PROMITHEAS – 4

Ukraine

Mapping national procedures, sources, available data and information

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†Passed away in May 2012. The report bears his name as author, in memory of his offering to science.

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1. General information

1.1. Government structure

Victor Yanukovich was elected president of Ukraine in February 2010, narrowly beating rival candidate Yulia Tymoshenko. Following the election, Yanukovich appointed his long-time ally Mykola Azarov as prime minister. The ruling coalition has 238 seats in the 450-seat parliament. The next legislative elections are due in September 2012, and the next presidential election will be help in 2015.

The government is committed to attracting foreign investment. In 2008, Ukraine acceded to the WTO and is negotiating a free-trade agreement with the EU. However, widespread corruption and an unwieldy bureaucracy continue to be considered problems. According to investors, lack of transparency in business processes and a difficulty in ensuring property rights were also identified as political problems impeding investment [1]. Also, due to frequent elections and government turnover between 2005 and 2009, politicians have found it difficult to resist populist policies to give voters short-term fiscal hand-outs such subsidies.

1.2. Mapping national procedures

1.2.1. Key categories according to IPCC

N/A.

1.2.2. Methodology for retrieving key-category data

N/A.

1.2.3. Responsible authorities and contact persons

N/A.

1.2.4. Procedures to address climate-change issues

N/A.

1.3. Population

1.3.1. Demographic characteristics

Population: 45,760,051 (2011)

urban population – 31,432,584 (68,69%); rural population – 14, 327,467 (31,31%).

Some large cities together with attached towns and villages form agglomerates. The largest among them are those of Kyiv, Zaporizhia, Kharkiv and others. The largest concentration of population lives in Donetsk (90 %), Dnipropetrovsk (83 %), Lugansk (86 %) and Kharkiv (79 %) regions. The largest volumes of villagers live in Zakarpattia (63 %), Chernivtsi (57 %), Ivano-Frankivsk (58 %) and Vinnytsia (54 %) regions.

Average density of population in Ukraine is 80 people per square km, which is less than in many other European countries. The density and quantity of Ukrainian population was influenced in the past by the war with foreign occupants. The density of population varies from region to region, the most densely populated being the eastern industrial regions, the least— in the northwest and in the south of the country (the least of all— in Chernigiv region— only 39 people per square km) [14].

All	Urban	Rural
Ukraine	**45760051**	**31411722**
Crimea	1962456	1233092
Vinnytsia Oblast	1638925	814212
Volyn Oblast	1037134	537464
Dnipropetrovsk Oblast	3331542	2781082
Donetsk Oblast	4423658	4004810
Zhytomyr Oblast	1277351	741013
Zakarpattia Oblast	1247628	463876
Zaporizhia Oblast	1798519	1383516
Ivano-Frankivsk Oblast	1379419	597213
Kiev Oblast	1717115	1054218
Kirovohrad Oblast	1008040	624688
Luhansk Oblast	2285783	1981841
Lviv Oblast	2542532	1545074
Mykolaiv Oblast	1181522	799703
Odessa Oblast	2387437	1593976
Poltava Oblast	1484751	907190
Rivne Oblast	1152763	551055
Sumy Oblast	1159029	781804
Ternopil Oblast	1082827	474565
Kharkiv Oblast	2750088	2201426
Kherson Oblast	1086675	664509
Khmelnytskyi Oblast	1325317	727811
Cherkasy Oblast	1283313	720148
Chernivtsi Oblast	904018	381305
Chernihiv Oblast	1095742	688960
Kiev (Kyiv)	2799898	2799898
Sevastopil	380760	357273

Table 1.3.1. The density of population in regions of Ukraine (april, 2011). Source: State Statistics Committee of Ukraine, 2011[1].

[1] http://www.ukrstat.gov.ua/operativ/operativ2011/ds/kn/kn_r/kn0311_r.html

1.3.2. Development indicators

Health — Life expectancy at birth (years) 68.6

Indicator	Value	Notes
Prevalence of undernourishment in total population (% of population)	<5	
Expenditure on health, public (% of GDP)	4.0	
Under-five mortality (per 1,000 live births)	16	
Life expectancy at birth (years)	68.6	

Education — Mean years of schooling (of adults) (years) 11.3

Indicator	Value	Notes
Adult literacy rate (both sexes) (% aged 15 and above)	99.7	1 2
Combined gross enrolment ratio in education (both sexes) (%)	90.0	
Expenditure on education (% of GDP) (%)	5.3	
Internet users (per100 people)	10.5	
Mean years of schooling (of adults) (years)	11.3	
Expected Years of schooling (of children) (years)	14.6	1

Income — GNI per capita (2008 PPP US$) LN 8.8

Indicator	Value	Notes
GDP per capita (2008 PPP US$)	6,591	1
GNI per capita (2008 PPP US$) LN	8.8	
Household final consumption expenditure per capita PPP (constant 2005 international $)	4,641	

Inequality — Inequality-adjusted HDI value 0.652

Indicator	Value	Notes
Income Gini coefficient	28.2	
Inequality-adjusted education index	0.795	1
Inequality-adjusted income index	0.509	1
Inequality-adjusted HDI value	0.652	
Inequality-adjusted life expectancy	n.a.	

Figure 1.3.1 Human development indexes in Ukraine. Source: United Nations Development Profile, International Human Development Indicators, Ukraine, 2010[2].

[2] http://hdrstats.undp.org/en/countries/profiles/UKR.html

Poverty	Multidimensional poverty index (k greater than or equal to 3)	0.008

Indicator	Value	Notes
Multidimensional poverty index (k greater than or equal to 3)	0.008	1
Intensity of deprivation	35.7	
MPI: Headcount (k greater than or equal to 3), population in poverty (% of population)	2.2	1 2
Population living below $1.25 PPP per day (%)	<2	

Gender	Gender Inequality Index, value	0.463

Indicator	Value	Notes
Maternal mortality ratio (deaths of women per100,000 live births)	18	1
Population with at least secondary education, female/male ratio	0.952	
Adolescent fertility rate (women aged 15-19 years) (births per 1,000 women aged 15-19)	28.3	
Labour force participation rate, female/male ratio (Ratio of female to male shares)	n.a.	
Gender Inequality Index, value	0.463	1
Shares in parliament, female-male ratio	0.087	
Maternal mortality ratio (new estimates) (deaths of women per100,000 live births)	26	
Gender Inequality Index (updated)	0.488	

Sustainability	Adjusted net savings (% of GNI)	8.5

Indicator	Value	Notes
Carbon dioxide emissions per capita (tonnes)	6.9	
Protected area (percentage of terrestrial area)	3.5	
Adjusted net savings (% of GNI)	8.5	1

Figure 1.3.1 (continued) Human development indexes in Ukraine. Source: United Nations Development Profile, International Human Development Indicators, Ukraine, 2010[3].

[3] http://hdrstats.undp.org/en/countries/profiles/UKR.html

Human Security Refugees (thousands) 28.4

Indicator	Value	Notes
Refugees (thousands)	28.4	1
Unemployment rate, total (%) (% of labour force)	6.4	
Homicide rate (per 100,000)	6.3	1
Robbery rate (per 100,000)	59	1
Population affected by natural disasters (average per year, per million) (average per year per million people)	1,561	1

Composite indices HDI value 0.710

Indicator	Value	Notes
Multidimensional poverty index (k greater than or equal to 3)	0.008	1
HDI value	0.710	
Gender Inequality Index, value	0.463	1
Inequality-adjusted HDI value	0.652	

Human Development Index Rank 69

Year	Ukraine	Europe and Central Asia	World
1980	n.a.	0.534	0.455
1985	n.a.	0.571	0.486
1990	0.690	0.664	0.526
1995	n.a.	0.644	0.554
2000	0.649	0.668	0.570
2001	n.a.	0.675	0.575
2002	n.a.	0.682	0.581
2003	n.a.	0.689	0.587
2004	n.a.	0.695	0.594
2005	0.696	0.696	0.598
2006	0.703	0.702	0.604
2007	0.710	0.709	0.611
2008	0.714	0.714	0.615
2009	0.706	0.713	0.619
2010	0.710	0.717	0.624

Human Development Index

Figure 1.3.1 (continued) Human development indexes in Ukraine. Source: United Nations Development Profile, International Human Development Indicators, Ukraine, 2010[4].

[4] http://hdrstats.undp.org/en/countries/profiles/UKR.html

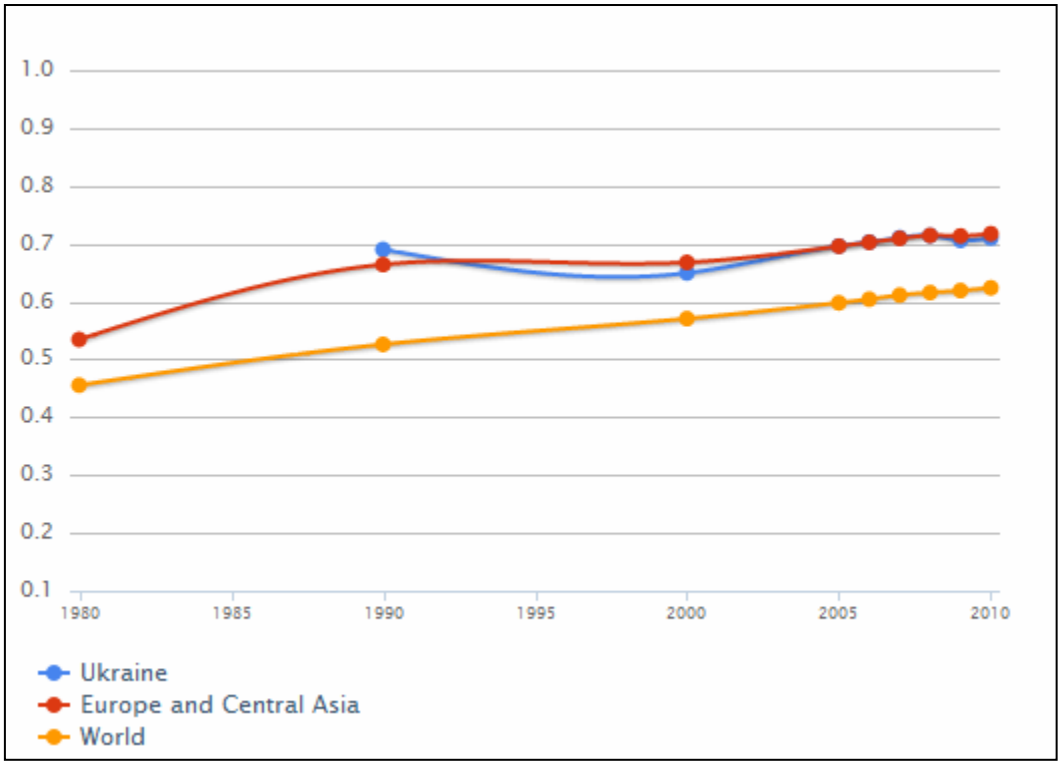

Figure 1.3.2 Human Development Index: Trends 1990 – present. Source: United Nations Development Profile, International Human Development Indicators, Ukraine, 2010[5].

