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Study

Resource Efficiency Gains and Green Growth Perspectives in Ukraine

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- Ukraine is one of the most energy-intensive countries in Europe. In addition, the carbon intensity is critically high due to gas, coal and oil being the predominant energy sources. Ukraine is counted among the top twenty countries with the highest CO_2 emissions worldwide. Although it does not have a low-carbon economic development strategy and refuses to take on any restrictive obligations to reduce emissions, Ukraine is signatory party to the Kyoto Protocol.

- The issue of green economy is reflected in many national documents. However, there is no comprehensive political strategy and only about 30 per cent of the planned actions have been implemented. The most important positive example is the launch of a green tariff. There has been national and international criticism because the obligation to perform environmental reviews of projects in a number of areas was significantly simplified or eliminated in the Ukraine. Although it has joined the Energy Community, the EU influence on legislative measures is only given in financial terms.

- Ukraine's most promising sectors for green growth are: building, (organic) agriculture and renewable energies. It has a potential to develop green technologies, but governmental support and a favourable investment climate are still lacking. The main obstacles for a transition to green growth are the government's intervention in energy pricing (direct and indirect subsidies), a strong lobby for traditional energy, lack of funding, and most importantly corruption.

Content

Introduction

The greening of the economy is a world-wide trend which affects almost all spheres of life. However, Ukraine sup to lacks a coherent green economy strategy. There are some positive examples of successful implementation of mechanisms for introducing elements of the green economy, the most important of which is the green tariff. However, hitherto there have been no political efforts to unite all the means and measures within one policy strategy in order to achieve synergy. All the individual steps taken so far towards launching a public and political debate on this issue have been initiated and/or funded by external institutions. Nevertheless, the effects of the long-term, extensive exploitation of energy resources, minerals, soils and waters are so devastating that they can no longer be ignored.

Ukraine uses too much energy, much of its soil has suffered erosion, municipal solid waste landfills are congested and the country is categorised as not having sufficient provision of fresh water. Moreover, Ukraine has strong heavy industry, chemical and mining sectors, operates 15 nuclear plants and agricultural land occupies half of its territory. Nonetheless, living standards remain among the lowest in Europe.

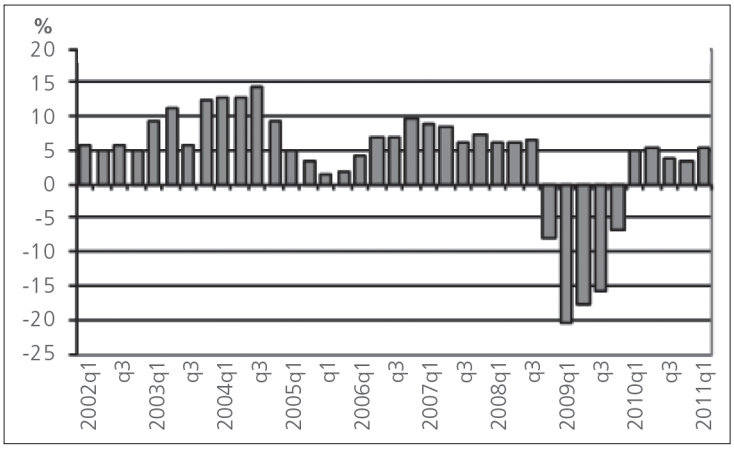
The greening of the economy may well provide solutions to all these problems and also ensure decent (in the ILO's sense) green jobs for the citizens of Ukraine. This chapter aims to outline the state policy measures already implemented for »greening« the economy, as well as to analyse the prospects of and obstacles to a rapid transition to a low carbon development path. The first section provides a brief overview of the general economic situation, energy intensity and greenhouse gas (GHGs) emission levels. National goals and the potential for reducing energy consumption and GHG emissions are also discussed. The second section examines economic sectors that have the greatest potential for creating new green jobs and the prospects of green technologies in Ukraine. It also presents the major obstacles to an economic transition to a low carbon economy. In the third section, the role of the state and the EU's impact on the development of Ukraine's environmental policy are analysed.

1. Overview of National Goals and Potential for Energy Saving and Reducing Greenhouse Gas Emissions in Ukraine

1.1 Economic Situation, Energy Intensity and Greenhouse Gases

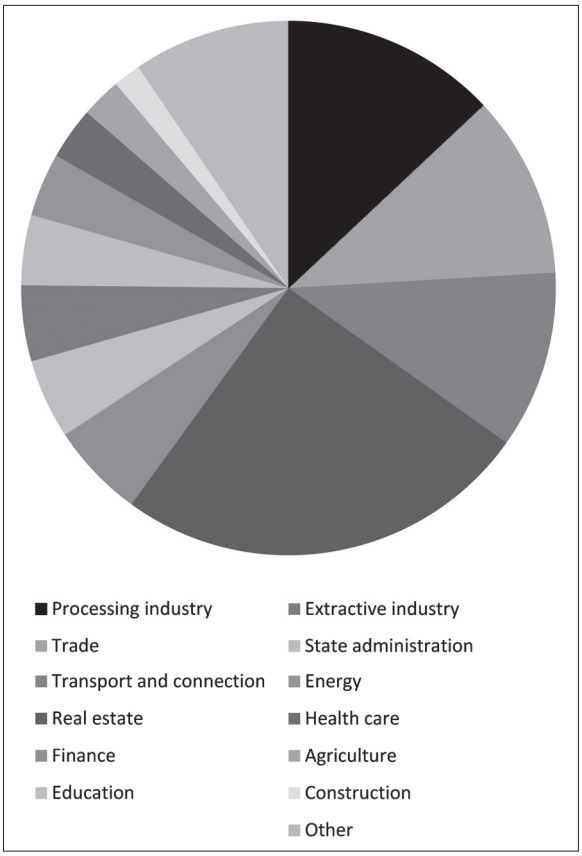
After the crisis experienced during the transition at the beginning of the 1990s, Ukraine entered a period of steady growth during 2000–2006, with an annual average real GDP growth exceeding 7 per cent. The increase in global demand for steel, chemicals and agricultural products contributed to the restoration of the Ukrainian economy. In turn, the growth of revenue from exports led to an increase in people's incomes and thus to rising private consumption. As a result, domestic demand became a powerful engine of economic growth (IFC, 2009). The global economic crisis of 2008–2009, however, resulted in a significant reduction in demand for Ukrainian steel, which together with other factors led to a reduction in GDP of 14.8 per cent in 2009. However, GDP growth reached 4.2 per cent in 2010 and was 5.2 per cent in the first quarter of 2011 (see Figure 1) (World Bank 2011). A large share of GDP belongs to processing industry, trade, transport and communication (see Figure 2). Ukraine's economy is fairly mono-oriented as the mining and metallurgical complex continues to play a key role, accounting for about 27 per cent of nominal GDP, 40 per cent of foreign exchange earnings and 15 per cent of jobs (Vedenyeyev 2010).

