to as much as 75% of all financial assistance to Eastern Europe (Matlary, 1993).

3.2.1 The PHARE and TACIS programs

The Community's PHARE program of assistance for economic reform in Central and Eastern Europe was originally geared to help Poland and Hungary, but now the program also includes the former CSFR, Romania, the former Yugoslavia, and Bulgaria; between 1990 and 1991 about 164 million ECU were spent in these countries (EC, 1992).

The TACIS program is a technical assistance program geared toward the former USSR. The program objectives are to develop local skills and know-how required for the reform process through provisions of relevant advice and expertise and to encourage conditions favorable to private investments and the development of the private sector. In 1991 and 1992 a total of 850 million ECU was provided by the EC (CEC, 1992b).

3.2.2 The European Environment Agency

The European Environment Agency consists of a central body and a European information and observation network, both of which draw upon CORINE (Co-ordinated Information on the Environment) experiences. It aims to provide EC member states and third-party countries with reliable and comparable information, and technical and scientific support for assessing necessary environmental measures and to ensure that the public is properly informed about the state of the environment in Europe (CEC, 1992a).

3.2.3 The Energy Efficiency 2000 program

The Energy Efficiency 2000 program was set up in 1990 by the UN World Commission on Environment and Development to enhance trade and cooperation in energy-efficient and environmentally sound technologies and management practices between participating states, in particular between Eastern Europe and market economies. In order to achieve these objectives several measures have to be taken (Romig, 1993):

- Facilitating contacts between business executives, trade officials, bankers, engineers, and energy managers.
- Creating a network and listing of competent individuals in relevant enterprises, banks, and government offices.
- Enhancing information exchange on legal instruments, grants, subsidies, loan schemes, energy labeling, and technical standards.
- Listing of selected technologies, products, and services for efficiency enhancement and pollution abatement, which are particularly relevant to Eastern Europe.
- Conducting analyses to identify key energy-efficient technologies and management practices and to determine their potential impact on energy savings and environmental quality in Eastern Europe.
- Description of current pilot and demonstration projects for energy savings in buildings, industry, agriculture, and transport in Eastern Europe.

3.2.4 The EBRD

The European Bank for Reconstruction and Development (EBRD) was established in April 1991 to act as Western Europe's financial instrument vis-a-vis Eastern Europe. The objective has been to assist in efforts to broaden the supply expansion focus to a "least-cost" focus, which will maximize development by considering the efficiency with which resources are used. The Bank's strategy focuses on the development of commercial management, appropriate incentives, and competitive practices in the energy sectors of Eastern Europe (Baudon, 1993).

3.3 Policy Actions within Eastern Europe

Not until a decade after the first oil crisis in 1973 was any effort made in economic restructuring and energy-efficiency improvements in Eastern Europe, though this was not very successful (UN, 1992). Since the transformation process started, however, an environmental consciousness at the governmental level has developed.

In certain countries, for instance, the Ukraine, energy programs have been developed emphasizing the social orientation of the economy, including fundamental changes of economic structure and improvements in the ecological situation. In the case of the Ukraine, focus is on achieving energy savings in ferrous and aluminum metallurgy, electricity generation, coal and gas production, oil refining, and other chemical industries. Attention is also being paid to an increase in the implementation of the engineering and machinery industry and to improving building materials. The Ukraine program is expected to save a total of 92 TWh of electricity between 1991 and 2005, which equals about one-third of the 1990 annual electricity consumption in the country (Gavrilenko, 1991).

In the former CSFR an Air Protection Act has been established, including emission limits for power production closely adhering to EC standards. These limits are to be applied to newly built sources, but within five years also to the present sources. Other projects are oriented toward renewable energy sources such as wind, hydro, biomass, and geothermal energy (Vostatek, 1991).

4 Basic Problems to Common Policies

There is an inherent problem in implementing common policies in Eastern and Western Europe; these regions have been committed to two opposite economic systems. The differences are both in the way problems have been solved, and in the stage of environmental concern. In this respect several problems have to be solved.

First, there is the issue of whether a global policy is to be pursued or if national efforts are to be emphasized. If a policy on global warming is agreed upon internationally, the national efforts taken in the European region

addressing the local and regional environment should be included as efforts to reduce greenhouse gas emissions. Energy-efficiency and conservation measures to reduce sulfur emissions and improve the local and regional environment also reduce emissions of CO_2; this is a positive "side-effect." This issue must be considered one way of combining the interests of Eastern and Western Europe, and Europe as a whole, in contrast to the rest of the world.

Second, there is the question how to implement these policies. The tradition in Eastern Europe of implementing government decisions by direct state intervention has of course left a legacy in the decision-making procedure, a pattern which could be hard to alter. In the West the implementing procedure of policies has been to use market forces through market regulations, and to harness market forces by state regulations. An evolving problem in Eastern Europe could be to persuade the new democracies to implement state regulations, which may resemble policies of the former communist regimes.

Third, there is the problem of whether to deal with environmental problems on a mandatory or voluntary basis. Mandatory agreements at the national level are perhaps from a medium- or long-term perspective, whereas voluntary agreements could be taken quite soon. To avoid the free-rider problem it is important to stress to the Central and East European governments that energy-conservation and efficiency-enhancement measures save money and relieve capital for other investments, and to give volunteering nations a benefit when trading with the West as an incentive for participation. At the subnational level it is probable that voluntary and mandatory agreements could be taken even in a short-term perspective, for instance in industry.

Fourth, there has to be a consensus between Western Europe and Eastern Europe of whether to take immediate actions, a step-by-step approach or a wait-and-see policy. Here, a distinction can be made between the three alternatives on a cost-benefit basis. Immediate actions should be taken when both environmental and economic benefits can be derived from low investment costs. Step-by-step policies can be taken when the investment costs are higher in relation to the benefits, and a wait-and-see policy when the actual benefits are insecure and the investment costs are high.

The current paths of development in Eastern and Western Europe are quite different, even though the transformation process in Central and Eastern Europe is on the way toward a market economy. In Eastern Europe the trends are a deepening economic crisis, advancing marginalization of markets, social uprooting, emergence of primitive forms of nationalism, a push for national sovereignty, and efforts to handle the transformation process on a national basis. In the West the trends are a move to a more socially and ecologically streamlined economy, further steps in markets' integration, a move toward political and economic unity of future Europe, and shared social objectives while preserving national identity (Nikolajev, 1992). The differences in these trends may temporarily make it difficult to identify and implement common policies.

It is important to consider that substantial transformation is being conducted within the West European economies; in a controlled manner they are

moving toward an economic development characterized by new qualitative interrelationships between economic growth and ecological sustainability (Nikolajev, 1992). An important issue for the EC is to strengthen the Community which is a necessary prerequisite to widen it, i.e., to adopt Central and East European countries as members of the EC. If no strengthening is conducted this may not only endanger the future EC, but also lead to disappointment among East European countries, which would find themselves in an enlarged but weak Community, unable to take clear decisions in the interest of its new members (Bonvicini *et al.*, 1991).

Hitherto, the first basic principles of a market economy either have been or are being introduced in Eastern Europe. This first phase of transition is generally associated with the following measures (Nikolajev, 1992):

- Privatization as the principal source of raising efficiency by underlining the role of entrepreneurship, private incentives, and market-related management.
- Introduction of free-market competition, abolition of state monopolies, and opening up toward worldwide competition and investment flows.
- Liberalization of economic activities, including price reforms.
- Profound financial reforms, for example, in banking systems, enabling convertibility of national currencies, and creating new administrative structures and legal institutions.
- Decentralization and deregulation of economic performance.

An important experience to bear in mind when identifying policy measures is the rapid integration of the former GDR and FRG; in a very short time all these above-mentioned measures were introduced in eastern Germany. These actions, however, did not release the forces of a market economy as expected; on the contrary, it seems to be that the more radical the steps taken, the more severe the distortion of the economy (Nikolajev, 1992). Therefore, great caution must be taken in implementing the transformation to a market economy; the measures taken must be weighed carefully. The problem with a more careful and slower implementation of market conditions, however, is that the people in Eastern Europe are impatient to adopt the Western way of life. This has been noticeable especially in the former GDR, where growing discontent with and disillusion of the market economy is spreading. Thus, a way must be found to balance these issues and achieve successful implementation of market economies in Eastern Europe.