1.4. Geographic profile

1.4.1. Geomorphologic characteristics

Typical of Ukraine is flat terrain with small hills. Such terrain accounts for almost 90 % of the country`s territory with depressions constituting 70 %. The average hills of the flat part of the country are relatively small and reach about 170 m. Only some Carpathian peaks are 1,700—2000 m and Crimean 1,500 m above sea level.

The north-westernmost part of Ukraine, mostly the northern part of the Dnieper right bank area, is occupied by the Ukrainian Polissya region.

Ukrainian Polissya is a large geomorphologic region consisting of three subregions: the Volyn, Rivne and Kyiv Polissya areas. The degree of saturation of ground with water, the amount of precipitation and air humidity decrease from west to east. Conversely, the continental quality of climate increases from west to east.

The Polissya terrain is mostly flat with frequent elevations and hillocks genetically connected with glacial activity. Ukrainian Polissya is characterized by small hills (150—200 m). The

[5] http://hdrstats.undp.org/en/countries/profiles/UKR.html

biggest of them is part of the Ovruch chain of hills (316 m). The medium hills here are 50—60 meters high.

Ukrainian Polissya has the wide (30—40 km) valley of the Prypyat, the largest right tributary of the Dnieper. A large area in this valley is occupied by a creek whose width varies between 2 and 20 km. The creek has many creases, small lakes, and swells. The latter consist of sands, shingle, boulders. Prevalent in Ukrainian Polissya are different forms of aquatic and glacial relief.

More typical of the Polissya, particularly, Prypyat depression are aeolian forms of relief. They rise above the surface in the form of dunes and consist mostly of quartz sand. Dunes, hillocks and swells are widespread here. The sands are consolidated in most part by plants.

In Volyn Polissya, where cretaceous rock lies close to the surface, karst formations are frequent. Well-known are lacustrine gullies of karst origin. The area has several dozen karst lakes. They are located mostly in the north-western part of the Volyn region. The largest of these lakes is Svityaz. It is part of the famous Shatsk chain of lakes, an important and promising health resort area of Ukraine.

In the north-east of Ukraine is the Dnieper depression. It is in fact a continuation of the Ukrainian Polissya region in the north-eastern direction. In the west and south-west the depression`s boundary runs along the Dnieper and in the north-east, across the Middle Russia hills. In the south, the depression`s boundary is at the latitude of Dnipropetrovsk and then turns north and reaches the boundary of the Middle Russian hills (the south-east of the city of Kharkiv). The north-eastern boundary of the Dnieper depression coincides with Ukraine`s national border.

The Dnieper geomorphologic region includes: in the north — the Middle Dnieper - Desna, in the center — the Dnieper proper and in the south — Poltava-Oriol geomorphologic subregions. Each of these subregions has its distinctive territorial, morphologic and genetic features.

On the whole, the Dnieper geomorphologic region is a stratum-like depression occupying the major part of the northern and central left bank area of the Dnieper. The hills of this depression are somewhat higher than in the Polissya area. On valley sides, especially on the vaults of the right bank of the Dnieper, there is a well-developed network of ravines and gullies. The network of ravines covers this area irregularly. This network is more intensive within the Middle Dnieper – Desna subregion. Juts of cretaceous rock are preserved well here.The steep and not very long sides of cretaceous juts contributed to the development of deep albeit short ravines.

The central and southern part of the Dnieper area has a well-developed system of ravines connected with the sides of the valleys of the left tributaries of the Dnieper. Landslides and

soil washouts often occur here. Glacial and water-glacial formations are characteristic of the southern part of the region.

In the southernmost part of Ukraine is the large Black Sea depression. In the south, it ends with low steep terraces facing the Sea of Azov and the Black Sea. In the Crimean peninsula, this depression adjoins the Crimean depression which is its constituent part. The Crimean depression borders the Tarkhankut hills in the west and the Kerch hills in the east. In the south, it comes directly to the cuesta lowland. The continental western boundary of the Black Sea depression runs across the Prut river valley.

The Black Sea depression and the flat Crimea are a complex geomorphologic region formed by the Danube-Dniester, Dniester-Buh, Dnieper–Molocnna, Azov and Crimea geomorphologic subregions. The distinctive morphologic feature of the subregions is a slight incline of the surface southward, toward the Black Sea and the Sea of Azov. The Crimean plain, however, inclines northward. Characteristic of all subregions of the Black Sea depression is a mostly smooth terrain, gradual transition of low lands to the neighboring higher morphologic structures and a greater dissection of the surface in the northern part than in the southern one. In the Crimean plain, the picture is different: the dissection is greater in the south. What all these subregions have in common is the presence of water-erosive and water-accumulative suffosive formations of terrain.

At the same time, each subregion has certain distinctive geomorphologic features. The Danube-Dniester subregion, for instance, has the general sloping of the surface both southward and northward. Typical of the Azov subregion are great differences in heights from north (180 m) to south (0 m).

Ukraine also has large areas of high elevation. This is above all the Volyn-Podillya hills situated in Ukraine`s west. In the west, it is split into two parts by the so called Little Polissya area. The larger of the two - the Podillya hills - are in the south. The smaller one - the Volyn hills, in the north.

The Podillya hills are the topmost south-western part of the Russian plain. The latter borders the valley of the Dnieper and the Southern Buh in the south and the Moldova hills in the north-east. In the east the Podillya hills become part of the Dnieper hills. In the north-west, the Podillya area abruptly slips to the Little Polissya area.

The Podillya medium hills are mostly over 300 m or 400 m high. The Gologoro-Kremenets chain of rather high hills is located in the north of the Western Podillya area. This chain of hills has rather high (150—180 m) elevations in the form of massifs with steep sides, a network of gullies, numerous karst formations.

The Tovtry hills are located in the western and central part of the Podillya area. These hills stretch from the north-west (from the town of Pidkamin in Lviv oblast), continue near Zborov, Ternopil, Grymailiv and end near Kamyanets Podilsky (Khmelnytsky oblast). The

scenic central part of the Tovtry hills is called Medobory. In these parts, there are many endemic and relic species of plants and large prospected reserves of unique mineral waters (of Naftusya type). The national preserve Medobory was set up here in 1990 (10.7 thou. hectares).

The Opillya area occupies the westernmost part of Podillya. This rugged terrain features narrow river valleys, steep banks and scenic places. The left tributaries of the Dniester — the Gnyla Lypa, Zolota Lypa, the Strypa and other - cut deeply into this part of Podillya. In the Opillya area, to the south-east of Lviv, is one of the highest summits of the Podilly hills — Mount Kamula (473 m). Opillya consits of a number of high steep-sided regions located along the said Dniester tributaries. The flat plateau-like hills, covered with forests and located between rivers, are the distinctive feature of Opillya.

In the west, Podillya (Opillya) gradually joins the Precarpathian hills. Their north-western part is the Sayany-Dniester plain. The latter in turn includes the Nadsyanska, Khirivsko-Gorodotska, Sambir and Vyshnyansko-Shchyretska plains. Their terrran was formed due to ancient icing.

Mount Berda (515 m) located within the Khotyn hills (Chernivtsi oblast), is the highest in the vast area between the Carpathians and the Urals.

Karst formations are widespread in the Podillya hills. These are mostly clefts, wells, cavities, etc. Well known are the numerous gypsum caves (several dozen kilometers long).

Next to the Podillya hills are (within the bounds of Lviv) the Roztochya hills which extend into Poland. These hills stretch north-westward and occupy a narrow strip of land whose relief has glacial forms. The area of Lviv and the adjacent areas are called Gryadove Pobuzhya.

The eastern part of Little Polissya transforms into the Prypyat depression. To the north of Gryadove Pobuzhya (to the south of Sokal and farther eastward, through Berestechko,Ostrog and Kryvyn) is the southern boundary of the Volyn hills whose terrace (40—60 m) stands out in bold relief. Within these hills are a number of local elevated areas — the Mizotsky range (max. height: 341 m), Pelchynske plateau (324 m). The plateau lies between Berestechko and Dubno. The northern boundary of the Volyn hills ends with a low terrace in the direction of Volyn and Rivne Polissya.

The vast area of the Dnieper-Azov hills stretches across central Ukraine along the Dnieper in the north-east (to the point where its current changes near the Dnieper rapids) and farther south-eastward (as far as the Azov depression) and south-eastward along the Southern Buh river (approximately to the latitude of Zaporizhya and farther eastward and south-eastward). These hills border the Polissya area in the north-west. Their eastern edge is bounded by the steep bank of the Dnieper. The hills are a complex geomorphologic formation. The latter

includes the large area of the Dnieper hills and the smaller area of the Azov hills , as well as the Zaporizhya plain. These landscape zones are the subregions of the Dnieper-Azov hills.