Figure 1: Real GDP, Ukraine (change in per cent)



Source: World Bank (2011).

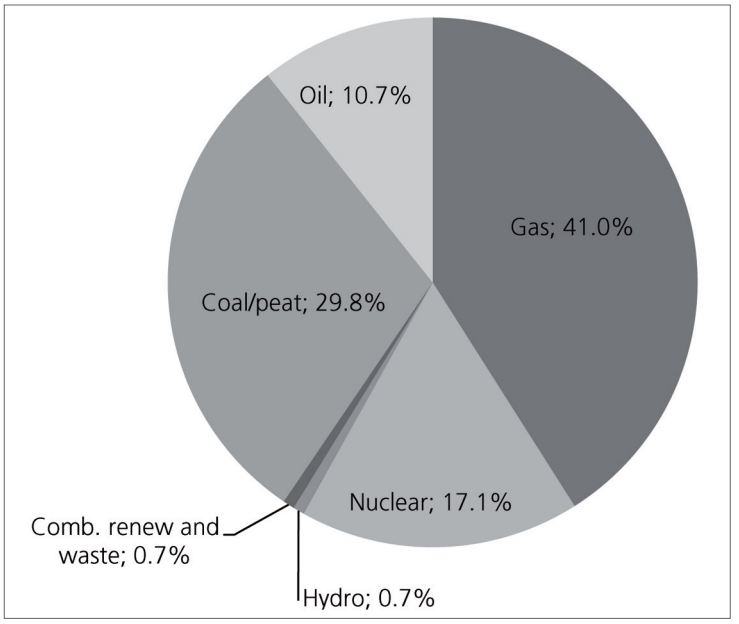
Figure 2: GDP structure, Ukraine (first quarter of 2010)



Source: Vedenyeyev, 2010 (according to State Statistics Committee).

Ukraine remains one of the most energy-intensive countries in Europe. In 2009, the energy capacity of Ukraine's economy was 0.44 koe / $ 05p, while the average for EU27 countries is 0.12 koe / $ 05p (ENERDATA 2010). The balance of primary energy consumption is presented in Figure 3. Evidently, gas, coal and oil predominate. Thus the carbon intensity of Ukraine's economy is also critically high, standing at 0.91 kCO_2 / $ 05p (as of 2008: EBRD 2011).

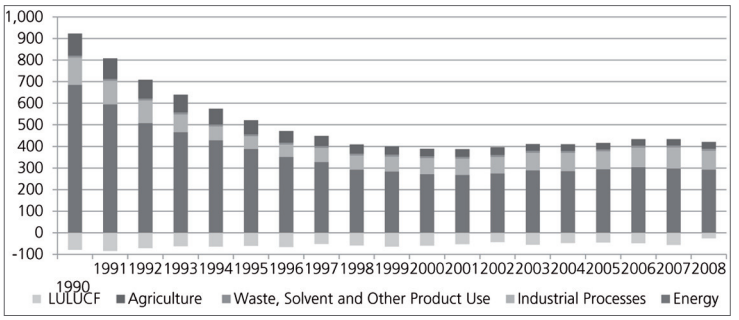
Figure 3: Share of total primary energy supply, Ukraine, 2008



Source: IEA Statistics.

In 2009, a record annual fall in greenhouse gas emissions of 28 per cent was observed. GHG emissions stood at 255 million tonnes of CO_2 (US Energy Information Administration 2011), which could be explained not by deliberate government action, but by a sharp decline in demand for Ukrainian products (metal, chemical fertilisers and so on), as a result of which many companies are not working at full capacity or were halted. Figure 3 shows greenhouse gas emissions trends starting from 1990, which is taken as the basis.

Figure 4: Emissions of Ukraine during the period from 1990 to 2009



Note: LLCF: land use, land-use change and forestry.
Source: Ministry of Environment (2010).

1.2 Objectives and Potential for Energy Efficiency

The issue of cutting energy use and advancing energy efficiency is reflected in many national documents. Major institutional and legal provisions aimed at promoting energy efficiency are reflected in the Law on Energy Conservation of 1994. In 1997, the Comprehensive State Energy Saving Programme for the period up to 2010 was approved. However, analysis of the effectiveness of the Programme indicates that only about 30 per cent of the planned actions are being implemented (Bulgakova and Prystupa 2011). In addition, a transport sector programme had been operating up to 2010, which included a number of priorities for modernising the main transport fund and remodelling infrastructure to promote energy efficiency in this sector. Today, a programme on energy efficiency and development of the renewable energy sector is being implemented that aims at reducing energy consumption each year by 3.3 per cent within the programme implementation period, from 2010 to 2015. Issues of energy saving in the housing sector are reflected in a sector-specific programme.