5 Problems and Opportunities in the East

5.1 Finding common grounds

One opportunity in finding common grounds to implement common policies is to consider the environmental concerns. There are certainly common interests, even though the priorities are different on a geographical scale; improving the local environment also improves the regional and global environment. This is especially true when it comes to energy-efficiency and conservation measures applied to the use of fossil fuels. Furthermore, these measures often reduce the energy costs at the personal, company and national level. Thus, capital is made available for further investments, which can make a significant contribution to get the wheels turning in Eastern Europe. This is especially important in Central and East European countries relying on energy imports at world market prices. For instance, energy savings of 15% of the total energy demand in this region are considered to be feasible with short-term energy-efficiency and conservation measures until 1995 without major investments. This would reduce the energy import requirement in the region by 50 Mtoe and save about $4.5 billion (Baudon, 1993). In the longer-term savings are even greater; 540 Mtoe in 2000 and 600 Mtoe in 2010 if the energy-intensity gap between Eastern and Western Europe is reduced by 50% (UN, 1992). The Russian energy-conservation potential is estimated between 500 and 600 Mtoe, which accounts for 60% of the 1992 primary energy consumption (Grübler *et al.*, 1993b). To achieve energy savings of this magnitude, structural and technological change, and improvement of the economic mechanisms are required.

5.2 Governmental issues

In Eastern Europe the production capacities for a certain product were concentrated to a few specific sites to achieve the advantages of large-scale production. Furthermore, in the industrial location policy was unemployment given a higher priority than the local market demand. Thus, most products have to be transported over large distances to meet the market demand in different Republics. This legacy and the growing marginalization of markets provide strong incentives to reestablish the intraregional cooperation and trade. This will require political attention and governmental policies. Hitherto this has not been achieved to any greater extent. For example, the monthly meetings of the Baltic Ministers of energy have not led to any coordination of their energy activities to develop the synergy effects existing within their region (O'Dell *et al.*, 1993).

An important problem to solve is the very short-term economic focus that has evolved during the recent period of political instability and high rates of inflation (Schipper *et al.*, 1992). Thus, it is very important to stabilize the political and economic situation, as soon as possible, to improve the investment climate, and to attract domestic and foreign investors.

It is also important to overcome the educational barrier in all stages of society from the general public to engineers, energy managers, researchers, manufacturers, and government authorities. To achieve this governments must set a tone that conserving energy and enhancing efficiency are high public priorities.

5.3 Technological issues

A problem with energy-efficient equipment is that high-tech equipment often demand a higher quality of the energy input. This could limit the potential of some technologies, and lead to the use of less efficient equipment that tolerates the energy input (Schipper *et al.*, 1992).

Another problem is the physical limitation of production capacities of energy-efficient equipment, which only can be solved by investment and development of machine producing industries. On the other hand, the consumer demand for energy-efficient equipment is of course limited by economic and practical facts. The demand for energy-efficient equipment can, however, be modified by governmental policies providing favorable terms of writing of energy-intensive units (Bashmakov, 1991).

An important constraint to the diffusion and development of energy-efficient equipment is the information barrier. International cooperation and information exchange have to be elaborated to make information easily accessible (ESETT, 1991).

5.4 Economic issues

The rapid introduction of world market price of energy has triggered a vicious circle in Eastern Europe. In the former communist satellite states, such as the Baltic nations, the high world market price of energy paid in US dollars, in relation to the low GDP level, has consumed any capital that otherwise would have been available for energy-conservation and efficiency-enhancement measures at the national level. Furthermore, this situation rapidly increases the foreign debt and budget deficit. At the individual level the effect is much the same. There is simply no capital for investing in future energy savings; all capital is spent on paying the running bills to the utility. All in all this leads to a "hand-to-mouth" economy. The problem here is not the world market price charged for energy, but rather the underestimated currency exchange rate in Eastern Europe, which in relation to average wages creates an unrealistic price difference between domestic products and imported energy. World market prices have to be charged for energy to avoid the incentive barrier; the final consumer must see the benefit of energy-efficiency and conservation measures. A direct benefit can be achieved when consumers reduce their energy consumption, and the reduction of costs is higher than the price of energy-efficient equipment (Moe and Roland, 1991).

A related issue at the national level is that a rapid increase of energy prices

can be a threat to the fragile and youthful democracies in Eastern Europe. This was the case in Hungary in October 1990, when the world-market price of oil increased drastically due to the Gulf crisis. The Hungarian crisis was mainly due to lack of hard currency that inflicted small reserves of oil (Matlary, 1993).

An opportunity in Eastern Europe is the potential ability to produce competitive goods due to relatively low wages and relatively high skill levels. To explore this opportunity Western investments and technology transfer will be required (Bonvicini *et al.*, 1991).

5.5 Institutional issues

In the last of the communist years a special section of the state plan in most East European countries was developed for energy conservation. The assignments were very general, and without economic evaluation of the specific measures. Ministers in different branches were not responsible for energy-efficiency improvements to be achieved within their domain. As a result, the planned levels of energy efficiency were never achieved. Furthermore, there was no government agency responsible for the development and realization of energy-efficiency policies (Bashmakov, 1991).

An important and difficult task will be to find a way to connect benefits from energy conservation with the costs of energy production. No institutional link or framework exists between the consumers and the production side in the energy sector. Trade in energy has not been based on commercial decisions on a voluntary basis, but as a function of planning decisions (Moe and Roland, 1991). Annually centralized limits of energy consumption were established for the majority of enterprises; these were based on the previous year's experience. Thus, energy was consumed up to the very limit to avoid being assigned a lower limit next year (Bashmakov, 1991).

Other institutional problems preventing energy-efficiency measures to be implemented are (IEA/OECD/NOVEM, 1991):

- Lack of incentives for local and national institutions to make sustainable development systems a high priority.
- Existing institutions are not designed to deal with the risk of introducing new technologies.
- The limited role of energy utilities, which must be allowed to profit from the installation of energy-efficient equipment.

To borrow experience from the West in creating a modern institutional infrastructure will be crucial for a successful implementation of energy-conservation and energy-efficiency policies (Bashmakov, 1991).

5.6 Sectoral issues

In the residential, service, and commercial sectors the existing building stock poses a problem. The turn-over of the stock is rather slow (a few percent per year), and the stock is very energy inefficient. Major barriers preventing energy-conservation measures are (IEA/OECD/NOVEM, 1991):

- The tenant/owner dilemma; the former paying the energy bills and the latter paying the investment in energy-efficient equipment.
- Lack of insight and information for occupants, janitors of service buildings, and energy managers.
- Limited capital for retrofits
- The importance of the payback gap.
- Budgeting practices allowing wasteful energy use, but not investments in energy efficient equipment.

In appliances lack of information and understanding are identified as major obstacles to a more efficient energy use. Higher efficiency of already widespread types tend to be countered by introduction of new appliances (IEA/OECD/NOVEM, 1991). Higher efficiency also tend to be countered by increased size and degree of service. Opportunities exist in increasing the turn-over of refrigerators and air-conditioning equipment, replacing electric resistance heating with heat pumps, and introducing fluorescent lamps and electronic ballasts in lighting systems. These measures could reduce the specific energy use by as much as 50% (Grübler *et al.*, 1993b).

In the transport sector there is an inherent problem due to the great number of actors, and the complexity of the sector. Lack of financial resources to change the existing infrastructure is another problem (IEA/OECD/NOVEM, 1991). An opportunity to pursue is the high use of the public transportation mode in Eastern Europe.

In district heating there are great opportunities for substantial energy conservation due to low energy efficiency, and a high share of the home heating sector; approximately 50% of the homes in urban areas are connected to district heating systems.

In the energy-supply sector the former communist satellite states are compelled to continue the traditional deliveries of oil and natural gas from Russia. Lack of infrastructure and the present configuration of the electric grid leaves no scope for diversification of energy imports in the short-term. Furthermore, future prospects of Russian export of oil and natural gas are much smaller than the current export volumes.[2] This makes energy-conservation and energy-efficiency measures even more important, especially until the infrastructure can be altered to facilitate diversification (O'Dell *et al.*, 1993).

[2]According to a statement by V. Okorokov at the 6th International Energy Workshop at IIASA, Laxenburg, Austria.

6 Political Measures

6.1 Governmental actions in general

The whole economic system in Eastern Europe, especially in the FSU, was a unified mechanism which has been frozen by recent processes. This has resulted in great suffering for all former members of the communist community. Therefore, the first step out of the economic crisis must be to reestablish an economic union within Eastern Europe.