The general inclination of the Dnieper area surface from the north-west (220—250 m) to the north-east (160—190 m) is 60 meters. The terrain is billowy with reasonably flat river valleys. A characteristic feature of the terrain is a developed network of ravines and gullies, specifically in the Dnieper right bank area. This is especially true of the stretch near Kaniv, where the steep Dnieper bank is as high as 255 m. Some ravines here are 85— 90 m deep. In the area of Stari Petrivtsi (to the north of Kyiv), near Kaniv and in other places, landslips occur. There are glacial and water-glacial formations in the northern area of the Dnieper hills.

The area of the Azov hills coincides with the south-eastern prominence of the Ukrainian crystalline bed and reaches an absolute height of 200—300 m. The northern side of this high land is narrow and steep. The southern one is much wider (by 5—8 times) and is 45—60 m high. It gradually goes into the narrow stretch of the small Azov depression. In the Azov hills, crystalline rock often comes to the surface. The highest peak of these hills is Mount Mogyla Belmak (324 m).

The Zaporizhya plain is also genetically connected with the Ukrainian crystalline bed. The highest hills here are 190—265 m. The terrain is billowy and cut with ravines and gullies. Landslips are not an infrequent phenomenon here.

Spurs of the Middle Russia hills come into the north-eastern part of Ukraine.In the country`s territory, the spurs occupy a rather narrow strip (40—50 km) and stretch along the north-eastern border between Ukraine and Russia in Sumy, Kharkiv and Lugansk oblasts. Characteristic of this elevation are erosive formations. The surface here slopes southward and south-westward and heights vary from 20 to 50 m. In the territory of Ukraine the Middle Russia hills gradually go into the Dnieper depression. The area of these hills feature river valleys. There are many ravines here which are in most cases connected with the steep banks of rivers. Some ravines are several kilometers long. Karst formations, landslides, dispersion of sand deposits are frequent phenomena here.

In the south-east of Ukraine is the Donets hills. The length of this area, from the west-northern west to the east-southern east, is nearly 350 km with the maximum width being 150 km. In the north-west, the area borders the Dnieper depression, in the south-west - the Azov hills, in the south — the Azov hills, in the north and north-east — the Middle Russia hills. Within this area, there are two geomorphologic subregions; the Donets range(the south-eastern part) and the Bakhmut-Toretsk hills (the north-west).

The terrain of the Donets range is rugged. A ravine and gully network is developed well, and there are badlands here. Mount Mogyla Mechetna (367 m), Mound Mechetny (358 m) and

some other are the highest places of the Donets range.The heights of the range gradually decrease from its central part to the periphery by 100-120 m.

The Bakhmut-Torets hills feature large watershed tracts which alternate with wide plains. The absolute heights of this area are smaller than in the Donets range and reach 180—270 m. The north-western part of this area is the lowest. The land is very dissected, but not as much as in the Donets range.

Characteristic of the Donets hills is a developed network of ravines and gullies.There are ridges, cuests, sliderocks, landslides,various karst formations, different large man-made formations (rock debris, waste banks,strip pits), etc.

Ukraine also has mountain landscapes proper. The mountains take up 6.,8 % of the country`s territory. The Ukrainian Carpathians are in the west (33.2 thou. sq. km., including the lowland zone — 3.3 thou. sq. km.). The Crimean mountains are in the south (7.9 thou. sq. km). The mountain massif of the Carpathian and Crimean geomorphologic regions play an important part in the country`s economy, tourist and recreation business and have a strong impact on the climate.

The Ukrainian Carpathians are an integral part of the vast mountainous Carpathian area which is divided among Ukraine and other countries (Romania, Poland, Slovakia) the Ukrainian Carpathians are the central part of the Carpathian massif.

In Ukraine, the Carpathians stretch from the north-west to the north-east, occupying a relatively narrow (100—120 km) strip at a distance of nearly 290 km. The Ukrainian Carpathian geomorphologic region consists of three subregions: the Carpathian massif proper, the Precarpathian plain and the Transcarpathian depression.

The south-western and north-western boundaries of the Ukrainian Carpathians coincide with the national Ukrainian-Romanian, Ukrainian-Hungarian, Ukrainian-Slovak and the Ukrainian-Polish borders. Their north-eastern boundary runs approximately along the line Sudova Vyshnya-Mykolaiva-Vano-Frankivsk-Chernivtsi. The Precarpathian plain lies to the north-east of the Ukrainian Carpathians. This plain with absolute heights of 340—360 m, stretches parallel to the mountains. It is a transition zone between the south-western edge of the Russian hills and the Carpathians. The plain is strongly dissected by the left tributaries of the Dniester and the upper reaches of the Prut and Seret.

The Ukrainian Carpathian massif is not homogeneous orographically. It consists of a number of large parallel strips. The North-eastern (external) strip is made up of the Beskids, Gorgans and the Pokuttya-Bukovyna Carpathians. The highest summits here are: Syvulya (1,838 m), Grofa (1,748 m), Popadya (1,742 m), Stoy (1,677 m), Menchul (1,501 m), Magura (1,368 m) and some other.

Farther to the south-west, parallel to the North-Eastern subregion, stretch the relatively low (800—1,200 m) Vododilno-Verkhovyna Carpathians (they are nearly 30 km wide in the north-west and 10 km in the south-east). Running through the low parts of these mountains are famous Carpathian mountain passes with automobile roads, railroad, gas and oil pipelines, high voltage transmission lines. The passes are: Seredny Veretsky (839 m), Uzhotsky (889 m), Yablunetsky (931 m), Volovetsky (1,014 m). The Main Carpathian watershed is situated within this strip.

Farther south-westward lies the highest subregion of the Ukrainian Carpathians, the Polonyna Chornogora mountains. Chornogora, the highest massif of this subregion, is situated between the rivers Prut and Chorny Cheremosh, Bila and Chorna Tisa. Loomimg over the Alpine pastures are the cone-shaped summits the highest of which are: Goverla (2,061 m), Brebeneskul (2,035 m?), Pip Ivan (2,026 m), Petros (2,022 m), Gutyn Tomnatyk (2,017 m), Rebra (2,007 m) and other. In the Polonyna Chornogora mountains, there are several mountain massifs: Svydyvets, Chornogora, Grynyav mountains, Bukovyna Polonyna.

The Crimean mountains run, like a 150-km arc, through the Crimean peninsula from the north-east (near Feodosia) to the south-west (near Balaklava). The mountains consist of three parallel mountain ranges (cuests). Intrinsic in cuests are steep south-eastern and gently sloping and long north-western mountainsides. The height and size of the cuests increase from the south-east to the north-west. The highest is the Main range (1,200—1,500 m), then come the Internal (nearly 500 m) and External (250—320 m) ranges. The average height of the Crimean mountains is 440 m. The highest summits are in the Main range. Among these, the highest are: Romen-Kosh (1,545m), Eklizi Burun and Chatyrdazi (1,527 m), Ai Petri (1,234 m). Mount Kubalach (738 m) near Bilogorsk is the highest summit of the Internal range.

The Crimean mountains play an important climatologic role. They protect from the impact of cold air masses the narrow coastal strip — the Southern Coast of the Crimea. The latter is Ukraine`s most important seaside health resort area with mild subtropical climate which is conducive to rest and medical treatment [5].

1.4.2. Ecosystems

The description of the major landscapes and ecosystems of Ukraine varies from source to source. When taking into account sub-classifications, their number approaches 17. The 2001 Biodiversity Assessment for Ukraine listed eight major landscapes and ecosystems. In order to facilitate comparison between the two reports, the current analysis utilizes the same number of landscapes and ecosystems as the 2001 report. Table 1.4.1 provides an overview of these systems [16].

Landscape/ Ecosystem	Description	Important Species
Polessia	Swamp and wetlands area in northern Ukraine, heavily impacted by Chernobyl disaster	Threatened aquatic warbler (*Acrocephalus paludicola*), extensive sedges (*Carex spp.*)
Forest-steppe	Historically broadleaf forests and grassland in a band across Ukraine's center, but much of the region has been converted for agricultural use.	Endangered Saker falcon (*Falco cherrug*)
Steppe	Ukraine's grasslands, mainly in southern Ukraine	Rare bobac marmot and great bustard (*Otis tarda*), lone breeding site for Steppe eagle (*Aquila rapax*)
Carpathian Mountains	Site of highest peak in Ukraine, highly diverse ecosystem in west	Globally threatened Imperial Eagle and European bison
Crimean Mountains	Warm, moist climate at southern tip of Ukraine, IUCN-designated center for floral diversity	Endangered plant False Hellebore (*Adonis vernalis L.*)
Forests	Scattered throughout country	Threatened and endangered lynx, Eurasian badger (*Meles meles*) and Hermit beetle (*Osmoderma eremite*)
Black Sea and Sea of Azov	Watershed covers nearly all of Ukraine, both are isolated from the ocean	Habitat and breeding ground for large numbers of waterbirds, including endangered white-tailed eagle and pygmy cormorant; also breeding ground for rare Great black-headed gull (*Larus ichthyaetus*)
Freshwater Systems	About 22,000 rivers, most of which flow into the Black Sea or Sea of Azov. Include 22 Ramsar wetlands of international importance	Numerous endangered species, including Danube salmon (*Hucho hucho*), European crayfish (*Astacus astacus*), and varied species of sturgeon

Table 1.4.1. The eight major landscapes and ecosystems in Ukraine and their important species. Source: USAID 2007[6].