In 2006, the Energy Strategy was approved, which aims to reduce the energy intensity of the economy by 50 per cent up to 2030. The strategy identifies priority areas for implementation of technological (production efficiency due to new technologies) and structural energy saving (reduction of the GDP share of energy consuming industries). Estimates of technological energy saving potential by 2015 and by 2030 in industry, housing and utilities, energy, construction and transport, as well as in agriculture are given in Table 1 and Table 2. It is clear that the greatest savings of fuel, as well as electric and thermal energy may be achieved in industry in the medium and long term. Significant savings in fuel consumption can be also achieved in almost all sectors. In addition, energy-saving measures in the housing sector will lead to a significant reduction in the consumption of heat and electricity.[1]

1. According to a study commissioned by the EBRD on the residential sector in Ukraine (EBRD 2011), economically feasible energy saving potential is 32.6 MWh annually, which would save approximately 7.18 billion UAH (624 million euros).

Table 1: Potential of economically feasible technological energy efficiency up to 2015, by sector

Sector	Energy Saving Potential (per year)		
	Fuel (million tonnes of coal equivalent)	Electricity (HVth)	Thermal energy (million Gcal)
Industry	26.16	25.27	45.47
Power industry	8.64	4.46	0.5 0
Agriculture	11.33	0.72	0.00
Construction	0.64	0.10	0.14
Transport	10.88	0.67	0.21
Housing and communal services	9.53	7.88	18.88

Source: Ukraine's Energy Strategy up to 2030 (Ministry of Energy 2006).

Table 2: Potential of economically feasible technological energy saving by 2030, by sector

Sector	Potential energy savings		
	Fuel (million tonnes of coal equivalent)	Electricity (GWt)	Thermal energy (million Gcal)
Industry	52.66	47.39	138.52
Power industry	18.50	6.80	1.40
Agriculture	17.97	1.29	0.00
Construction	1.02	0.18	0.40
Transport	17.24	1.24	0.73
Housing and communal services	15.12	14.68	63.62

Source: Energy Strategy of Ukraine up to 2030 (Ministry of Energy 2006)

However, it should be noted that the current Energy Strategy has been criticised many times by international experts (IEA 2006) and civil society (Geletukha et al. 2006). In particular, NGO experts believe that the strategy »contains an unacceptably high level of energy intensity of GDP, which hinders energy efficiency in Ukraine for the coming decades« (Geletukha et al. 2006, Art. 3). Thus, the strategy stipulates that the energy intensity of GDP 2005–2030 will decrease by 2.05 times and stand at 0.43 kg of coal equivalent / US $ PPP. This compares to a global average of 0.34 kg of coal equivalent /US $ (PPP) back in 2003. The strategy is focused on developing the coal and nuclear industries to address the prob-

lem of energy dependence. Obviously, in this scenario, advancing energy efficiency and renewable energy development will be more difficult due to the redirection of state funds to dangerous and environmentally harmful energy sectors. In addition, the Strategy does not take into account the economic crisis of 2008–2009 and thus energy consumption forecasts are outdated. Currently, the Energy Strategy is being updated but leading think tanks and NGOs are concerned about the lack of transparency characterising the preparation of such a strategically important document for Ukraine.[2]

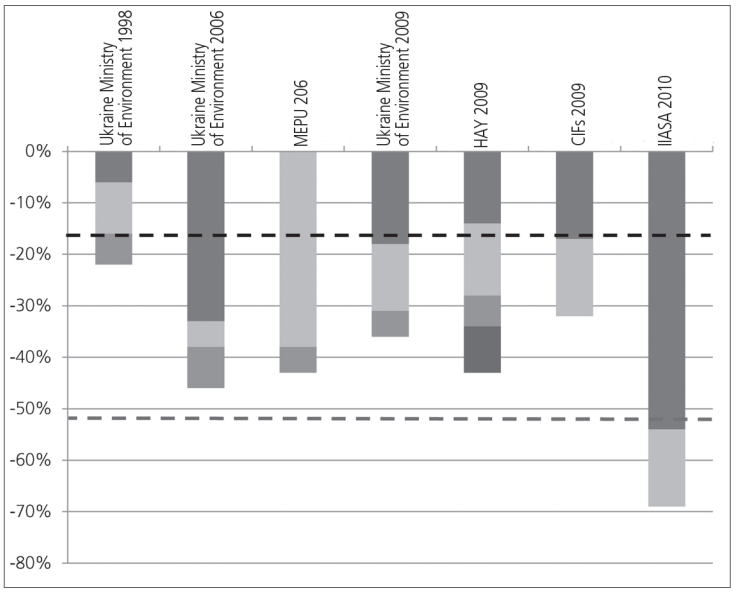
1.3 Objectives and Potential for Reduction of Greenhouse Gas Emissions

Ukraine ratified the UN Framework Convention on Climate Change (as an Annex I country) in 1996 and since 2004 has also been a party to the Kyoto Protocol, which defines the obligations to reduce greenhouse gas emissions for signatories. Ukraine is supposed not to exceed the 1990 emission level by 2012, which actually means a zero target of emission reductions. Although greenhouse gas emissions have dropped compared to 1990 (Ministry of Environment 2010), Ukraine is among top twenty countries with the highest CO_2 emissions (United Nations Statistics Division 2010). Therefore, it must also take responsibility for climate change and take measures to reduce greenhouse gas emissions. However, Ukraine does not have a low-carbon economic development strategy and refuses to take on any restrictive obligations to reduce emissions. The official GHG emissions reduction goal in Ukraine is 20 per cent from 1990 up to 2020 (DAEI 2010), which actually provides room for further growth rather than limiting emissions (current GHG emissions are at the level of –54 per cent compared to 1990).