There is an urgent need to decentralize the decision-making procedure and to reorganize the extensive bureaucracies in Eastern Europe to a more appropriate up-to-date structure and attitude among civil servants. Otherwise there is an inherent risk that government policies, no matter how well formulated, will be diverted from their initial intention. In this reorganization it is extremely important to emphasize that energy-efficiency and conservation measures are a high public priority. Other important issues that need governmental involvement are:

- To privatize energy-producing, energy-distributing, and energy-consuming enterprises, and to change the attitude of management in these companies from a supply-side focus, i.e., increasing production to a "least-cost" focus and improving efficiency (Romig, 1993). By allowing supply-side and demand-side measures to compete on equal terms, the available resources will be used to maximize the development of the sector (Baudon, 1993; Union of Concerned Scientists, 1991).

- To develop strategies for energy pricing, efficiency regulations, and tax incentives, which also can be enhanced by other methods such as information programs, grants, training programs, and support for R&D (Schipper *et al.*, 1992).

- To induce mandatory and voluntary agreements in industries to improve the energy efficiency of their products and processes.

- To create government agencies in special sectors, such as housing, transport, industry, and environmental protection, which can do much to integrate energy efficiency with other concerns (Schipper *et al.*, 1992).

- To create nongovernmental agencies in different fields complementing government actions and accelerating efficiency improvements.

The governments in Eastern Europe could attract foreign investment capital and Western companies by giving them incentives as market advantages for early action and a preferential status for future cooperation, under the precondition that they adhere to Western standards on health, safety, and environmental protection (Moe and Roland, 1991).

On the Western side there must also be a change in policies. To fulfill the Associate EC agreements the EC must grant market access for those products

that Eastern Europe can rapidly produce, such as agricultural products, textiles, steel, and coal. This will not be an easy task due to the sensitivity of these products to some economic and political interest groups in the EC. Trade liberalization measures, however, should be taken as soon as possible otherwise it will prove even more difficult in the future (Bonvicini *et al.*, 1991).

6.2 Energy and environmental laws

Concerning the legislative situation in Eastern Europe, the problem is actually not lack of legislation but rather the formulation and enforcement of the laws. Currently there are environmental laws in Eastern Europe. The percentage of different types of laws covered in Eastern and Western Europe are shown in *Table 1*; in one case the percentage is even higher in Eastern Europe than in Western Europe. If we assume that the proposed laws are implemented, then the percentage of the different types of laws will in most cases reach West European levels (see figures in parentheses in *Table 1*).

Table 1: The average percentage of different types of legislative (4 types), financial, (4 types), and technological laws (9 types) in seven West European countries in the EC and in eight East European countries. The figure in parenthesis is the percentage if proposed laws are implemented, which for Western Europe include EC initiatives. Data extracted from (UN, 1992).

	Industry sector		Building sector		Domestic sector	
Western Europe						
Legislative	57%	(57%)	61%	(61%)	61%	(61%)
Financial	36%	(39%)	14%	(18%)	25%	(29%)
Technological	13%	(24%)	25%	(51%)	29%	(44%)
Eastern Europe						
Legislative	31%	(53%)	33%	(56%)	31%	(53%)
Financial	28%	(33%)	14%	(19%)	6%	(11%)
Technological	21%	(27%)	9%	(16%)	14%	(23%)

Concerning pollution originating in energy use, environmental laws in Eastern Europe have been applying a special penalty system proportional to the environmental damage, and differentiated between danger of pollution and area characteristics. Funds created from penalties have been used to retire extremely polluting units and for subsidizing business development with an environmental purpose. The penalty and subsidy system, however, has not been able to create environmentally sustainable economic development. This is partly because penalties have only been imposed in cases when general or special standards were exceeded, entailing that the sum of penalties was substantially lower than the annual environmental damage caused at the national level, estimated as high as 3 to 5 % of GDP in Eastern Europe (UN, 1992). Thus, new and radically different approaches must be taken, in doing so the

Western experiences gained in environmental legislation will be of great importance.

6.3 Demilitarization of economies

The military activity in the FSU has decreased drastically in the conventional arms field. Activity in other areas, however, does not seem to be decreasing. For example, Russian military activity in space has until now been very high, and as recent as in the first quarter of 1993 12 military and 6 civilian satellites were launched (*The Independent Newspaper*, 1993). This is more than twice the number of satellites launched by the USA during the same period, which equaled a total of eight military and civilian satellites. The continued high military expenses camouflage any positive change accomplished in the transformation process. Furthermore, there is the risk that capital transferred to Eastern Europe from the West would be devoured by military activity.

Demilitarization of the economies in Eastern Europe would release enormous production capacities, know-how, and skilled personnel experienced in large-scale production of high-tech equipment; this could make a significant contribution to the transformation process by decreasing the need to import energy-efficient equipment. An example from the FSU of the potential in this respect is the production of oil-producing equipment. In the past about two-thirds of the oil-producing equipment was manufactured in Azerbaijan; since the demise of the Soviet Union this supply has dropped drastically. By transforming military production units, however, Russia is expected to become self-sufficient in oil-producing equipment in 1994 (IEA, 1993).

Demilitarization would not only reduce import expenses, such as for energy-efficient equipment, but also make available enormous amounts of capital. The USSR military expenses during the postwar period amounted to 30% or more of the national income; it would be an understatement to say that this capital could be better spent in the future (Sinyak, 1992b).

It is important to stress that the military personnel should be transferred to civilian production as early as possible. This will help to avoid periods of unemployment for military personnel, which could destabilize the fragile democracies in the region. There are, however, barriers to demilitarization from military personnel because of the loss of privileges when changing from military to civilian employment.

Nevertheless, there are many benefits of demilitarization. It would certainly be worthwhile to give this issue the highest of priorities when assessing policies to promote the transformation process in Eastern Europe.

7 Economic Measures

The basic principle behind economic measures to improve the environment is to provide incentives to all actors in the energy market to use energy in the most efficient way and to reward these actors for conserving energy with

reduced energy bills (Moe and Roland, 1991). In doing so, the price of energy must be raised to include the externalities as environmental and social costs in the energy price. This could be accomplished either by raising the actual purchase price of energy or by introducing a penalty for energy use, e.g., a carbon/energy tax.

There are difficulties in including the externalities in the energy price (EC, 1992):

- Insufficient information about the physical state of the environment.
- Uncertainty about the tolerance limits of the environment.
- Difficulty in assessing the costs of environmental damages or the benefits of repairing the environment or costs of nonaction.
- Uncertainty in choosing an appropriate discount rate to value the environment to future generation.
- Problems in setting a price on the environment.[3] Certain aspects of the environment are priceless (for example, an adequate quality of drinking water) and thereby not susceptible to normal economic costing mechanisms such as cost-benefit analysis or the free play of market forces.

To deal with these issues instruments such as environmental indicators should be developed, enabling an as complete as possible assessments of relevant costs and benefits, which would pave the way for a broad and balanced approach to the design and the choice of environmental priorities (EC, 1992).

7.1 Pricing of energy

Market economy theory suggests that energy users abate emissions as long as the abatement cost is lower than the penalty of emitting. If the price of energy corresponds to the actual environmental damage, then the sum of damages and abatement costs would be minimized (Barret, 1991). Thus, introducing prices that reflect the real costs of supplying energy will make available the powerful instrument of market forces, which most likely will change the consumption patterns to conserve energy and accelerate energy-efficiency improvements in all end uses and will reduce waste in production, transformation, and transportation processes (Moe and Roland, 1991).[4]

A possible path for achieving "proper pricing" of energy is, first to abandon subsidies so that end-user prices at least cover observed costs involved in making the energy available. Second, price discrimination between different

[3]See, for example, IIASA work on damages, costs, and abatement of the greenhouse effect (Ayres and Walter, 1991), and economic aspects of ecological risk due to nuclear and coal-fired electricity production (Wahlström *et al.*, 1991).

[4]See, for example, IIASA study on energy pricing and the transition from a command to a market economy in Eastern Europe (Cofala, 1991).

groups of end uses should be removed to institute marginal-cost pricing. Finally, externalities as social and environmental costs should be included in the energy price (Moe and Roland, 1991).

It could prove profitable to import energy or energy-intensive goods from countries with less stringent environmental regulations. Thus, common rules must be established for they way in which energy should be priced and traded to ensure that energy is used in the most efficient way and to avoid environmental dumping through trade in energy and energy-intensive goods. However, the most energy-intensive industries in Eastern Europe are also the most subsidized; therefore they are not likely to survive in a market-based economy (Moe and Roland, 1991).

The structure, activity, and level of service in different sectors are affected by energy prices through macroeconomic impacts, which are usually short term. An important medium-and long-term effect is that higher energy prices act as a spur to conserve energy and enhance efficiency, which may contribute to decisions to upgrade equipment (Schipper *et al.*, 1992).