Ecosystem (as defined by 2001 report) *Section II.A*	Productive Sector *Section II.B*
Steppe	Agriculture
Forest-steppe	Forestry
Carpathian Mountains	
Crimean Mountains	
Forests	
Polessia	Fisheries and Irrigation (Rivers, Wetlands and Aquatic Systems)
Black Sea and Sea of Azov	
Freshwater Systems and Wetlands	

Table 1.4.2. Ukrainian Ecosystems Condensed by Productive Sector. Source: USAID 2007[7].

Ukraine possesses an extremely rich and diverse biota. Despite the fact that Ukraine occupies only six percent of European territory, Ukraine possesses about 35 percent of Europe's biodiversity, a higher percentage than all European countries except Italy and

[6] http://www.devtechsys.com/assets/Uploads/docs/publications/ukraine-faa-119-biodiversity-analysis.pdf

[7] http://www.devtechsys.com/assets/Uploads/docs/publications/ukraine-faa-119-biodiversity-analysis.pdf

France. There are estimated to be more than 70,000 different species of its biota. Of these, there are over 25,000 species of plants; including mushrooms and myxomycetes, algae, lichen, bryophyta, and vascular plants. The richest floral regions in Ukraine are Crimean and Carpathian Mountains with 2,230 and 2,060 species, respectively. The highest endemic rate in Ukraine of 11 percent is found in the Crimean region. The animal kingdom contains over 45,000 species. Invertebrate animals include arthropods, insects, worms, protozoa, and mollusks.

Ukraine has several important aquatic systems; including rivers, wetlands, and seas. With a coastline that extends 1,629 kilometers along on the southern border, Ukraine claims a marine ecosystem that extends 12 nautical miles into the sea and covers an area of approximately 24,520 square kilometers. Four species of marine mammals occur in the seas: the monk seal (*Monachusmonachus*), which is on the verge of extinction, and three species of dolphins, the bottlenose dolphin (*Tursiops truncatus ponticus*), the common dolphin (*Delphinus delphis ponticus)* and the harbor porpoise (*Phocaena phocaena relicta*). In the beginning of 1950s the Black Sea was home to about 1 million dolphins. Although hunting for dolphins has been banned since 1966 their population by the end of 1980s was less than 50,000 to 100,000 and their number continues to decline, mostly due to habitat loss and decline in prey species.

Approximately 200,000 kilometers of rivers in Ukraine drain into the Black Sea and Sea of Azov. Many of these rivers have been dammed for electricity, converted to fish ponds, or modified for irrigation. Wetlands cover approximately 5.3 percent of Ukraine; these include coastal marshes, peat bogs, river plains, and forest swamps. Of these, Black Sea wetlands and marshes are among Europe's most important habitats for migratory birds along with freshwater and marine fish [16].

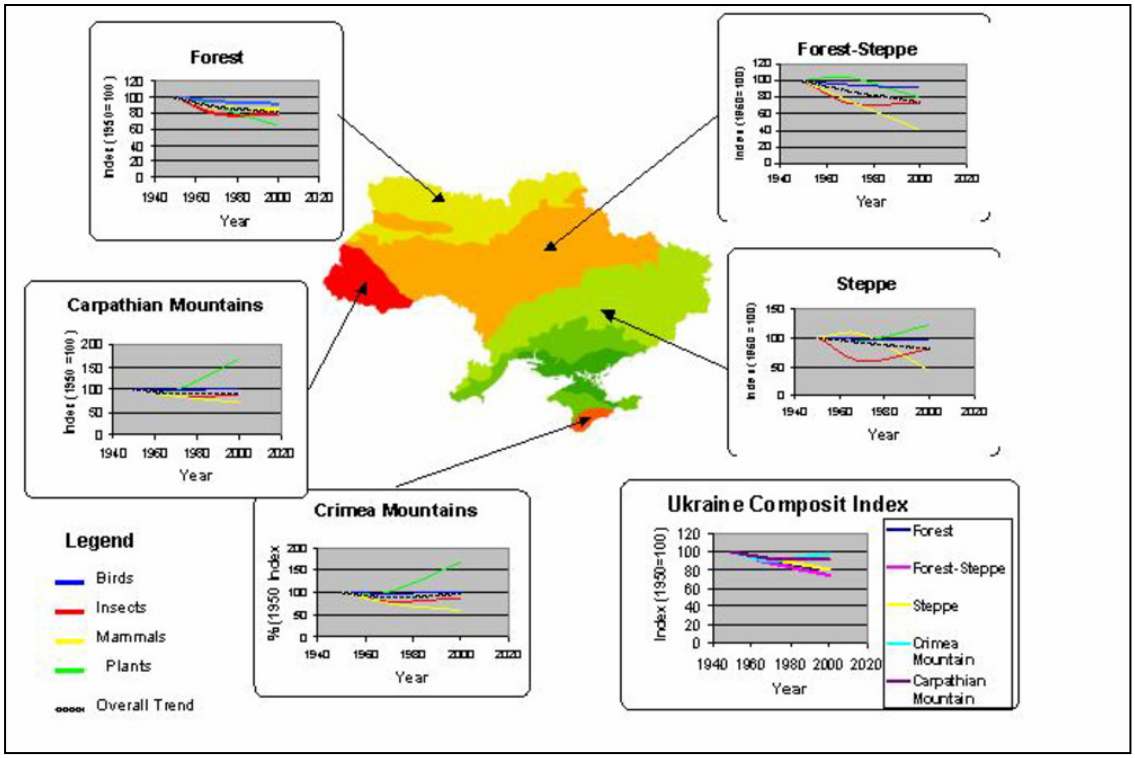

Figure 1.4.1. Biodiversity Trends by Agricultural Region and Species Type in Ukraine Based on Expert Evaluation. Source: Stefanie Aschmann, Vasyl Prydatko, Yulia Apetova, «Biodiversity and Agriculture in Ukraine», UNEP-GEF BINU Project, Kyiv, Ukraine, 2004[8].

1.4.3. Land use, land-use change and forestry

Land Use data (forest land, cropland, wetland, settlements, grassland, others) and Activities of Land Use, Land-Use Change and Forestry (LULUCF) in order to offset emissions of greenhouse gases.

[8] http://www.ulrmc.org.ua/services/binu/prmaterials/Biodiversity_Agriculture.pdf

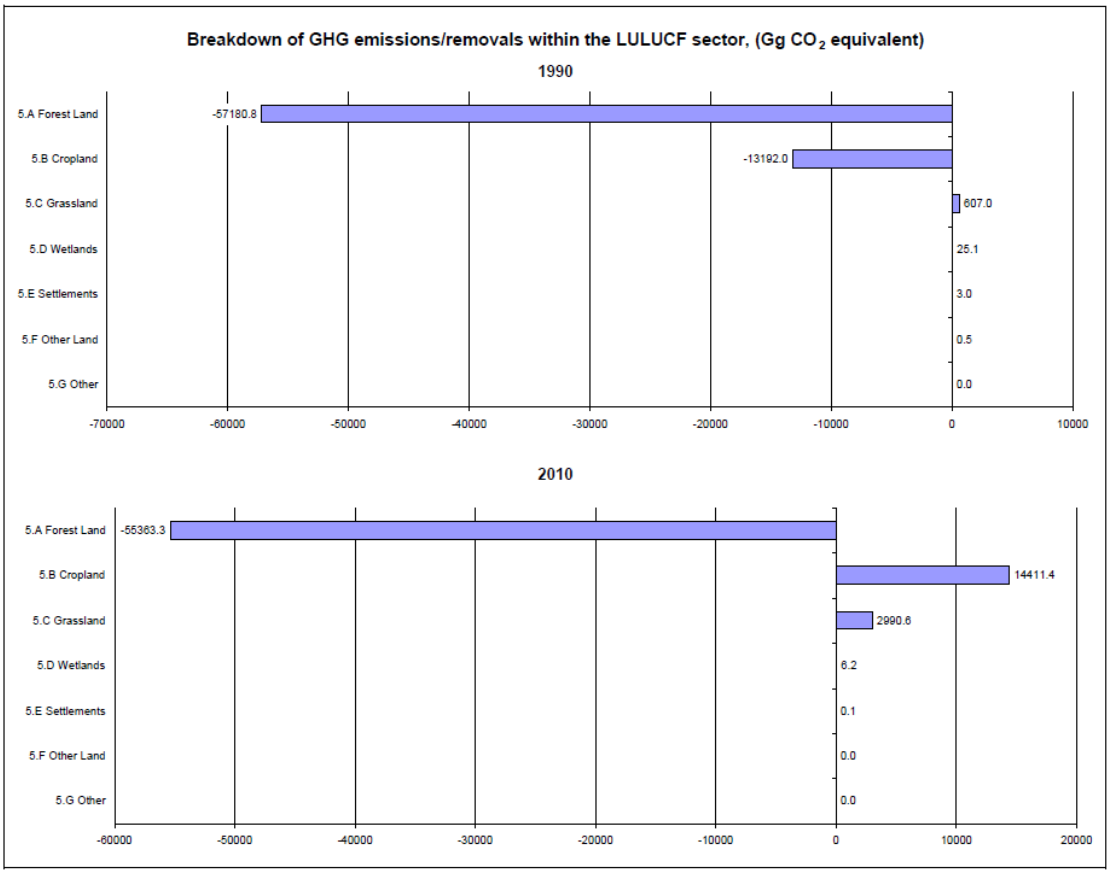

Figure 1.4.2. Breakdown of GHG emissions/removals within the LULUCF sector (Gf CO2 eq.). Source: Framework Convention on Climate Change, UNFCCC[9].

1.5. Climatic profile

Ukraine lies in a temperate climatic zone influenced by moderately warm, humid air from the Atlantic Ocean. Winters in the west are considerably milder than those in the east. In summer, on the other hand, the east often experiences higher temperatures than the west. Average annual temperatures lie in the range 5.5–7 °C in the north to 11–13 °C in the south. The average temperature in January, the coldest month, is -3 °C in the southwest and -8 °C in the northeast. The average in July, the hottest month, is 23 °C in the southeast and 18 °C in the northwest.