Environmental organisations have been criticizing the official position. Instead, they offered to approve a plan to stabilise emissions by 2020 at 2007 emissions levels (NGO Working Group on Climate Change 2009). In addition, evaluation of »fair« objectives for Annex I countries on the basis of four indicators (emissions per capita; intensity of GHG emissions per unit of GDP; indicator of preventive action on climate change; change in population) indicates that the goal for Ukraine as regards reducing emissions by 2020 should be 12 per cent from 2005, or 60 per cent from 1990 (European Commission 2009).

The potential for emissions reduction is presented in each national communication on climate change (Ministry of Environment 1998, 2006, 2009, 2010), as well as in a study by the National Aviation University (NAU 2009) and a few assessments by international organisations (CIFs 2009; IIASA 2010). These documents present different results since estimates are based on different methodologies and assumptions.

Figure 5: Comparison of studies on estimating GHG emission reduction potential in Ukraine by 2020[3]



Note: The vertical axis illustrates the potential for reducing GHG emissions in 2020 (as a percentage below the 1990 level) according to various studies, indicated along the horizontal axis. Dark grey columns represent scenarios with the lowest potential reduction of greenhouse gases, which corresponds to a »business as usual« or pessimistic scenario of economic development. Columns of different shades of grey illustrate the scenarios with higher emission reduction potential. The black dotted line presents an official goal for GHG emissions reduction of –20 per cent by 2020 (from 1990). The grey dotted line illustrates the current level of emissions (–54 per cent from 1990).

Source: The figure was prepared on the basis of various studies estimating potential GHG reductions in Ukraine (Ogarenko 2010).

2. See: http://euea-energyagency.org/show_news.php?id=395&lang=ua

3. Except for the first national communication (Ministry of the Environment 1998), which presents the potential for emissions reductions by 2015.

However, most estimates indicate that the potential for emission reduction in Ukraine is much larger than the official goal for GHG emissions reductions of 20 per cent from 1990. Moreover, a study by the International Institute for Applied Systemic Analysis (IIASA 2010) shows that Ukraine can stabilise emissions of greenhouse gases at a level of 57 per cent from 1990 according to a »business as usual« scenario and even obtain economic benefits from the introduction of certain measures (for example, for energy efficiency advancement).

2. Potential for »Greening« the Economy

2.1 Promising Sectors for Creating Green Jobs

The most promising, from many points of view, is increasing the efficiency of multi-storied and private houses. This sector accounts for about 40 per cent (IEA 2008) of total gas consumption. When the usual insulation measures are implemented in buildings (insulation of walls, roofs, new windows, new boilers and so on without ultra-modern technologies such as heat pumps) the economic potential of energy saving will be approximately 32.6 million MWh/year, which in monetary terms will be approximately 624 million euros. The reduction of CO_2 would amount to 11.1 million tonnes (EBRD 2011). The following calculations are approximate estimates of the number of new jobs.

Total area of housing stock is 1,066 million m^2. Energy service companies estimate the unit cost of work on thermo-modernisation at approximately 100 euro m^2. Thus, the investment potential of energy saving in the residential sector is approximately 100 billion euros. The Greenpeace report (Greenpeace 2009) estimates the cost of creating one job in the thermo-modernisation of buildings at 20–50 thousand euros. Assuming that the cost of creating one job in Ukraine in this area is 50 thousand euros and if the mentioned investments are applied, 2 million new jobs will be created. This is an estimate because in this case the implementation of these investments and specific features of the economy are not taken into account. The growing number of jobs in related industries such as construction materials[4] production, transport and so on are also not included.

The number of employees in the construction sector increased slightly, from 903,600 in 2000 to 966,200 in 2009 (annual statistics) which is half the estimated number of new jobs. A large number of building workers work abroad, and many operate unofficially, without paying taxes and thus without proper social protection. These issues are expected to be resolved with the growth of this sector.

In any case, energy saving in the residential sector has tremendous unused potential. The side effects of its implementation may be just as important as direct ones. These are: improving the comfort of Ukrainians' homes, increasing tax revenues, reducing the consumption of Russian gas, advancing local employment as opposed to working abroad and extending buildings' lifespan.

Further great potential for green growth lies in agriculture, in particular, organic agriculture, energy crops (rape, willow and corn) and the use of straw in energy production. Ukraine is already one of the leaders of rape seed production, producing 1.9 million tonnes in 2009 (Canola 2007). There are several important factors in agricultural greening:

- the existence of 502,000 unemployed in villages and rapid growth of rural unemployment (7.2 per cent in 2009; annual statistics);
- steady demand for different types of bio fuels in the EU;
- constant growth in prices for traditional energy sources;
- experience of organic farming and demand for its products.

The number of those employed in agriculture, forestry and hunting is falling constantly, from 4.33 million in 2000 to 3.13 million in 2009 (annual statistics). It can be assumed that green jobs make up a relatively small number of these. On the whole, often the quality of jobs in this sector can be increased without significant cost through training and compliance with legislation. Thus,

4. There are numerous cases in Ukraine in which the production of thermo-insulating and other modern quasi-green construction materials damage the environment and human health by either emitting harmful substances or direct destruction of ecosystems in the process of mining. Therefore, it is necessary to analyse the whole life-cycle of building and other materials when assigning them green status.

the proper handling of chemicals used for various purposes and the use of modern agricultural practices can improve working conditions.

It is difficult at this point to quantify investment needs and potential for green agricultural growth due to the lack of special studies and relevant statistical reports. The UNEP report (UNEP 2011) presented data on the creation of new jobs in agriculture through the implementation of programmes to stimulate production of bio fuels. Ukraine's agriculture is significantly less mechanised than in the EU. Also, considering the possibility of obtaining not only liquid fuels for transport, but also solid and organic products, we can assume that it is possible to talk about at least hundreds of thousands of new green jobs in agriculture. However, the development of this sector will not only create many new jobs, but also contribute to solving urgent social problems in rural areas, which have caused mass unemployment.