However, price measures only are not sufficient. For example, there are no significant differences in energy efficiency in the Danish and Swedish residential sectors, even though the Danish residential electricity prices have been twice those of Sweden for more than a decade (Mills, 1991a). The reason for this is that energy consumption usually is a negligible expense in contrast to the purchase price of equipment, whereby many other concerns compete at the time of purchase. Thus, due to these facts energy pricing must be supplemented with other policy actions.

7.2 Credits and subsidies

7.2.1 In the Residential and Commercial Sectors

Promoting the purchase of energy-efficient equipment by lowering the initial cost through rebates or tax incentives or by providing low-interest financing can be an effective alternative to reduce the impact of the low share of energy costs in the life-cycle cost of a product. For instance, US utility rebates have proved to be efficient in promoting fluorescent lamps and other energy-efficient products (Schipper *et al.*, 1992). To introduce an "alternative cost" for not choosing energy-efficient equipment a system of "feebates", i.e., fees on inefficient equipment and rebates for efficient ones, could be introduced, whereby the gap between efficient and inefficient equipment is reduced from both directions (Union of Concerned Scientists, 1991).

Grants and tax credits could be used for retrofits of the building stock. These measures have been used in Western Europe and in the USA, but to what extent they have increased energy-savings activity over what would have occurred is uncertain (Schipper *et al.*, 1992).

Subsidizing end-use energy prices may have an allocative function in society by supporting households of small means, but there is a general recognition that it is not an efficient way to do so. Low energy prices encourage

overconsumption, delay retirement of inefficient equipment, and distort fuel choices. Furthermore, the subsidies drain the governmental budgets of capital that could have been used for efficiency-enhancement and energy-conservation measures in the needy households, thereby lowering their energy bills (Schipper *et al.*, 1992).

The energy prices, however, must be in correlation to the income level of the society. Otherwise the actors on the market can not react to the economic signals given, and the high energy prices lose their effect on energy-efficiency and conservation measures (O'Dell *et al.*, 1993). This is the situation that has evolved in many of the East European countries due to the rapid introduction of world market price of energy, which has created a "hand-to-mouth" economy in Eastern Europe (see discussion in section 5.4). To counter this effect temporary and progressively decreasing support schemes should be introduced in these economies to support energy-efficiency and conservation measures (O'Dell *et al.*, 1993).

7.2.2 In Industry

To help renewable-energy industries achieve economy of scale and to correct for the different tax treatments of fuel expenses and capital investments, which direct energy choices away from capital-intensive renewable technologies and toward fossil-fuel-intensive technologies, a temporary tax credit could be introduced for renewable-energy production until the technologies mature. This has been proposed in the USA with a 2.5 cent tax credit per kWh for renewable electricity production, and a tax credit of $2 per million Btu for heat supplied to large industries and commercial users (Union of Concerned Scientists, 1991). To encourage retrofits in industry, especially those with long payback periods, low-interest loans or even more effective grants or subsidies could be introduced (Schipper *et al.*, 1992).

7.3 Taxes

A carbon/energy tax policy is thought to be beneficial because it incorporates a decentralized decision-making process. The idea is to place the incentives on the market and then leave the detailed implementation to the individual actors in the economy. The advantages of this approach are very much the same advantages evident in the market-oriented economies and help to explain their superior performance (Gaskin and Stram, 1990).

The carbon/energy tax would raise the price of fossil fuels and the price of products manufactured using fossil fuels. The price rise would cause producers to try to use less fossil fuel or to shift among fuels to reduce costs. Consumers would tend to shift from products that had risen in price because relatively large amounts of energy were used in their production. This combination would cause the total amount of fossil energy used to decline relatively to the amount that would have been used in the absence of the carbon charge.

Furthermore, a carbon/energy tax would reduce the use of high-polluting fossil fuels as low-grade coal would be replaced by "cleaner" fuels such as natural gas. This would in turn reduce the emissions of both CO_2 and SO_2; this is important to emphasize because it combines the different environmental priorities in the West and the East.

There is always the question of how a carbon/energy tax is to be formulated. First, should it be a pure carbon tax or a mix between a carbon and energy tax, as in the case of the EC tax. Second, how should the tax be administered. Here an international agency supervising the compliance of the agreement, and also collecting the revenues, seems a sensible solution. Third, there is the question of how to reimburse the revenues to the countries. This could be done according to a fixed set of reimbursement parameters. Suggested parameters are using observed CO_2 emission patterns ("grandfathering"), GDP, or population, or a combination of these parameters; this would have to be negotiated among participating countries (Hoel, 1990).[5]

Of course several difficulties have to be solved before a carbon/energy tax could be implemented. One difficulty is that a carbon/energy tax would have to be internationally agreed upon to make any difference in the global-warming problem, i.e., the problem with the negotiation process. Cooperation to address global climate change policy would likely take place through an incremental, iterative process at the regional level. Participants may not have a fixed national interest that would make the negotiation process even more difficult, as, for instance, in the case of strategic military agreements. Furthermore, the eventual agreement would bring about a greater degree of compliance among participants and would be more durable than is usually the case in arms-control agreements. There are, however, post-negotiation impasses that could affect the acceptance of an environmental treaty (see, for example, Korula, 1992). Such an incremental, iterative process may take several years before an agreement is produced and perhaps several more years to generate positive results (Feldman, 1990).

Other difficulties arise when approaching the problem of the power of the tax, i.e., how much we are willing to pay and what emission reduction this would yield. One problem is estimating the actual effect of a CO_2 tax on the fuel mix, which is very dependent on the estimation of both cross and own price elasticities. In other words, it is difficult to estimate the fuel switching from more to less polluting fossil fuels and the actual reduction of the use of a certain fossil fuel. The difficulty of determining the power of tax is even more complicated by fluctuations in the energy markets, because it is the price of the fuels including the tax that determines the emissions.[6] The price of a barrel of crude oil increased by more than \$10 between August and December 1990 due to the Gulf crisis. A \$10 increase in the price of a barrel of crude

[5]A scheme for sharing the costs of reduced sulfur emissions in Europe has been suggested in an IIASA study (see, Klaassen *et al.*, 1992).

[6]The potential consequences of energy-related carbon taxes in two world regions (OECD and developing countries) were analyzed by Messner and Strubegger (1990).

oil is approximately equal to a carbon tax of $77 per ton. Another difficulty in assessing the emissions' reduction induced by a CO_2 tax, is that the pretax price might fall as the energy suppliers absorb some of the increased costs of energy to increase the demand volume. Furthermore, the carbon tax will reduce the demand volume and thereby the suppliers will reduce their price to regain some of the lost market volume. Accordingly, this will increase the demand volume. Hence, a new equilibrium market volume will be established that most likely is between the original pretax market volume and the initially expected volume when the tax is introduced (Barret, 1991).

It has been suggested that the revenues from a carbon/energy tax implemented in the developed world placed in internationally controlled funds (e.g., UN and World Bank) could be used for financing investments in energy conservation and efficiency enhancements in the developing world (Sinyak, 1993). The "investments" from the developed countries could, in the long run, be returned to the donors in the form of increased demand for goods and services produced by the developed countries. A scaled-down version of this could be applied in Europe, where carbon/energy tax revenues from the West are placed in European controlled funds (e.g., the EBRD or EIB) to be used for energy-conservation and efficiency-enhancement investments in Eastern Europe. When the wheels have started to turn in Eastern Europe, the carbon tax could be extended to this region too. At the subnational level in Eastern Europe there is the problem of poorer households not being able to bear the burden of an emission tax. This could be solved by redistributing some of the tax revenues to these households to allow them to improve their personal energy-efficiency by purchasing energy-efficient appliances (Barret, 1991).

7.4 Emission trades

An alternative to a carbon/energy tax is to establish a market of tradable emission permits. The advantage being that the cost of reducing CO_2 and SO_2 emissions varies considerably from country to country, and is in general lower in the East than in the West; therefore, it would be profitable to engage in projects reducing emissions in Eastern Europe and to sell the corresponding emission entitlements to parties in the West. Thus, one would establish instruments that improve the cost efficiency of greenhouse and acid-rain abatements throughout Europe, relocate capital to Eastern Europe, and give companies investing in Eastern Europe a strong incentive to improve the environment (Moe and Roland, 1991). However, there must be a certain control over the flow of permits on the market. This is because greenhouse gas emissions are often produced jointly with other pollutants that have local impact. Thus, measures for emission reductions must not be concentrated in specific sites just because it is cost-effective to reduce CO_2 in these areas, but the local ambient air quality must also be considered (Smith *et al.*, 1991). A good example of approaching this issue is a series of studies on acid rain in Europe carried out at IIASA (see, for example, Amann and Klaassen, 1992).