Precipitation is uneven, with two to three times as much falling in the warmer seasons as in the cold. Maximum precipitation generally occurs in June and July, while the minimum falls in February. Snow falls mainly in late November and early December, varying in depth from a few inches in the Steppe region to several feet in the Carpathians. Western Ukraine, notably the Carpathian Mountains area, receives the highest annual precipitation—more than 47 inches (1,200 millimetres). The lowlands along the Black Sea and in the Crimea, by contrast,

[9] http://unfccc.int/files/ghg_emissions_data/application/pdf/ukr_ghg_profile.pdf

receive less than 16 inches annually. The remaining areas of Ukraine receive 40 to 60 cm of precipitation.

The southern shore of the Crimea has a warm, gentle, Mediterranean-type climate. Winters are mild and rainy, with little snow, and the average January temperature is 4 °C. Summers are dry and hot, with an average July temperature of 24 °C [3].

1.5.1. Precipitation

N/A.

1.5.2. Temperature

N/A.

1.5.3. Other climatic characteristics

N/A.

1.6. Economic profile

1.6.1. General

	2008	2009	2010
GDP (purchasing power parity), billion $	345.9	293.7	306.3
GDP (official exchange rate), billion $	N/A	N/A	136.6
GDP - real growth rate, %	2.1	-15.1	4.3
GDP - per capita (PPP), $	7500	6400	6700
Unemployment rate, % (officially registered, large number of unregistered or underemployed workers)	N/A	8.8	8.4
Population below poverty line, %	N/A	35	N/A
Labor force, million	N/A	N/A	22.06
Public dept, % of GDP	N/A	30	38.4
Inflation rate (consumer prices), %	N/A	9.8	15.9
Investment (gross fixed), % of GDP	N/A	N/A	16.1
Budget revenues, $ billion	N/A	N/A	41.18
Budget expenditures, $ billion	N/A	N/A	49.79
Central bank discount rate, %	12	10.25	N/A

Table 1.6.1. Ukrainian Economy Profile. Source: Index mundi. Ukraine Economy Profile 2011[10]

[10] http://www.indexmundi.com/ukraine/economy_profile.html

Commercial bank prime lending rate, %	17.49	20.86	N/A
Stock of domestic credit, $ billion	N/A	103.9	110.8
Current Account Balance	N/A	-$1.732 billion	$603 million
Exports, $ billion	N/A	40.39	49.71
Exports - commodities	ferrous and nonferrous metals, fuel and petroleum products, chemicals, machinery and transport equipment, food products		
Export - partners	N/A	Russia - 21.1%, Turkey- 5.3%, China - 3.8%	N/A
Imports, $ billion	N/A	45.05	53.54
Imports - commodities	energy, machinery and equipment, chemicals		
Imports - partners	N/A	Russia - 28%, Germany - 8.6%. Kazakhstan - 4.9%, Poland - 4.9%, China - 6.1%	N/A
Reserves of foreign exchange and gold, $ billion	N/A	26.51	32.91
Dept - external, $ billion	N/A	94.3	97.5
Stock of direct foreign investment - at home, $ billion	N/A	46.81	52.31
Stock of direct foreign investment - abroad, $ billion	N/A	2.067	2.327
Market value of publicity traded shares, $ billion	111.8 - 2007, 24.36 - 2008	16.79	N/A
Exchange rates, UAH per US Dollar	5.05 - 2007, 4.9523- 2008	7.7912	7.9111

Table 1.6.1. (continued) Ukrainian Economy Profile. Source: Index mundi. Ukraine Economy Profile 2011[11]

1.6.2. Primary sector

agriculture: 9.8 %

Labor force - by occupation

agriculture: 15.8 % [9]

[11] http://www.indexmundi.com/ukraine/economy_profile.html

1.6.3. Secondary sector

GDP - 32.3 %

Labor force - 18.5 % [9]

	2009	2010
Industrial production growth rate, %	N/A	8
Electricity production, billion kWh	172.9	N/A
Electricity consumption, billion kWh	134.6	N/A
Electricity exports, billion kWh	4	N/A
Electricity imports, kWh	0	N/A
Oil production, bbl/day	99,93	N/A
Oil consumption, bbl/day	348	N/A
Oil imports, bbl/day	147,6	N/A
Oil exports, bbl/day	154,4	N/A
Oil proved reserves, million bbl	N/A	395
Natural gas production, billion cu m	21.2	N/A
Natural gas consumption, billion cu m	52	N/A
Natural gas exports, billion cu m	5	N/A
Natural gas imports, billion cu m	26.83	N/A
Natural gas proved reserves, trillion cu m	N/A	1.104

Table 1.6.3. Ukrainian Secondary Sector. Source: Index mundi. Ukraine Economy Profile 2011[12].

1.6.4. Tertiary sector

GDP - 57.9 % (2010 est.), Labor force - 65.7 % (2008) [9]

1.6.5. Future prospects for the country's economy and development

Country Forecast Overview (3 Year)

Key Indicators	2010	2011	2012
Real GDP Growth (%)	4.30	5.00	5.20
Consumer Price Inflation (av;%)	9.37	10.40	9.30
Budget Balance (% of GDP)	-5.20	-4.00	-3.00
Current-Account Balance (% of GDP)	-2.09	-2.80	-3.90
Exchange Rate US$:Euro (av)	7.94	7.94	7.84
Exchange Rate US$:Euro(year-end)	7.96	7.90	7.80

Table 1.6.5. Key indicators. Source: Alacra Store, Ukraine Country Outlook, 2011[13].

[12] http://www.indexmundi.com/ukraine/economy_profile.html
[13] http://www.alacrastore.com/country-snapshot/Ukraine

1.7. Transportation

1.7.1. Road transport

Motor vehicles	98 motor vehicles per 100 p
Driving side of the road > Left or right	Right side
Highways > Paved	163,898 km
Highways > Paved (per capita)	3.333 km per 1,000 people
Highways > Total	169,491 km
Highways > Total (per capita)	3.447 km per 1,000 people
Highways > Unpaved	5,593 km
Highways > Unpaved (per capita)	0.114 km per 1,000 people

Table 1.7.1. Road information. Source: Nation Master. Ukraine – Transportation[14].

1.7.2. Shipping

Roads, goods transported > million ton-km (per capita)	0.608 million ton-km per 1 mi
Roads, passengers carried > million passenger-km (per capita)	1.229 million passenger-km pe

Table 1.7.2. Shipping road information. Source: Nation Master. Ukraine – Transportation[13].

Merchant marine > A note	
includes some foreign-owned ships registered here as a flag of convenience: Cyprus 1, Greece 1,Panama 1, Russia 4, Saint Vincent and the Grenadines 1 (2002 est.)	
Merchant marine > Note	
includes some foreign-owned ships registered here as a flag of convenience: Cyprus 1, Greece 1, Panama 1, Russia 4, Saint Vincent and the Grenadines 1	
Merchant marine > Ships by type	
bulk 7, cargo 89, container 5, liquefied gas 2, passenger 14, passenger/cargo 1, petroleum tanker 10, railcar carrier 2, short-sea passenger 1	
Merchant marine > Total > Dwt	899,859 Dwt
Merchant marine > Total > Dwt (per $ GDP)	8.587 Dwt per million $ of GDP
Merchant marine > Total > Dwt (per capita)	19.435 Dwt per 1,000 people
Merchant marine > Total > GRT	763,293 GRT
Merchant marine > Total > GRT (per $ GDP)	7.374 GRT per million $ of GDP
Merchant marine > Total > GRT (per capita)	16.486 GRT per 1,000 people

Table 1.7.3. Shipping information. Source: Nation Master. Ukraine – Transportation[13].

[14] http://www.nationmaster.com/red/country/up-ukraine/tra-transportation&all=1

1.7.3. Railways

Rail usage statistics > Distance travelled by rail per inhabitant in km/year Kilometres/year	1,01
Rail usage statistics > Freight rail by billions of tonne-kilometers > Billion tonne-kilometres	223.98
Rail usage statistics > Passenger-km of rail transport, in billion/year > Billion passenger-kilometres	52.66
Railways > A note	
these data do not include railroads dedicated to serving industry and not in common carrier service (2001)	
Railways, goods transported > million ton-km (per capita)	4,757.909 million ton-km per 1 mi
Railways, passengers carried > million passenger-km (per capita)	1,118.527 million passenger-km pe

Table 1.7.4. Railway information. Source: Nation Master. Ukraine – Transportation[13].

1.7.4 Air transport

Air transport, freight > million tons per km	39.29 million tons/km
Air transport, passengers carried (per capita)	53.381 per 1,000 people
Air transport, registered carrier departures worldwide (per capita)	0.89 per 1,000 people
Aircraft departures	38,8
Aircraft departures (per capita)	0.825585 per 1,000 people

Table 1.7.5. Air transport information. Source: Nation Master. Ukraine – Transportation[13].

1.8. Energy generation

1.8.1. Energy supply

Total installed generating capacity in Ukraine in 2009 amounted to 52.2 GW. Ukraine has 18 utility-owned thermal power plants, the largest 10 of which are coal-fired. There are four nuclear power plants with 15 reactors, and four large hydropower plants along the Dnieper and Dniester rivers with a combined capacity of 3.3 GW, and a total hydro capacity of 4.8 GW [8].

Peak demand averages 29 GW. Due to declining industrial demand, there is significant over supply of capacity in Ukraine [2]. However, with over 90 per cent of fossil-fuel fired plants in Ukraine approaching their expected decommissioning dates, additional generating capacity will be required. Between 2010 and 2020, 16,000 MW of new or refurbished generating capacity is expected to be added, and an additional 17,000 MW between 2020 and 2030. According to the government energy strategy, EUR 38.6 billion will need to be spent on constructing new capacity or refurbishing existing. Of that, EUR 0.7 billion will be spent on renewable power (excepting large hydro). Table 1.8.1 shows the projected generating mix in 2020 and 2030 [17].