Along with that, the EU's influence in the form of requirements concerning environmentally-friendly agricultural production should play a major role in agriculture. The institutional weakness of the relevant authorities means that there is virtually a complete lack of control over compliance with requirements of environmental regulations in agriculture while using chemicals, crop rotation, recycling and so on. Only pseudo-green agriculture could be obtained without improved control.

Currently, there are no quantitative estimates of potential job creation in the renewable energy sector in Ukraine. However, the sector is developing due to the abovementioned »green tariff«. According to data from the VESTAS TOWERS company, 80,000 jobs were created in Germany in the production of 25 GW of electricity by wind power stations; 31,500 in Spain for 19 GW; 21,600 in Denmark for 3.5 GW; 85,000 for 35 GW in the United States for 35 GW; 40,000 in China for 25 GW. [5]

2.2 Prospects of Green Technology Development in Ukraine

Although the share of renewable sources in energy production in Ukraine grows every year, national renewable energy technologies in the sector are at an early stage of development. Ukraine has some capacity for wind turbine manufacturing, but the effectiveness of national equipment is very low and thus it is uncompetitive compared to equipment produced in Western countries. However, the country has some technological potential for the production of modern units, which in the medium term could be implemented in cooperation with foreign producers. This would significantly reduce the amount of investment required per unit of power as tower transportation is expensive (Mayssner and Ukerdt 2010). It should be noted that the first steps have already been taken in this direction. Thus, a Memorandum of Understanding between the Danish company VESTAS TOWERS, the state enterprise »Production Association Southern Machine-Building Plant named after O.M. Makarov« was signed on 6 June 2011. The Danish company was interested in the supply of wind power units in Ukraine and was looking for a local partner for the production of towers, as their transportation from Europe is economically disadvantageous (Petrenko 2011). Already in November 2011 the German company Fuhrlander AG announced its intention to produce wind generators for Ukraine's domestic market using the Kramatorsk heavy machine production plant (Chernovalov and Ledenev 2011).

The introduction of a »green tariff« has become a powerful incentive for the development of the solar power equipment market, which today is represented by the manufacturers of monosilicon, polysilicon, ingots, wafers, solar cells and modules (EUEA 2011). Domestic production of PV-panels is around 90 MW per year. Moreover, approximately two-thirds of the output is exported (Veremiychyk, 2009).

In addition, Ukraine has companies which produce equipment for the manufacture of pellets from biomass. Some pellet producers use domestic equipment, while others prefer foreign because they believe it is of better quality (Kuznetsova 2011).

It should be noted that there are a number of research institutions and institutes involved in the development of new technologies in energy efficiency and renewable energy sources in Ukraine. For example, the Renewable Energy Institute is working to assess the potential of renewable energy in Ukraine and to develop domestic renewable energy technologies in the sector (Agency of

5.http://ua-energy.org/post/8082

State Energy Efficiency 2010). In general, Ukraine has the potential to develop green technologies, but government support and a favourable investment climate are needed for large-scale implementation of new technologies in energy saving and renewable energy sources.

2.3 Main Economic Barriers to the Development of a Low Carbon Economy

The main economic obstacles to Ukraine's transition to a low carbon economy and creating new green jobs is the government's intervention in energy pricing and the monopolistic structure of the energy market. State control of energy prices and, consequently, pricing below market prices, which often do not reflect the short- and mid-term costs of energy production (IEA 2006), is a significant barrier to investment in the modernisation of thermal power plants and increasing the capacity of the renewable energy sector.

Constant underfunding of the building, maintaining and updating of energy infrastructure, including pipelines and electricity networks, is a consequence of the current system of energy pricing. For the same reasons neither producers nor consumers of energy have incentives to invest in energy saving. Current energy pricing practice leads to the fact that most energy sectors are not economically viable without considerable government subsidies and many other forms of administrative support (OECD 2011).

According to the International Energy Agency (IEA 2010), indirect subsidies in the energy sector in 2009 were at a level equivalent to 4.7 per cent of GDP, which is double those of Russia or Kazakhstan. It should be noted that indirect or hidden subsidies constitute a distortion of energy prices; that is, when actual prices as a result of government policy interventions are lower than market prices for gas, oil or coal. In addition, indirect subsidies in nuclear energy are pervasive, which are difficult to estimate, for example, state budget financing of radioactive waste management (Law on Radioactive Waste Management), and the lack of resources of the fund for decommissioning units.[6] The latter is not just a substantial indirect subsidy but also a slow time-bomb ticking for the whole country: in the future, a decommissioned NPP can be a source of increased danger in the absence of adequate funding.

In contrast, direct subsidies – that is, direct payments from the state budget for the production or consumption of energy – are concentrated in the coal sector. In particular, 10.8 billion euros were allocated from the state budget in 2009 (Ministry of Coal Industry 2010), which is approximately 4 per cent of the state budget.[7] Moreover, most of the subsidies were spent to partially cover production costs.

The Programme of Economic Reform from 2010 to 2014 aims to partly solve the above problems through gradual liberalisation of energy prices, privatisation of state companies and a number of institutional and legislative reforms. One can only wish that these measures were implemented successfully rather than remaining on paper.

3. The Role of Politics and Society

3.1 The Role of State

Ukraine does not have a policy strategy for green growth. Politicians, regardless of party affiliation, always say »the economy comes first« in their speeches. Under the current government this view is reflected in a significant simplification and complete elimination of the obligation to perform an environmental review of projects in a number of areas. Such documents as the State Environmental Policy Strategy of Ukraine for the period up to 2020 and the National Transport Strategy for the period up to 2020 were adopted last year only after the European Commission had given 35 million euros and 65 million euros, respectively, to support the implementation of these strategies. This fact concerns NGOs, who fear that these documents will not find practical realisation.