A general problem with tradable permits is where to relocate them initially. This problem is similar to the problem of the reimbursement of carbon/energy tax revenues to the respective countries; therefore, the same parameters could be used, i.e., observed CO_2 emission patterns ("grandfathering"), GDP, and population, or a combination of these parameters. The most important issue to consider is not to give one party enough permits to have substantial market power. Other problems include the resistance to infusion of permits, because this would devalue the existing ones, and tightening the environmental constraints which would require revoking some of the permits (Smith *et al.*, 1991).

An important issue to be considered is the level of the market at which trading should occur. One possibility is to introduce the trading of permits at the national level, where they will have as much of an effect on global environmental problems as an emission tax. If we disregard the effect large countries can have on the CO_2 permits market, which is considered to be small, and if there are many countries participating in the CO_2 agreement, a competitive market of CO_2 permits is likely to develop. Then the different countries would benefit from trade in CO_2 emissions, due to their different abatement marginal costs. However, unlike a tax scheme, the system of tradable permits has no built in mechanism for treating CO_2 emission releases that exceed the permitted level. This could be solved by the international agency in charge of the permits marking off the emissions versus the permits and selling the remaining permits at a somewhat higher price than the market value (Hoel, 1990).

If the tradable permits are implemented at a subnational (i.e., company) level consideration has still to be given to the level at which the trading is to occur. If the permits are implemented among consumers of products or services, then the problem is the enforcement due to the large number of actors. On the other hand, if the level chosen is the primary producers, then the problem is that the small number of actors implies a greater chance of market-power problems in the market. An advantage with tradable permits at the company level is that a market arises between firms, which will make the cost of emission reduction smaller than in the case of an emission tax, when an implicit market mechanism is created internally in each firm. A problem implementing tradable permits at the company level concerns new entrants to the market, when existing producers do not want to sell the required permits to the competitors (Smith *et al.*, 1991).

An alternative formulation of emission trade within Europe at the enterprise level, avoiding the problem with the allocation of allowances, is as follows. Assume that a Western company must invest in environmentally sound equipment to reduce its energy consumption, due to stringent environmental legislation. Instead of realizing this investment, the company could transfer the expected capital requirement to a European intraregional agency, which identifies, values, and invests the majority of the capital in environmental projects in Eastern Europe. Because a greater environmental benefit can be accomplished at a lower cost in Eastern Europe, there would be enough capital

left to create incentives for future participation by payments to the "donor" company in the West and the "acceptor" company in the East.

7.5 Social costs in technology selection

In determining which technology to select out of a set of alternatives for a certain application, consideration should be given to the total social costs of the selected alternative. For instance, before investing in coal technologies, consideration should be given of to local air quality and its effect on human health and thereby the associated health-care costs to society.

The difficulty in including the social costs in the selection of technology is the absence of an accepted economic analysis methodology internalizing social costs. Another question is how much of the total social costs of a specific piece of equipment should a country or region bear.

7.6 Changes in investment patterns

In changing the investment patterns the most important issue is to influence a shift from energy production to energy conservation in the internal policy. If this is not done first, the other actions will not have any great effect on the investment patterns.

The East and the West must also cooperate in identifying economically and environmentally sound projects, and economic interests must be combined to reduce the risk of a project. In doing so, it is important to avoid extremely large projects, which require large investments and have a poor cash flow. Furthermore, it is important that governments concentrate on demonstration projects; these projects may attract future private domestic and foreign investments (Trumpy, 1993).

The international financial institutions need to be active and flexible in securing efficiency-enhancing and energy-conservation investments in Eastern Europe. They should also encourage partnership with local firms bearing in mind innovation-financing agreements such as the following (UN, 1992; UN-ECE, 1993):

- Joint-venture agreements with external investors.[7]
- Third-party financing with external investors and knowledge of how to get ROI on energy savings.
- Energy-service agreements with external providence of energy service at a fixed initial unit cost.
- Shared-saving arrangements with a certain partition of profit between external and local firms.

[7]See, for example, IIASA study on the new business environment in Eastern Europe (Razvigorova and Wolf-Laudon, 1991).

- Variable payment loans, where the "debt" is paid according to ability.
- Limited term, guaranteed payback loans.

Another policy to consider is providing economic benefits for early action for both Western and domestic companies, which in the latter case could include temporary production incentives as governmentally guaranteed production volumes and subsidies to ensure a near-term market. This type of policy has established Denmark as a world leading manufacturer of wind turbines. An additional possibility is to encourage and stimulate high-value niche markets, to both end-use and renewable-energy technologies. The Swedish energy authorities recently completed a competition regarding energy-efficient refrigerators/freezers, in cooperation with major institutional buyers of household appliances; as a result of this competition new models with significantly reduced electricity use have been introduced to the market (IEA/OECD/NOVEM, 1991).

8 Technological Policy

8.1 Technology transfer in general

Historically, technical improvements have played a central role in energy conservation and improving energy efficiency in the West, especially since the oil crisis in 1973, and they are expected to play an equal significant role in the future. Since the energy-conservation and efficiency-enhancement potential in the East is great, the technical improvements are likely to be of great importance in transforming their societies. When it comes to the industrial sector, energy-efficiency and conservation measures not only effect ecology, society, and production, but often produce additional benefits such as higher productivity in technological processes (Bashmakov, 1991).

In formulating a technological policy it is important to focus on certain activities, due to the complex situation of achieving energy savings, attaining economic and financial rewards, and environmental and social acceptance (UN, 1992). Due to the lack of domestic capital attention should first be paid to measures with a short payback period and quick realization, for instance, heat-supply and heat-consumption systems. Another important area is the fuel mix, where substantial benefit can be achieved in certain countries due to heavy reliance on low-grade coal with high sulfur content. To realize such a technological policy, intraregional cooperation and technology transfer are essential.

An important issue to bear in mind is that there are many examples when technological innovations in the East have brought substantial benefits to Western partners. Therefore, technology transfer must not be considered a one-way street from the West to the East, but a busy crossroad facilitating intraregional cooperation in both directions. Furthermore, technology transfer does not consist of mechanically transferring a given technology from one

place to another, but rather involves introducing specific technologies suited to the conditions and needs of the user. Moreover, technology encompasses not only hardware, but also software in the form of know-how related to operation, maintenance, training, marketing, and financing (ESETT, 1991).

The diffusion of environmentally sound energy technologies requires actions within each country at the international level and cooperation between different countries at various levels. The private sector should be the main actor in strengthening the market forces in Eastern Europe and in introducing more efficient technologies. However, governments also have an important role in creating a favorable climate for technology transfer through regulations, legislations, incentives, removal of barriers, and institutional arrangements. Another important actor is the international coordination of policies, which is necessary to ensure that the efforts are efficient and do not harm the competitiveness of countries in focus and to avoid dumping of unsatisfactory technologies in acceptor countries (ESETT, 1991).

Experiences show that the real problem in technology transfer is transfer and not technology, and that technology-transfer programs not going beyond auditing and feasibility studies have ended in failure. To avoid this the following components are necessary (Jászay, 1993):

- Commitment and awareness must be established at both the governmental and the company level. Important areas are to demonstrate commitment by instituting a high-rank energy-efficiency and conservation office and to evoke awareness by a focused flow of relevant information.

- Good policy and investment climate must demand correct pricing of energy and that taxes and duties do not distort the market signals from the correct energy price.

- Management and technical capabilities need to be further developed, especially managerial and financial skills.

- Effective implementation institutions have to be developed using price and legal frameworks to promote technology transfer, especially when direct government intervention is prohibited by the rules of market economy.

- Existence of technology vendors and service companies already play a promising role in technology transfer by importing and marketing advanced equipment and services; the skilled domestic companies can evolve when abandoning uneconomic (i.e., military) production.

Western companies have to be motivated to transfer technologies to Eastern Europe where some problems with profitability and convertibility of received profits still exists, not to mention the fear of losing control of equipment in the case of political instability. A policy which could attract Western investments to East European markets would be to give investors early-action subsidies

or grants from their governments, then subsidies from the governments of Eastern Europe could support the process of local adaptation of the transferred technologies. Solving the convertibility problem, until it can be solved at the national level, could be done as outlined in Section 7.4, i.e., by relocation of capital from Western companies that would have to be spent anyway. Another solution is to link energy conservation with energy exports, by selling some or all of the energy saved for hard currency and paying foreign investors from those receipts. A third option is to pay for the Western contribution in joint-ventures in energy-efficiency equipment or parts (Bashmakov, 1991).