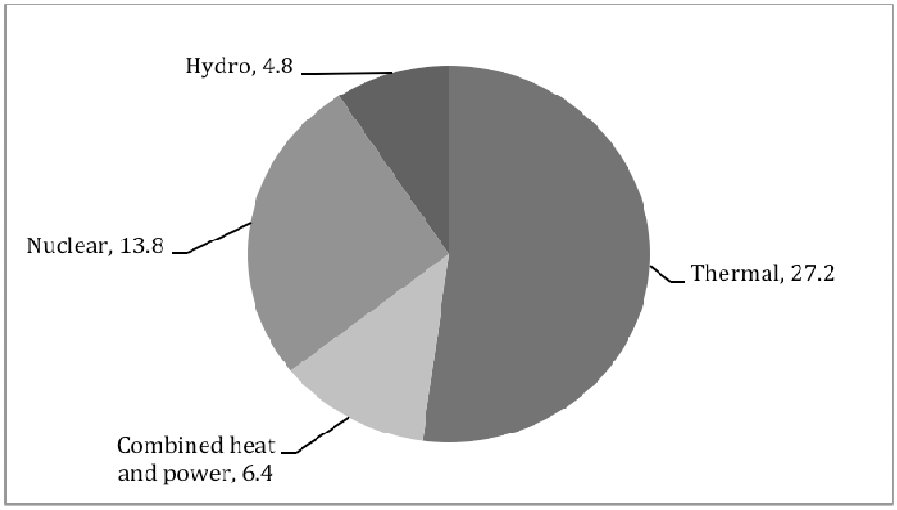

Figure 1.8.1. Total installed generating capacity in Ukraine in 2010 (MW): Total 52.2 GW.

Source: Ministry of Fuel and Energy, Інформаційна довідка про основні показники розвитку галузей паливно-енергетичного комплексу України за грудень та 2010 рік, January 2011[15].

Technology	2010[a]	2020[b]	2030[b]
Nuclear	26.4	30.9	33.3
Thermal	64.4	53.3	52.4
Hydro (all)	9.2	13.6	11.9
Other renewables	0	2.3	2.4

Table 1.8.1. Power generating capacity by type of plant in Ukraine from 2010 to 2030 (% share). Sources: [a]Ministry of Fuel and Energy, Інформаційна довідка про основні показники розвитку галузей паливно-енергетичного комплексу України за грудень та 2010 рік, January 2011[16].; [b]UNDP, Comparative Analysis of EU and Ukraine Energy Security of Supply, 2007[17].

In 2010, a total of 187,910.1 GWh of electricity was generated in Ukraine, an 8.7 per cent increase from the 172,899.6 GWh generated in 2009. Thermal power and nuclear power plants generated more than 90 per cent of total generation (see Table 1.8.2). Gross power consumption likewise increased by 8.8 per cent in 2010 compared to 2009 to reach 183,900.2 GWh, and net power consumption increased by 9.5 per cent to 147,330.1 GWh. Ukraine is also a large exporter of electricity. In 2010, Ukraine exported 4,218.1 GWh of electricity, primarily to Slovakia, Hungary and Belarus, compared to 4,108.3 GWh in 2009 [11].

According to the government's energy plan to 2030, prepared in 2006, gross generation is projected to increase to 420.1 TWh, with nuclear power seeing the largest increase in

[15] mpe.kmu.gov.ua/fuel/control/uk/publish/article?art_id=188753&cat_id=35081
[16] mpe.kmu.gov.ua/fuel/control/uk/publish/article?art_id=188753&cat_id=35081
[17] www.undp.org.ua/files/en_74621comparison.pdf

generation. In the same time period, gross power consumption is projected to increase to 395.1 TWh by 2030.

Technology	2010	2009
Nuclear	89,151.3	82,924.1
Thermal	77,976.7	71,068.6
Hydro	12,965.1	11,768.7
CHP	7,811.6	7,135.1
Total	187,910.1	172,899.6

Table 1.8.2. Comparison of electricity generation by type of plant in Ukraine in 2010 and 2009 (GWh). Source: Ministry of Fuel and Energy, Інформаційна довідка про основні показники розвитку галузей паливно-енергетичного комплексу України за грудень та 2010 рік, January 2011[18].

Technology	2010[a]	2015[b]	2020[b]	2030[b]	Required CAGR 2010-2030
Nuclear	89.2	110.5	158.9	219.0	4.6
Thermal (including CHP)	85.8	125.0	129.9	180.4	3.8
Hydro	13.0	11.4	12.7	14.1	1.8
Pumped hydro		3.2	3.9	4.5	
Other renewables	0	0.8	1.5	2.1	N/A
Total	188.0	250.9	306.9	420.1	4.1

Table 1.8.3. Projected increase in electricity generation from 2010 to 2030 (GWh). Sources: [a]Ministry of Fuel and Energy, Інформаційна довідка про основні показники розвитку галузей паливно-енергетичного комплексу України за грудень та 2010 рік, January 2011[17]; [b] Govenrment of Ukraine, Про схвалення Енергетичної стратегії України на період до 2030 року, 2006[19].

Ownership of generation is divided into three categories. Thermal power plants are owned by four regional generation companies known as “gencos” (Centrenergo, Donbasenergo, Dniproenergo, and Zahidenergo) and Ukrhydroenergo owns the eleven hydro power plants. The Energy Company of Ukraine, a state-owned company, owns the majority shares in all these companies. There is one private genco, Skhidenergo, that owns three thermal power plants. The wholly state-owned Energoatom owns the four nuclear power plants. Most of the CHP and district heating plants in Ukraine are owned by regional utilities or municipalities. [6, 7]

The state-owned Energorynok (“energy market”) acts as the single market buyer of all output. Energoatom sells its output to Energorynok at regulated rates. Electricity tariffs are set by the government and, while increasing, are still priced below the long-run marginal cost, particularly for nuclear power. Current electricity tariffs are considered too low to cover capital costs of most power plants [8].

[18] mpe.kmu.gov.ua/fuel/control/uk/publish/article?art_id=188753&cat_id=35081
[19] eneco.com.ua/data/Ukrainian%20Energy%20Strategy%20up%20to%202030.pdf

1.8.2. Energy consumption

Total primary energy supply was 136,7219 ktoe (thousands of tonnes of oil equivalent) in 2008 (see Figure 1.8.1). Over half of primary energy supply in Ukraine is oil and gas, with an additional 30 per cent from coal. Renewables, including large hydro, account for approximately 1 per cent (see Figure 1.8.1). Over 60 per cent of all energy sources were imported, primarily oil and gas [2]. The government has made reducing the dependency on imported energy sources a priority [8].

Primary energy supply has dropped from approximately 180 Mtoe in 1993 due to economic recession {17]. According to the government's 2030 energy plan, completed in 2008, primary energy supply is set to increase to 217.3 Mtoe by 2030, which would represent a CAGR of over 2 per cent from 2008 levels. The use of domestic coal and nuclear power is set to increase, with a corresponding decrease in the use of imported natural gas. This is to reduce reliance on imports from 60 per cent in 2008 to 21 per cent in 2030.

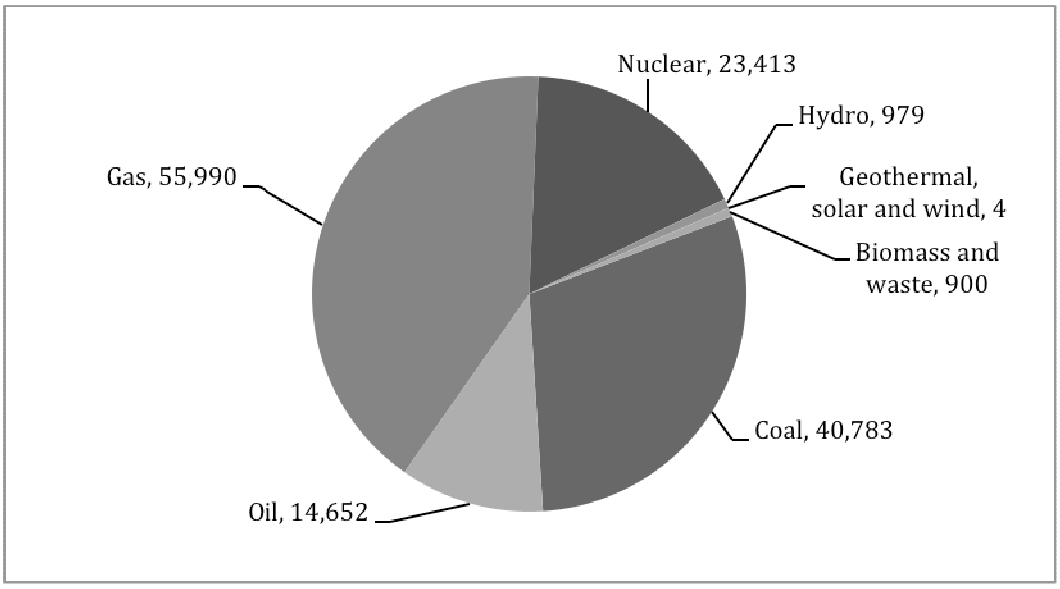

Figure 1.8.2. Primary energy consumption in Ukraine in 20008 (ktoe): Total 136,7219 ktoe. **S**ource: IEA, 2008 Energy Balance for Ukraine[20].