A group of experts who have been preparing the Environmental Performance Reviews (Ukraine, Second Review, ECE/CEP/133, 2007) have come to similar conclusions. In particular, the following was noted: »Despite the fact that a number of laws and revised technical standards have significantly improved the basis for monitoring compliance, formation of policy and strategies in

6. Official response of NAEC »Energoatom« on the official site of the NGO Ecoclub, available at: http://www.ecoclubrivne.org/query/ua/8

7. In 2009, the expenditure of the state budget of Ukraine totaled 274 billion UAH.

the sphere of the environment a lot of further work is required ... Since the first review [1999 – A.M.], there has been little progress in the development of economic instruments to promote environmental protection.«

In terms of the indicator of economic impact on the environment Ukraine ranks 87th out of 163 countries with an index of 58.2.[8] This assessment takes into account such factors as greenhouse gas emissions, quality of water, air, state of agriculture, forests, biodiversity and morbidity. In its report on low carbon development (EBRD 2011) the European Bank for Reconstruction and Development evaluates Ukraine's energy sustainability index as fairly high or higher than most CIS countries. This assessment is due to the existence of the green tariff and joint implementation.

The main factors that affect the overall greening of the economy are:

- emission limits;
- charges for use of special water;
- standardisation of specific energy consumption for certain products;
- construction standards;
- taxation of certain emissions;
- joint implementation projects within the framework of the Kyoto Protocol.

There are several major drawbacks in the mentioned regulatory mechanisms:

- The relatively small size of the financial burdens that they cause. Usually, it is more profitable for a company to pay fines for years rather than to install new equipment or additional purification facilities.
- Institutional weakness of regulatory bodies. For example, there is no state agency that can review the energy consumption of buildings and the State Inspectorate for Energy Conservation was abolished this year.
- Fragmented regulations. One striking example is the existence of the Energy Strategy and the Strategy of Environmental Policy. These documents are in no way interrelated and have very different structures and purposes.
- Agriculture is not subject to environmental requirements.
- Public awareness-raising is sporadic.

8. The page is on the official website of the Yale University: http://epi.yale.edu/Countries/Ukraine

3.1.1 Climate Policy Measures

A good point is that Ukraine actively participates in flexible mechanisms of the Kyoto Protocol that allow both the reduction of emissions (although emissions reductions are credited to the owner of the project from another country) and the attraction of the necessary investment to modernise the economy. Thus, Ukraine is the leader in realising the Joint Implementation Projects.[9] As of 13 October 2011, there were 240 projects at various stages of implementation, which should lead to a reduction of emissions of 252 million tonnes of CO_2-equivalent over the period of 2008 to 2012. About 40 per cent of emission reduction units[10] (ERU) in the world are received as a result of JI projects in Ukraine (FTSEI 2011).

In addition, Ukraine has received an excess of GHG emissions quotas, since current emissions in Ukraine are much lower than national commitments under the Kyoto Protocol. According to Article 17 of the Kyoto Protocol parties may participate in international emissions trading to achieve implementation of national emission reduction commitments. In order to address Ukraine's participation in international emissions trading and the utilisation of the obtained finance, the Green Investment Scheme was created in 2008. In 2009–2010, Japan and Spain sold 47 million AAU[11] at a price of 9.5–10 euros per unit. Thus, Ukraine has received about 450 million euros from the sale of quotas. The State Environmental Investment Agency (SAEI) selected for consideration 871 projects[12] on thermal insulation of buildings (replacement of windows, doors, facades), building and reconstruction of heat supply (advancement of efficiency and use of alternative fuels) and mine water purification. As of September 2011, 365 projects had been approved for implementation. However, by 1 November 2011, only one project for the reconstruction and insulation of the facade and the replacement of windows in the clinical

9. Joint implementation is one of the flexible mechanisms of the Kyoto Protocol (Article 6), which allows one Annex I country to implement an emission reduction project in another Annex I country, and the resulting emission reductions will be credited to the project owner from the first country.

10. A unit of emissions reduction is equivalent to one tonne of CO2-equivalent. Emission reduction units are provided as a result of the realisation of joint implementation projects.

11. AAUs (assigned amount unit): permit for the emission of a tonne of CO2 equivalent.

12.According to the National Environmental Investment Agency (as of 21 June 2011).http://www.neia.gov.ua/nature/doccatalog/document?id=128822.

hospital for handicapped and war veterans in Simferopol (NECU 2011) had been completed.

It is worth noting that even the active use of flexible mechanisms of the Kyoto Protocol will not provide a quick and efficient transition to a low carbon economy. It is necessary to introduce a number of policy instruments to promote energy efficiency and use of renewable energy sources. Ukraine has already taken some steps in this direction, although they have limited effectiveness at the moment. Thus, the new tax code has introduced a tax on CO_2 emissions at a rate of 0.1 UAH per 1 tonne of emissions, with a gradual increase to 0.2 UAH by 2014. However, this tax rate is too low and will not bring either environmental or fiscal benefits. Veklych and Maslyukivska (2008) believe that it is necessary to introduce a carbon tax with a starting rate of 1 UAH and a gradual increase up to 200 UAH by 2030.

In addition, on 21 October 2001, the draft law »On the Regulation of Energy Saving« passed the first reading in the Verkhovna Rada, which creates legal preconditions for the establishment of an emission trading system in Ukraine. The draft law has received much criticism from NGOs (Bulgakov, 2011) as well as business (Yeremenko 2010), however, and is currently being revised.

In theory, the system of emissions trading is an economically and environmentally effective instrument that makes it possible to achieve a desired goal at the lowest cost for the economy. However, EU practice shows that the emissions trading system is very difficult to implement because it is difficult to determine the optimal amount of emission reductions at the national level and to ensure the equitable distribution of permits between enterprises (Open Europe 2007; Carbon Trade Watch 2011).