A number of studies concerning technology diffusion, technology transfer, technological evolution, and social behavior in technology diffusion have been carried out at IIASA (see, for example, Nakićenović and Grübler, 1991, and Grübler and Foray, 1991).

8.2 Industry sector

Targeting large energy users (i.e., major companies and utilities) is an especially attractive strategy, because substantial energy savings can be obtained from few decisions at a high level. The increased demand for energy-efficient equipment can affect the whole market by lowering the costs to all purchasers by the benefits of large-scale production (Schipper *et al.*, 1992).

Only a fraction of the tremendous potential for efficiency improvements has been targeted in Eastern Europe. It has mainly been a question of no- or low-cost measures. The implementation of projects during the past decade requiring large investments have been much lower even with payback periods of less than two years, i.e., many energy-conservation measures that are cost effective have not been implemented (UN, 1992). The challenge is to identify areas where improvements can be made inexpensively with low investment costs and short payback periods, and to ensure that policies are effectively introduced and enforced.

An important strategic issue, to be decided on a case-by-case basis, is wether energy-efficient equipment should be added to existing production units and infrastructure, or if the environment is better served by an early retirement. Retrofitting can reduce emissions at an early date, but addition of end-of-pipe technologies often increase the use of energy. On the other hand, retirement can reduce or eliminate the problem on a more permanent basis. (Moe and Roland, 1991).

Energy conservation can only be accomplished effectively, when we know where to focus our resources. Thus, to identify the most efficient options energy-audit processes must be among the first of measures (UN, 1992). Furthermore, auditing processes also identify operation and maintenance opportunities along with possible hardware changes (Schipper *et al.*, 1992).

8.2.1 Manufacturing sector

The manufacturing sector is likely to shifts away from the energy-intensive industries dominating the former centrally planned economies. This is not only due to natural retirement of older production units, but also because some energy-intensive industries will not survive in a market economy. Thus, substantial decline in energy intensity is likely to be accomplished during the transformation process. The extent of foreign investment in new production capacities will be a major factor in reforming the industry. New production capacities will be considerably more energy efficient than even relatively modern East European factories. Key opportunities in the manufacturing sector are (Schipper *et al.*, 1992):

- Waste heat recovery, especially in primary-metal production, food processes, pulp and paper industry, and in chemical processes.
- Bottoming cycles for cogeneration of electricity and heat
- Heat pumping of low grade heat.
- Improved combustion efficiency.
- Electric-arc furnaces and the "plasma-melt" process in steel industry could decrease energy consumption by one-third.
- In aluminum industry recycling could yield 5% of the production.
- In Chlorine-Alkali processes introduction of selective diaphragm membrane cells could reduce electricity consumption by 15 to 30%, improve product quality, and reduce environment and health impacts.

8.2.2 District heating

District heating systems in Eastern Europe are in very poor condition with heat loss primarily due to poor and damaged insulation. This is exacerbated because needed maintenance and infrastructure investments are being postponed. Another pressing problem is leakage of district heating water, which in some municipal networks amounts to 150–200% of the circulating water per month. In this context, it is not surprising that the residential heat consumption per square meter in the Baltic nations is estimated to be more than double the corresponding value in Sweden and Finland (O'Dell *et al.*, 1993).

There is a whole range of energy-efficiency measures to be taken in district heating. First, heat production efficiencies can be improved by improving combustion efficiencies, installation of heat recovery systems, and to recirculate heat from other sources. Second, distribution networks can be optimized by replacing obsolete supply pipes, improving insulation of supply pipes, metering of heat consumption, and improving maintenance. Third, energy management can be modernized by remote control systems for demand-side management,

and cogeneration of heat and electricity. Fourth, end-use efficiencies must be improved by installation of valves or thermostats on radiators, and by improving thermal efficiency of buildings. Furthermore, there has to be a meter retrofit to provide incentives for reducing energy consumption (UN, 1992).

8.2.3 Utilities

An important issue for utilities is demand-side management (DSM), where utilities are to consider improvements in consumer energy efficiency as a resource option, i.e., to "purchase" end-use efficiency if the cost is lower than new supply. DSM includes a wide range of activities as information programs, energy audits, providing low-interest financing, and installation of energy-efficient equipment at zero or low-cost to the consumer. Direct installation programs can achieve high penetration rates and substantial savings per customer, but generally at a higher cost to the utility than rebate or loan programs. Installation programs are most suitable to target low-income households and small commercial customers (Schipper *et al.*, 1992). To enhance DSM reforms must be taken enabling utilities to earn a fair rate of return from energy-efficiency programs (ESETT, 1991).

Supply-side measures can achieve substantial energy conservation and enhance efficiency. Rehabilitation of existing power plants can increase efficiencies by as much as 5 to 10 %. Another energy-efficiency measure is to introduce gasturbines in steam cycles. Natural gas fired gasturbines with steam turbine bottoming cycles could yield efficiencies of 50 %. Gasturbines can be used with coal as fuel in IGCC-configurations with high efficiency and low sulfur emission. Furthermore, gasturbines could promote the use of cogeneration by improved production flexibility. For example, the steam injected gasturbine (STIG) has a flexible electricity to heat ratio up to 40%. However, utilities have to be motivated to pursue this option, because selling heat is not their original mission. Another option to promote cogeneration is to implement policies requiring utilities to buy power from independent producers at avoided costs (Schipper *et al.*, 1992).

Reducing transmission and distribution losses can also achieve substantial energy conservation. These measures are quite straightforward, do not require any advanced technologies, and often have very short payback periods (Schipper *et al.*, 1992).

8.3 Transportation sector

The transportation sector poses a major problem for sustainable development. It is a fast growing sector that has been neglected for too long. In this context, it is not surprising that the largest energy-conservation potential from changes in activity levels and restructuring are possible in passenger travel (IEA/OECD/NOVEM, 1991; Schipper *et al.*, 1992). Improving the operation of transport systems and reducing air pollution are the main reasons for ur-

ban transportation strategies, but energy conservation can be an important result. Improving operation and maintenance is especially important in the transportation sector, because there is little scope for making physical retrofits to vehicles (Schipper *et al.*, 1992).

In East European countries public transportation is a commonly use travel mode. This is a key opportunity to be pursued, because it is more difficult to persuade people to change travel mode than to motivate them to continue with the present mode of travel. The efficiency of public transportations are, however, rather low due to postponed maintenance, obsolete technologies, and inefficient organizations. Thus, major investments are necessary, but modification and upgrading are likely to be achieved relatively easy due to the existing infrastructure (UN, 1992).

Policies favoring location of services closer to residences, transit centers, and work places, and high-density housing can promote the use of public transportation. These measures not only result in shorter distances to many of the daily destinations, but also encourage the use of mass transit due to easy access in high density societies. Another alternative is to introduce designated lanes or separate guide-ways for buses on major routes, which would give them an important time advantage in peak periods. Bus and rail are likely to continue to carry most passengers in the future in Eastern Europe. The automobile share will, however, increase greatly within the next 20 years (double or triple) (Schipper *et al.*, 1992).

The fuel intensity of new cars will have a rapid impact on the fleet average. In 10 to 15 years it is possible with an average new car similar in technology, size, and performance to the current Italian average. Combined with improvements in fuel quality, roads, and vehicle maintenance the current fleet average of 11 to 12 liters per 100 km could drop to 7 to 8 liters per 100 km in 2010. Automobile efficiency improvements could, however, be countered by a higher degree of service (e.g., more horsepower). Future automobile energy efficiency will also depend on the number and characteristics of used cars imported from Western Europe (Schipper *et al.*, 1992).

Once automobiles are acquired they tend to be driven, because people can usually travel more rapidly and in greater comfort in automobiles than in collective modes. Discouraging automobile ownership through high taxation is a measure used in many countries. Pricing of roads and bridges, road tolls, parking pricing, area licensing schemes, limitations on parking, and mandatory car-pooling are other options (Schipper *et al.*, 1992). Traffic management schemes can facilitate the traffic flow, and thereby decrease the energy used per passenger-km. However, the Western experience indicates that these schemes may induce increased traffic, which limits the environmental benefits (ESETT, 1991).

In freight transportation it is uncertain wether energy intensity will increase or decrease. Transportation of bulk raw materials and fuels are likely to decrease, which is in favor of decreased energy intensity. Furthermore, many East European countries are likely to build new facilities to produce locally

what was produced elsewhere. This will reduce the distance to the market, and thereby the energy used for transportation. On the other hand, increased trade with the West will bring significant increase in freight transportation, and the importance of trucks is likely to increase as consumer and other finished goods come to play a larger role in the economy; this will probably increase the energy intensity (Schipper *et al.*, 1992).