[20] www.iea.org/stats/balancetable.asp

1.9. Waste disposal

1.9.1. Solid waste disposal

Waste generation 2001 – 80 mln. tonnes

Total waste concentration – 35 milliard tonnes

1.9.2. Wastewater treatment

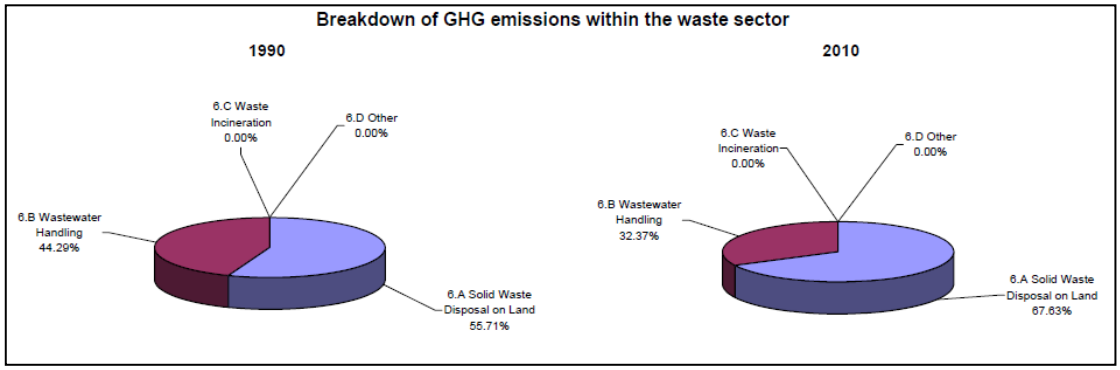

Figure 1.9.1. Breakdown of GHG emissions within the waste sector. Source: Framework Convention on Climate Change, UNFCCC[21].

[21] http://unfccc.int/files/ghg_emissions_data/application/pdf/ukr_ghg_profile.pdf

2. The National GHG inventory

2.1. Development of a national system for the GHG inventory

Materials of this section are based on Ukraine's national inventory report for 1990-2004 submitted to the UNFCCC Secretariat in May 2006. The report provides inventory results for four direct greenhouse gases – carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O) and perfluorocarbons (PFC). In the 2006 inventory submission there were no estimates for hydrofluorocarbons (HFC) and sulphur hexafluoride (SF6) because these gases are not produced in Ukraine and information on their use is lacking.

Total GHG emissions in Ukraine without account of Land-Use, Land-Use Change and Forestry (LULUCF) sector reduced in 2004 by factor of 2.2 (from 925.4 mtCO2-e to 413.4 mtCO2-e) compared to 1990, which is a base year for Ukraine. Carbon dioxide emissions reduced by 2.4 times, methane – by 2 times and nitrous oxide – by 2.45 times. Table 2.1.1 presents inventory results for the period 1990-2004 [10].

Gas	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
CO_2 emissions (excluding net CO_2 from LULUCF)	719.4	620.2	535.1	480.5	431.0	393.5	357.9	344.6	308.2	309.3	296.5	298.9	301.3	320.5	316.9
CH_4	151.2	138.3	131.3	118.6	107.3	94.4	86.9	80.0	76.6	75.5	76.9	76.5	75.8	74.5	74.1
N_2O	54.6	50.6	46.1	41.6	36.7	33.2	27.9	26.8	25.2	23.1	21.6	23.5	23.3	20.9	22.3
HFCs															
PFCs	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SF_6															
Total (excluding net CO_2 from LULUCF)	925.4	809.2	712.6	640.8	575.2	521.2	472.8	451.5	410.1	408.1	395.1	399.0	400.5	416.0	413.4
Net CO_2 from LULUCF	-33.8	-36.0	-31.9	-30.9	-39.3	-42.4	-48.4	-46.9	-52.5	-43.6	-38.0	-42.0	-37.3	-39.2	-32.1
CO_2 emissions (including net CO_2 from LULUCF)	685.5	584.2	503.3	449.5	391.7	351.1	309.4	297.7	255.7	265.7	258.5	256.9	264.0	281.3	284.8
Total (including net CO_2 from LULUCF)	891.5	773.2	680.8	609.9	535.9	478.7	424.3	404.5	357.6	364.5	357.1	357.0	363.2	376.8	381.3

Table 2.1.1. Ukraine's GHG inventory results for the period 1990-2004, mtCO2-e. Source: Ministry of environmental protection of Ukraine, report 2006[22]. Base year for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride

Ukraine selects 1990 as a base year for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. The government of Ukraine has not entered into any agreements with other countries to jointly fulfil commitments under Article 3, possibility of which is foreseen by Article 4.

Base year for Ukraine is 1990 for all direct GHGs, including hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. According to the results of the latest inventory submitted to the UNFCCC Secretariat on May 26, 2006, Ukraine's total emissions of direct

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http://unfccc.int/files/national_reports/initial_reports_under_the_kyoto_protocol/application/pdf/ukraine_aa_report.pdf

GHGs for the five sectors of Annex A to the Kyoto Protocol (that is, without account of net GHG removal in LULUCF sector) in 1990 were equal to 925 362 174.39 tons of CO2-e.

In accordance with Annex B to Kyoto Protocol, Ukraine's committed emission level is 100% of base year emissions.

With account of the above, Ukraine's assigned amount for the first commitment period is five times the base year emission level and equals [10]:

925 362 174.39 x 5 = 4 626 810 872 tCO2-e.

Calculation of commitment period reserve

As stated in paragraph 6 of the Annex to decision 11/CMP.1, "each Party included in Annex I shall maintain, in its national registry, a commitment period reserve which should not drop below 90 per cent of the Party's assigned amount calculated pursuant to Article 3, paragraphs 7 and 8, of the Kyoto Protocol, or 100 per cent of five times its most recently reviewed inventory, whichever is lowest".

The first value defined as 90 per cent of Ukraine's assigned amount, in accordance with section 4 of this report is equal to:

4 626 810 872 x 0.9 = 4 164 129 785 tCO2-e.

As its "most recently reviewed inventory" Ukraine uses the inventory submitted to the UNFCCC Secretariat in May 2006, for which the "Annual Status Report of the Greenhouse Gas Inventory of Ukraine" was received from the Secretariat on June 21, 2006. In this inventory, total direct GHG emissions in 2004 were 413 411 237.691 tCO2-e. Accordingly, the second value defined as 100 per cent of five times the most recently reviewed inventory is equal to:

413 411 237.691 x 5 = 2 067 056 188 tCO2-e.

Ukraine's commitment period reserve as a lower of these two values is therefore determined as [10]:

2 067 056 188 tCO2-e.

2.1.1. Government Ministries/agencies responsible for collecting and inventorying data

The National Environmental Investment Agency is the national authority for joint implement (JI) projects in Ukraine under the Kyoto Protocol. A national entity with overall responsibility for Ukraine's national inventory is the Ministry of Environmental Protection of Ukraine (MEP). Its designated representative for inventory related issues is the Head of Department on UNFCCC Implementation

2.1.2. Supporting institutions

Figure 2.1.1 presents inventory process stakeholders and informational relationships between them.

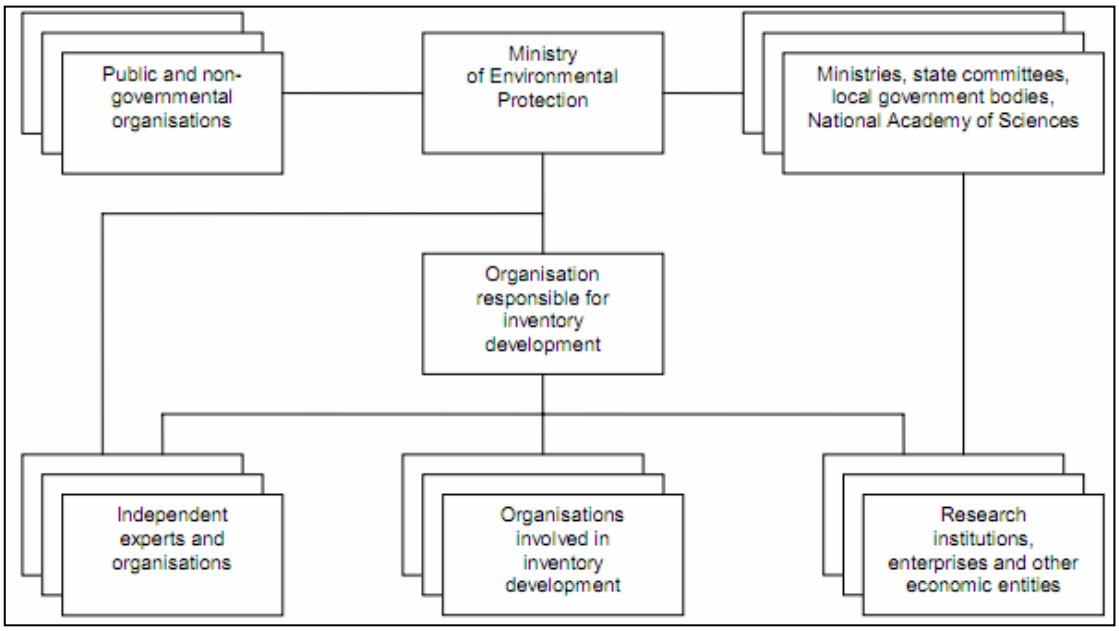

Figure 2.1.1. General organizational structure of the national inventory system.

Organisation responsible for inventory development (inventory developer) conducts this work under a contract with the MEP. Development of the inventory to be submitted in 2007 is performed by the Centre on Climate Change established by the MEP's Order of 01.09.2005 No.313. Tasks of the organisation responsible for inventory development include [10]:

• preparing the requests for initial data for GHG inventory;

• providing consultations for specialists of ministries, state committees and local government bodies who prepare initial data;

• collecting, processing and verifying statistical data from the State Committee on Statistics and industry-specific statistical reporting from ministries, state committees and local government bodies;

• determining inventory methodologies and developing inventory plan;

• performing calculations, including GHG emissions and removals estimates, uncertainty assessment, key source categories determination etc., with involvement (when necessary) of specialised organisations and experts;

• developing quality assurance and quality control (QA/QC) plan and carrying out relevant activities;

• performing recalculations for complete time series beginning from the base year;

• preparing the national inventory report and common reporting format tables and submitting them to the MEP;

• providing for expert review of inventory (including responding to requests from international experts) with account of existing national constraints related to confidential information;

• documenting and archiving all inventory initial data, assumptions, calculation algorithms and results;

• developing the terms of reference for research and development institutions concerning the studies on national emission factors for key source categories.