Despite institutional complexity and the huge administrative costs required for implementing emissions trading, Ukraine is taking some steps towards establishing a domestic carbon market. In October 2011, the State Environmental Investment Agency received a grant of USD 315,000 for the preparatory phase of the World Bank Programme »Partnership for Market Readiness« (SEIA 2011). If the preparatory phase is accomplished successfully, Ukraine will be able to get up to USD 5 million to implement a national emissions trading system. A critical issue is the development and implementation of a national emissions trading scheme (ETS) that would meet EU requirements for accession to the EU ETS, which will increase its effectiveness.

In addition, in September 2011 the National Plan of Adaptation to Climate Change for 2011–2013[13] was presented for public debate, which is mainly focused on studying changes in existing economic activities and ecosystems caused by climate change. Theoretically, adaptation measures can positively influence the greening of the economy. However, in Ukraine there is a considerable lack of knowledge and data in this field. In addition, proper budgetary financing of adaptation measures is very unlikely.

3.1.2 Stimulation of Energy Efficiency and Development of Renewable Energy Sources

Ukraine has a number of regulations to encourage the introduction of energy efficiency technologies (State Energy Efficiency Agency 2010). The majority of them are related to industrial enterprises and provide tax and customs concessions for different types of modern energy efficient technologies, recycling and renewable energy.

There is also the State Target Economic Programme on Energy Efficiency for 2010–2015,[14] which provides budget financing for a number of measures to advance energy efficiency. Within its framework, in 2009, a total of 277 million tonnes [?!] of equivalent fuel was saved in mining and metallurgy, the chemical industry and machine industry. In 2010, the Programme was financed up to 37 per cent, which represents only 17 million euros. These funds were spent mainly on the reconstruction of power grids and heating systems.[15]

In 2006, the International Energy Agency published different estimates of RES potential in Ukraine (IEA, 2006), which are given in Table 3.

13. Information on the official website of the State Environmental Investments Agency: http://www.neia.gov.ua/nature/doccatalog/document?id=131355

14. Decree of the Cabinet of Ministers of Ukraine from 03.03.10, No. 243. Available at: http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=243-2010- per centEF

15. Information on the official website of the State Energy Efficiency Agency: http://naer.gov.ua/archives/3460

Table 3: Estimates of technically feasible capacity for the use of renewable energy sources in Ukraine according to data from various sources (TWh / year)

Energy Source	Zabarny, Shurchkov (Institute of Engineering Thermo-physics)	Atlas of the energy potential of renewable and alternative energy sources of Ukraine (State Committee of Ukraine for Energy Saving)	Geletukha et al. (Scientific and Engineering Centre »Biomass«)
Biomass	35.93	n.a.	126.50
Solar	16.89	345.1*	48.00
Geothermal	53.50	n.a.	97.70
Wind	24.85	30.00	25–30.00
Small hydropower plants	2.04	8.25	3.7 **
Low-temperature heat (heat pumps)	100.91	146.44	NZ
Together	234.12	n.a.	n.a.

Note: * Economic potential is 53.8 TWh / year. ** Economic potential. n.a. - Not applied. Source: IEA, 2006.

As seen in Table 3, the estimates of different authors vary significantly. In any case, as stated in the same document, only a tiny part of capacity is used.

To increase the share of RES, a so-called green tariff has been adopted in Ukraine. According to the Law on the Green Tariff, the Green Tariff Rate is to be set periodically by resolutions of the National Electricity Regulatory Commission in the amount of a »doubled average rate for electricity that is purchased in energy generating companies operating in the wholesale electricity market of Ukraine at bidding, for the year preceding the year of tariff establishment«. Impetus for developing modern renewable energy technologies in Ukraine may be given by the so-called »local component« introduced by changes in the Law On Electricity.[16] Under this rule, »the share of raw materials, materials, main instruments, works and services of Ukrainian descent« should increase in the cost of new renewable electricity sources from 15 per cent in 2012 to 50 per cent in 2014.

Such rates make the project for implementing the listed renewable energy sources cost-effective. As of 23 February 2011 the identified total capacity of generating equipment that produces electricity from alternative energy sources is 156.094 MW,[17] among them:

- identified capacity of small hydro power plants: 67.78 MW;
- identified capacity of wind farms: 76.58 MW;
- identified capacity of power plants that use biomass: 4.2 MW;
- identified capacity of SES: 7.535 MW.

Table 4: Green tariff rates (as of November 2011)

Types of generating capacity	Tariff, kopecks / kWh
Solar power	512.38
Biomass	136.40
Wind farms	124.54
Small hydropower plants	85.39

Also, the press has reported[18] on completion of the construction of SES with a capacity of 80 MW in the Crimea. Moreover, considerable work is being undertaken to study wind speeds for the construction of wind farms. That is, the RES industry is actively developing due to bank loans. The main task is not to allow the establishment of new bureaucratic barriers.

3.2 The Role of EU Environmental Policy

Currently, international and European standards do not play a significant role in the formation of Ukrainian environmental policy. The most influential factor is direct

16. On Amendments to Article 171 of the Law of Ukraine »On Electricity« on the terms of stimulating production of electricity from alternative sources from 17.06.2011

17. Official site of the National Energy Regulation Commission http://www.nerc.gov.ua

18. See: http://www.unian.net/ukr/news/news-457288.html

financial support for certain measures. Although the effectiveness of such support is questionable because of corruption (see below), Ukraine has joined the Energy community and has made a major commitment to greening energy (see Table 5).