8.4 Residential and commercial sectors

In the residential and commercial sectors there are tremendous potential for energy conservation and enhanced efficiency. The greatest potential is considered to be in heating systems due to inadequate control and obsolete equipment. Energy-efficiency improvements in heating systems and electric appliances are estimated to reduce energy consumption by more than 50% in Eastern Europe compared to 30% in Western Europe. The first of measures must be to install energy meters. This will provide incentives for energy conservation, and better information on energy consumption (UN, 1992).

Another urgent issue is to encourage building owners to incorporate energy-conservation measures when undertaking general renovation. This is especially important because installation costs are much smaller in this situation. A large share of the building stock is in a poor state, and will have to be renovated in the near future. However, the retrofit will probably be slow due to lack of funds, and industries skilled in retrofitting large apartment buildings dominating the housing stock. Furthermore, the incentive for energy-conservation retrofits will be weak until meter-retrofits become widespread (Schipper *et al.*, 1992).

It is important to stress that many of the measures are quite simple, for instance, installation of functioning valves or thermostats on radiators. Trivial measures like this would conserve tremendous amounts of energy throughout Eastern Europe. In new buildings it is important that design and construction in regard to energy efficiency are based on modern principles, for example, concerning ventilation heat loss and insulation. These principles, simple as can be, reduced energy requirements of West European housing units by 50% between 1974 and 1991. However, increased thermal efficiency of buildings are likely to be countered to some extent by increased housing area per capita, decreased household size, and increased indoor temperature (UN, 1992).

In appliances there is an opportunity for improving energy efficiencies as stock turn-over may be rapid as incomes rise. However, increased standard of living is likely to induce growth in appliance size and ownership (Schipper *et al.*, 1992).

8.5 Agriculture

The productivity of communist agriculture cooperatives have been much lower than the Western market-oriented agriculture. Higher energy and land use efficiencies will conserve energy, and release some land for reforestation projects.

It should be stressed that the goal of this process is not to increase the use of pesticides and fertilizers to West European levels, but to implement sustainable and environmentally benign agriculture in both Western and Eastern Europe simultaneously. If a carbon/energy tax is introduced, a subsidy could be placed on forestry and other environmentally benign activities in agriculture (Barret, 1991).

To create sustainable agriculture will require (IUCN/UNEP/WWF, 1991):

- Strategies and plans to use agricultural land optimally.
- Restrictions on the use of fertilizers and pesticides.
- Economic incentives to induce sustainable use of land.
- Protection of farmland against conversion to non-agricultural use.

A strategy for the management of forestry resources should be developed including an inventory of forestry resources. The aim of this strategy should be to protect areas of natural forests and to establish sustainable plantations. Furthermore, forest conservation and agricultural planning must proceed together (IUCN/UNEP/WWF, 1991).

A number of studies on East and West European forests including future forest resources, economic impacts of forest decline due to air pollutants, policy implications, and land-use changes have been carried out at IIASA (see, for example, Nilsson *et al.*, 1991, and Nilsson *et al.*, 1992).

9 Research and Development Priorities

Technology research and development priorities must build on the existing energy infrastructure in Eastern Europe[8]; special emphasis should be placed on technologies that enhance diversity, efficiency, and safety, extend and improve prospects for utilizing reserves of conventional fossil fuels, and make available new and alternative energy sources. However, the necessity of a shift from today's emphasis on supply-side technologies to greater spending for energy efficient end-use technologies in Eastern Europe must be stressed to promote the compliance between the R&D efforts with the existing energy infrastructure in Eastern Europe (IEA/OECD/NOVEM, 1991).

Government support of R&D is important and should include creating a consistent methodology to *assist* in ranking the energy R&D priorities, which should consider technical, economic, environmental, and security criteria. However, governments should avoid "picking winners." The choice of specific technologies should instead reflect the pull of the market through R&D projects funded either entirely by the private sector or by government and producers (IEA/OECD/NOVEM, 1991).

[8]See, for example, IIASA study on research and development management in the economies in transition (Schneider, 1991).

The use of joint-ventures between West and East European private companies should be elaborated to help commercialize advanced energy-efficient technologies (Union of Concerned Scientist, 1991). To attract Western R&D funds, the lower cost-levels and the renowned scientific skills in Eastern Europe could be used, which would boost the future R&D capacities by transferring modern equipment to researchers in Eastern Europe.

It is important to concentrate on demonstration projects, which are a necessary link between R&D and commercialization. However, such projects often involve large investments and high risks; risk sharing through joint-ventures is a key element to consider (IEA/OECD/NOVEM, 1991).

Other important R&D efforts include pushing the efficiency frontier in the area of retrofits and to field testing integrated packages of advanced energy-saving technologies; this latter effort is important to measure the effect of component interactions on performance, economics, reliability, and energy-user acceptance (Schipper *et al.*, 1992).

10 Institutional Framework

An important challenge for the governments in Eastern Europe is to create an appropriate institutional and human infrastructure, which will play a crucial role in the adaptation process of Western energy-efficient technologies and the development of domestic technologies (Bashmakov, 1991). In this process, Western experiences will play a crucial role, and information exchange with the West should be encouraged.

10.1 Statistics and information

Historically, the information and statistical data on the environment in Eastern Europe have been scarce due to the lack of metering device installations from energy production to end use, which was influenced by the attitude that energy more or less was a common resource. Furthermore, the data and information given to the West were more a reflection of political propaganda issues than a register of the real situation.

Thus, it is urgent to develop statistical and information administration, for several reasons. First, statistical data and information are necessary prerequisites for developing policies and energy-efficient systems. Any study or energy-conservation activity has to start with the accumulation and systematization of vast amounts of information (Bashmakov, 1991). Second, they are needed to monitor and evaluate policies and projects engaged in determining future environmental projects (Fisher *et al.*, 1990).

Furthermore, if a global or regional carbon/energy tax is agreed upon, then it is necessary to build an administration quantifying emissions of CO_2, SO_2, and NO_x. One structure suggested for the verification of internationally agreed-upon reductions is a national organization quantifying the national emissions and supplying data to an international organization, which should

bear the responsibility for verifying each member's compliance with the emissions' limit (Fisher *et al.*, 1990).

10.2 Standards

It is important to start a process for setting common and harmonized emission standards on energy-using equipment for several reasons. First, standards focus on important product features such as energy efficiency, quality control, security, and reliability. Second, standards allow buyers to compare products. Third, energy-efficiency standards could have a large impact in a short time because they affect an entire industry at once (Schipper *et al.*, 1992). Fourth, emission performance standards are closely related to retrofitting the existing infrastructure and investments in new energy-using capital (Moe and Roland, 1991).

Other important features of emission standards are that the can gradually be tightened, as has occurred in the USA with mandatory appliance standards, and that a variety of incentives can encourage producers to go beyond the standards, such as payments, awards, and publicity to producers coming to the fore. To facilitate an initial agreement between governments and producers, voluntary agreements could be considered an alternative, an approach which has been preferred in Western Europe and Japan for automobiles and appliances (Schipper *et al.*, 1992).

However, implementation of environmentally benign performance standards usually adds to the investment costs and thereby the product costs. In some cases, these extra costs are justified by a reduced life-cycle cost from the energy conserved. In other cases the standards increase the life-cycle cost, but are justified by their benign effect on the environment. The scarcity of capital in Eastern Europe limits investments made in both of these cases, whereby governmentally backed fundings should be considered an alternative for financing the extra costs involved (Moe and Roland, 1991).

Standards should be implemented with priority given to the most pressing areas such as coal-fired power plants, emission standards for new cars, minimum performance standards for fuels, and building practices and materials. Furthermore, standards should be implemented for operation and maintenance in the energy-production sector, e.g., power and gas grids, power stations, and coal mines (Moe and Roland, 1991).

Concerning fuel-efficiency standards for automobiles, Western experience indicates that these standards were at least twice as important an influence on energy efficiency as gasoline prices (Greene, 1990). Real gasoline prices have fallen to a level below that of the early 1970s. Nevertheless, today's standards have required that cars be more fuel efficient than those of the 1970s. This has been accomplished by mandatory fuel-efficiency standards in the USA and voluntary targets for fuel-economy improvements in most other industrialized countries with automobile industries (Schipper *et al.*, 1992).

Building codes for new homes in Western Europe and in some states in the

USA have raised efficiency levels above what the industry is expected to have done on its own (Schipper *et al.*, 1992). The building codes have contributed to reducing the energy requirements of West European housing units, which all in all was reduced by 50% between 1974 and 1991 (UN, 1992).

10.3 Green labels

Performance labels identifying the energy performance of a piece of equipment can be used as a market-pull alternative to efficiency standards because they enable buyers to select more efficient products with lower operation costs (UN, 1992). However, the energy costs have been, and still are, only a minor part of the life-cycle costs of products, which is a weak reason for selecting more energy-efficient equipment. This is especially true when the up-front cost is higher for the more efficient unit — as for example, fluorescent bulbs.

Even if the market pull of the energy-efficient products at the present price of energy in the West is not very strong, there seems to be an impact on what manufacturers choose to offer, as in the case of energy labeling for new appliances in North America (Schipper *et al.*, 1992).

The effect of energy labeling can be enhanced by pursuing a policy with energy efficiency as a high public priority. By doing so similar effects could be accomplished with energy-efficient products as has been the case with non-chlorine bleached paper.

10.4 Energy and environmental consulting

Setting up local energy-efficiency and environmental-protection centers has been, and still is, regarded as an important initiative to promote the transformation process in Eastern Europe, to facilitate the technology transfer from the West to the East, and to improve energy efficiency and the environment. By 1991 energy centers had been set up in Poland, the former CSFR, and Moscow (Bashmakov, 1991).

Energy centers should be nongovernmental, and there should be many of them within each East European country. Furthermore, they should educate central and local governments on ways authorities can be responsible for improvements in energy efficiency in Eastern Europe. Another important feature is to create the energy-efficiency centers as joint-ventures with Western participation, which would yield several important benefits (Bashmakov, 1991):

- Participation of technologies' donors will facilitate information gathering on new energy-efficient technologies, and reduce the risk of transfer of outdated technologies.
- Cooperation will be possible with parties in donors countries.
- Financial resources and sponsors of potential energy-efficiency centers will be identified.

- Participation of well-known Western partners will enhance the confidence of new energy-efficiency centers among parties in the host country and will help induce local sponsorship for proposed projects.

The activities in the energy centers should include activities such as (Bashmakov, 1991):

- Scientific research in energy conservation and environmental protection, including investigation of the most effective ways to adapt efficient technologies.
- Development of energy-efficiency policy and legislation by:
  - Creation of an institutional infrastructure at government, local, and enterprise levels which will be responsible for the energy-efficiency improvements.
  - Development of a regulatory mechanism for government energy-efficiency policy, including energy-efficiency standards and labeling.
  - Prevention of violation of standards and regulations.
  - Development of methods for utility planning.
  - Development of proposals on energy taxes and price reforms.
  - Development of guidelines for assessment of energy efficiency and measurement of results.
- Provision of information and development of consumers' education programs and introduction of methods for building a statistical framework for more secure assessments in the future.
- Marketing and encouraging efficiency in the private sector.

Furthermore, industry associations should be promoted because they can play an important role in promoting energy efficiency among their members, as a standard of good environmental actions. Such associations can interact with nongovernmental energy centers and government agencies in identifying priorities, providing important feedback about proposed policies, and assisting their implementation (Schipper *et al.*, 1992).

11 Public Policy

In public policy it is important to emphasize that energy conservation and enhancing efficiency saves money at the individual, company, and national levels. This, however, will require a change of the national "philosophy"; in the past this philosophy has been that increased energy production is positive because it increases the GDP of the country. This attitude will have to be

changed to one focused on sustainable development and concern of the local, regional, and global environment.

To achieve successful implementation of a public policy, first, target groups with homogeneous behavior must be identified and, second, their behavior must be modified. One of the most important target groups is the local authorities, especially city managers, whose attitude is crucial. Another important group is companies and businesses. Here it is important to distinguish between large companies, on one hand, and small and medium companies, on the other hand. Large companies do not need any special attention in public policy because they are the focus of other policy measures. Instead special emphasis should be placed on medium and small enterprises because they probably do not have any special economic interest in decreasing their energy use originating in low energy costs; their presence in Eastern Europe is limited and is expected to grow radically. For instance, in the West 70 to 80% of the GDP comes from small and medium-sized enterprises (UN, 1992).

It is important to provide engineers, technical staff, energy managers, and researchers with information and training on the potential demand-side savings. All energy consumers who can implement energy-conservation measures can be considered clients; the largest target group is the general public. This group does not behave homogeneously, but there are common interests in the economy and environment that should be pursued in an energy-efficiency public policy. Addressing the general public will be crucial to limiting the expected high energy-demand growth rate, which is expected from the increase of basic household equipment and cars when the standard of living improves (UN, 1992).

11.1 Education

Formal environmental education as part of the public policy is needed to raise the environmental consciousness of individuals and encourage them to play their full potential role in energy-efficiency and conservation measures; the policy must connect each individual's actions to the environmental impacts of these actions (Matlary, 1993; EC, 1992). Thus, environmental education should be extended to and integrated into all stages of life (IUCN/UNEP/WWF, 1991).

The "common" part of an educational public policy includes training of Eastern and Western bankers, executives, decision makers, planners, and operators how to (Trumpy, 1993):

- Identify cost-benefit effective projects and bring them to the attention of the private sector.
- "Package" such projects to be financially attractive and inexpensive.
- Attract foreign loans, technology, suppliers, and customers if needed.
- Negotiate projects in the best interest of all parties in Eastern Europe.

- Avoid unnecessary foreign participation, costs, imports, and involvement.

11.2 Information campaigns

Educational campaigns and the mass media in Eastern Europe provide good opportunities for making an energy-efficiency policy understandable and accepted. These campaigns should encompass governments and be led by a nongovernmental movement (IUCN/UNEP/WWF, 1991). Information campaigns are especially important to address large target groups, to change attitudes and practices, and to provide consumers with reliable information, assisting them in making decisions about energy-efficiency investments, whereby they can affect decisions about the quantity or quality of service in various end uses, play a large role in shaping energy intensity, and affect the activity and the mix of activities in various sectors (Schipper *et al.*, 1992).

11.3 Public movement

Since the late 1980s, environmental awareness has increased in Eastern Europe; public opinion in several East European countries is that the environment is unsatisfactory, if not poor. Public opinion has caused officials to change their decisions and to develop restructuring programs in Eastern Europe, including environmental pollution abatement, and measures for selective industrial development (UN, 1992).

12 What Are the Benefits for the West?

There should be no doubt, whatsoever, of the tremendous benefits that will arise on both sides, if the West helps the East in the transformation of Eastern Europe. This process, however, will be neither painless nor free of costs on either side.

If the West does not participate, then there is a great risk that the transformation process in some of the East European countries will be unsuccessful. Several disadvantageous could evolve in such an event:

- Continued environmental degradation, including worsening local ambient air quality, increased regional soil acidification, and continued high emissions of greenhouse gases.
- Continued economic recession.
- Reappearance of nondemocratic states.
- Increased risk of national and ethnic conflicts.
- A new armament race within the region of Eastern Europe.

- Mass migration to the West, especially of well-educated people draining their societies of skill and know-how.

Considering the "alternative costs" to the West, then the alternative of not participating seems entirely unprofitable. First, the expenses of per unit of reduced emissions is higher in the West than in the East. Second, measures taken in the West will be countered both regionally and globally by the probable lack of measures in the East. Third, the reappearance of nondemocratic states in the Eastern and Central Europe or the risk thereof will impose continued high defense budgets in the West, which will consume capital that otherwise could have been used for environmental protection. Furthermore, mass migration will cause further expenses in aid to refugees. Moreover, there is, of course, the issue of human kindness, which in itself should be a motif for participation.

There are, however, differences between the East and the West. One is the different environmental priorities; in the East the local environment and worker safety are important; the West focus on the regional and global environment. The difference can, to a great extent, be explained by the number of actions that have already been taken in the West which addressed and thereby improved the local environment. This difference can easily be overcome considering that the solutions to the local, regional, and global environment can be closely related to the way energy is used.

Unilateral actions improving the environment in Eastern Europe will have a limited effect because of their deep social and economic crises, financial difficulties, large external debts, and out-of-date technologies (Bashmakov, 1991). Only through concentrated international effort — by sharing research, technology, and managerial skill — can the transformation process and environmental protection be accomplished successfully. All in all, the transformation process in Eastern Europe is a one time opportunity. The challenge is to create an appropriate mix of the policies mentioned above to evoke stable, environmentally conscientious, democratic states in the whole of Europe.

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