Table 5 Plan for implementing the acquis communautaire in accordance with the Protocol of Ukraine's Accession to the Treaty on the Energy Community[19]

Directive 85/337/EEC on the assessment of effects of certain public and private projects on the environment with amendments made by Directive 97/11/EC and Directive 2003/35/EC	By 1 January 2013
Directive 1999/32/EC on reduction of sulphur in certain liquid fuels	By 1 January 2012
Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air by large combustion plants (994_913)	By 1 January 2018
Paragraph 2 of Article 4 of Directive 79/409/EC on wild bird protection	By 1 January 2015
Plan on the implementation of Directive 2001/77/EEC on the promotion of electricity produced from renewable energy sources in the internal electricity market (994_503)	By 1 July 2011
Plan on the implementation of Directive 2003/30/EC on the promotion of using biofuels and other renewable fuels for transport	By 1 July 2011

In addition, a Directive on renewable energy sources (2009/28/YEC) will also have some influence on the greening of Ukraine's economy. This is not included in the plan on implementation of EU Directives in accordance with the Protocol of Ukraine's Accession to the Treaty on the Energy Community. A 2009 Directive establishes a number of sustainability criteria (protection of air, soil, groundwater, biodiversity, greenhouse gas emission reduction, food security, social criteria) for biofuels produced in the EU, and the same requirements apply to biofuels and feedstocks imported into the EU. Compliance with sustainability criteria can be proved through certification. Although the Directive does not prohibit the use of non-certified biofuel, subsidies will be granted only for biofuels that meet the criteria of sustainability. The prices of certified biofuel and feedstocks should thus be higher.

The first estimates of greenhouse gas emissions from the production of maize and rapeseed in Ukraine were made within the GIZ project (2011). Results indicate that it may be problematic for rapeseed producers to meet the requirements to reduce greenhouse gas emissions from 2017, therefore they should improve the efficiency of production, if they want access to the EU biofuels market. To date, 17 Ukrainian companies[20] have been certified as in compliance with the sustainability criteria of the Directive and probably the number of such companies will grow as the EU market offers attractive prices for biofuel raw materials.

In general, the consequences of joining the Energy Community will be important and diverse. This year, the International Centre for Policy Studies (ICPS 2011) has indicated an improvement in the quality of life and work, but along with that the enormous costs that companies bear. Undoubtedly, in good faith, these regulations will significantly affect the economy. That is why their implementation should be monitored.

3.3 Major Social and Political Obstacles to the Creation of a Low Carbon Economy and Green Jobs

First of all, one of the biggest obstacles to development of a low carbon economy is the low awareness of the necessity, benefits and potential of energy saving and alternative energy sources among average citizens and business people. In particular, according to the survey conducted by IFC (2009), most Ukrainian companies have indicated the importance of introducing measures to improve energy efficiency, but underestimate the potential for energy saving by their own companies at 45 per cent.

Unfortunately, environmental protection and development of green technologies is not a priority for the Ukrainian government. In general, there is a lack of political will to implement the necessary reforms in the energy sector. As a result, government programmes and strategies are often ineffective and declarative (UNECE 2010).

Another major obstacle to implementation of a green economy is the extremely high level of corruption in the

19. See: http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=994_a27

20. See: http://www.iscc-system.org/certificates/index_eng.html

state and a strong lobby for traditional energy in the power industry. Exhaustive assessment of corruption is given in the report prepared by a well-known NGO Transparency International: »corruption in Ukraine is a systemic problem existing everywhere and at all levels of government. Corruption thrives on small and large scales. Among the institutions that are perceived by the public as extremely corrupt there are political parties, legislative bodies, police, civil servants and judges. Ukrainian society can be characterised as a society with a high tolerance for corruption.«[21] This flourishing corruption affects all spheres of life. In the case of the greening of the economy, all measures must be effected in the most transparent way and with wide public participation in order to counter corruption.

Conclusions

As is evident from the relevant studies, there is great potential for the greening of the economy in Ukraine. This activity will have diverse consequences for people's welfare and for environmental protection. To shape this direction of development, targeted and interrelated activities are needed to make central and local authorities understand the necessity of green growth, to create incentives for economic greening and make different population groups aware of the aspects of the green economy that are important to them. All the institutions concerned should be involved in achieving this ambitious goal, otherwise green growth will remain just one more opportunity neglected by Ukraine.

- The current State Energy Strategy is focused primarily on coal and nuclear power and has fairly weak targets for increasing the percentage of renewable energy or energy efficiency. However, there is a »green tariff« that has greatly stimulated the development of renewables.

- Ukraine is one among a few countries whose greenhouse gas emissions are significantly lower than their commitments to reduce emissions. However, the reason for this is not current energy policy but lack of commitment and the economic crisis after the collapse of the USSR.

- The energy efficiency of buildings and various areas of green agriculture seem to be the most promising in terms of creating new green jobs and achieving rapid improvements for the greening of the economy.

- The »green tariff« and demand for pellets stimulate development of Ukraine's industry in renewable energy. Some high-tech products for this sector are produced in Ukraine. However, for the existing scientific and technological potential to be used, a significant increase in funding is required. Several of Ukraine's energy sectors are directly subsidised from the state budget; there is also cross-subsidisation. Such state intervention is the main obstacle to the modernisation of energy and energy efficiency. Ukraine should stop subsidising the coal and nuclear industry and introduce economic incentives in the above areas instead.

- The development of the green economy in Ukraine is in its initial phase; there are few examples of implementation thus far. Environmental protection and the development of green technologies is not a priority for the Ukrainian government.

- The most efficient instrument of climate protection policy is joint implementation projects. The introduction of a domestic carbon market may have significant positive effects under the relevant market rules.

- State policy on energy efficiency promotion is generally ineffective and is aimed primarily at the industrial sector.

- The influence of the EU in the form of various requirements to adapt national legislation to the European model may play a key role in the greening of the economy. This will be possible only within the framework of responsible and transparent activities in this sphere, however.

- Corruption affects all initiatives, policies and measures, without exception. If the destructive effects of corruption are not addressed, any plans are likely to be negated.

21. National Integrity System, Ukraine (2011): http://www.transparency.org/content/download/60824/974071

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