In addition to the MEP and organisation responsible for inventory development, stakeholders of the inventory process include:

• ministries, state committees, local government bodies (regional state administrations), National Academy of Sciences;

• research institutions and enterprises subordinated/related to the agencies indicated above;

• organisations involved in inventory development;

• independent experts and organisations;

• public and non-governmental organisations.

Major task of ministries, state committees, and local government bodies is to provide initial data for the inventory. The bulk of these data comes from the State Committee on Statistics. The MEP, Ministry of Fuel and Energy, Ministry of Industrial Policy, Ministry of Agrarian Policy, Ministry of Construction, Architecture and Housing and Communal Services, Ministry of Transport and Communication, State Committee on Forestry, State Committee on Land Resources, State Committee on Water Resources, and local government bodies provide agency-specific reporting data that are not reflected in state statistics. In addition to this, ministries, state committees, and local government bodies, together with sectoral and academic research institutions participate in QA activities.

For calculations of GHG emissions and removals inventory developer involves also experts from sectoral and academic research institutions, National Agrarian University, Council on Study of Productive Forces of Ukraine [10].

2.1.3. Measurement methodology and data sources

The following main security measures are used in the national registry for preventing unauthorized manipulations and operator errors [10]:

• access of registry administrator to the database is performed by means of dedicated line and employs procedures inaccessible through user interface;

• access to the registry (except for publicly accessible information) requires entry of usernames and relevant passwords;

• rights of user groups determine the sections of the system and their functions accessible for each user. User rights management sub-system is protected to high extent. Control is performed on all user actions during all the stages of work with the registry. If necessary, any transaction performed by a user can be terminated at any stage before its completion;

• user-entered information is checked for consistency, and acknowledgement of the entry is requested;

• in accordance with the Data Exchange Standards requirements, exchange of information with the ITL is performed by means of SSL (Secure Sockets Layer) protocol and hardware-based VPN (Virtual Private Network) using integrated VPN/firewall device CISCO PIX 506E;

• installation of up-to-date anti-virus software;

• at present, development of a complex information security system is being completed to meet the national requirements to registry security level, which are applied to state information resources.

2.1.4. Activity data

Main source of activity data for GHG inventory is the national statistics. State statistical reports are developed by the State Committee on Statistics proceeding from reports of regional statistical bodies compiled based on reports (filled statistical forms) from enterprises and other economic entities. Schedule of statistical reporting is determined by a plan of state statistical observations, approved annually by a CMU decree.

Time for submitting the reports by enterprises and other economic entities is about one month after the end of year. Terms for preparing the reports by regional statistical bodies depend on the sector and are in the range of 1 to 3 months. For the State Committee on Statistics, these terms are from 1 to 4 months.

However, only national statistics is not sufficient for inventory purposes. Initial data are also taken from agency-specific statistical reporting produced by ministries, state committees

and local government bodies based on activity reports from enterprises subordinated to them. Other information sources are also used as necessary, and they include publications and reports on scientific studies, reference books etc [10].

2.1.5. Conformity with data-exchange standards

National registry of Ukraine is developed in conformity with requirements to the technical standards for data exchange between registry systems, with the purpose of ensuring the accurate, transparent and efficient exchange of data between national registries, the clean development mechanism registry and the transaction log (ITL) as prescribed by decisions of the Conferences of Parties 19/CP.7 и 24/CP.8.

In order to achieve this purpose, formats of account numbers, serial numbers of AAUs, ERUs, RMUs and CERs are realised in the manner described in Annex F (Definition of Identifiers) to the Data Exchange Standards for Registry Systems Under the Kyoto Protocol - Technical specifications, Version 1.0 (the Data Exchange Standards). Besides, for the information transmitted electronically when transferring ERUs, CERs, AAUs, and RMUs to other registries and receipt of these units from other registries and registry for clean development mechanism, as well as for the information transmitted to the ITL during issuance, transfer, cancellation, and retirement of ERUs, CERs, AAUs, and RMUs it is foreseen to use XML files with messages, formats of which meet the requirements of the Data Exchange Standards.

It should be noted, however, that full conformity of XML files with required specifications can be established only in conditions of availability of working tools for data exchange with the ITL. Testing of the processes of information exchange with the ITL will be conducted as soon as it becomes possible after putting the ITL into operation [10].

2.2. Systematic observations

2.2.1. Measurements of meteorological parameters and instrumentation deployed

The Law of Ukraine “On Metrology and Metrological Activity” (hereinafter referred to as “the Law”) defines legal grounds for ensuring the unity of measurements in Ukraine, regulates relations in the area of metrological activity and aims at protection of citizens and national economy from the consequences of inauthentic results of measurements.

The Law shall apply to central and local bodies of executive power, bodies of local self government, enterprises (their associations), institutions, and organizations regardless of their type of ownership and the type of activity, which operate on the territory of Ukraine, citizens - subjects of entrepreneurial activity and producers, and foreign countries importing units of measuring equipment to the territory of Ukraine.

Ukraine shall apply measurement units of the International System of Units, accepted by the General Conference on Weights and Measures and recommended by the International Organization of Legal Metrology. According to the decision of the State Committee for Standardization, Metrology and Certification of Ukraine, Ukraine can also apply measurement units, which are not included into the International System of Units. Names of measurement units, multiples and quotients thereof, applied in Ukraine, indications and rules for writing them down shall be established by the State Committee for Standardization, Metrology and Certification of Ukraine [15].

2.2.2. Oceanic observations

2.2.3. Terrestrial observations

The Department for Space Geodynamics was founded by Ya. S. Yatskiv in 1979 on the basis of the Laboratory of the Earth's Rotation. There are several procedures in use: analysis of polar motion and latitude variations and their geophysical interpretation, the determination of the parameters of Earth rotation (laser ranging, VLBI observations, radio observations of the navigation satellites GPS, GLONASS, etc.) and their analysis. There were created programme complexes KIEV-GEODYNAMICS and SteelBrees, and the Department became one of the centres in the International Earth Rotation Service. The Satellite Laser Ranging stations in Kyiv and Poltava were modernized, and the work is in progress on creating a fundamental network of stations for observations of the navigation satellites GPS and GLONASS. The permanent GPS station is in operation at the Observatory from 1998.

There are several scientific researches of theoretical aspects of the irregular Earth's rotation, application of modern space techniques, such as Satellite Laser Ranging (SLR), Very Long Base Interferometry (VLBI), Global Positioning System (GPS), to derive the Earth Orientation Parameters (EOP), tracking stations coordinates and velocities, to obtain realizations of the local geodetic networks and global terrestrial reference frames [12].

2.2.4. Air-quality monitoring

At present air quality observations in Ukraine are provided by the State Committee for Hydrometeorology, Ministry of Health, Ministry for Environmental Protection and Nuclear Safety. Environment Pollution Observational Network of the State Committee of Ukraine for Hydrometeorology is a part of the State Observational System, because stations and posts provide both hydrometeorological and environment pollution observations. Air pollution observations are carried out in 52 cities at 172 stationary, 6 routing and 37 undersources observation points. The network of observation points performs the following tasks:

- studies a condition of atmospheric pollution with the purpose of determination of a levels and sources of pollution;

- provides governmental bodies with the systematic and emergency information on a level of atmospheric pollution as well as with short-range and long-range forecasts of atmospheric pollution.

The list of pollutants being subject to the control is established in view of volume and composition of emissions and results of preliminary survey of air pollution in a specific populated areas. Simultaneously with sampling of air, meteorological par ameters (air temperature, humidity, wind direction and speed, other weather parameters) are measured. In total the content of 20 pollutants in air is observed by the State Committee of Ukraine for Hydrometeorology. The list of observed pollutants is determined so that it includes chemical compounds, which can cause critical eco-toxicological situations with the greatest probability. A class of danger by acute toxicity, volatility, ability to accumulation, irritant, allergic, mutageneous effects are also taken into account. Air quality observations within industrial zones over territory of Ukraine are carried out by Analytical and Inspection Services of Regional State Departments for Environmental Protection of Ministry for Environmental Protection and Nuclear Safety of Ukraine. Taking into account an especially stressed environmental conditions in Donetsk, Dnepropetrovsk, Lugansk, Zaporozhye, Kiev regions, the laboratories were arranged in sub-regional cities with large technogeneous loading (Krivyi Rig, Mariupol', Nikopol', Severodonetsk, Bila Tserkva and others).

Main function of analytical services consists in carrying out non-regular observations of surface water quality, industrial emissions of pollutants to the atmosphere, soil pollution in areas with heightened technogeneous loading.

For the time being there are no stationary points for air quality observations in the Ministry for Environmental Protection and Nuclear Safety, therefore information from State Committee for Hydrometeorology and other sources is used.

Observations of pollutants emissions from industrial sources are carried out in accordance with programs, approved by the heads of Regional State Departments for Environmental Protection. Proceeding from conditions of industrial facilities impacts, frequency of the industrial emissions control is determined. In total, Analytical Services observe the contents about 65 pollutants in industrial emissions.

Ministry of Health Protection of Ukraine has the 54 stationary observation points and controls about 100 pollutants. In addition to observations at stationary points, routine (about 602), undersources (about 2010) observation, as well as special studies of environment parameters are carried out.

Environmental observational network of SES is arranged in order to accomplish the tasks related to human health protection. Existing practice consists in the selective non-systematic monitoring of certain parameters in necessary time intervals.

Samples selected at observation sites are analysed in sanitary-epidemiological stations, where physical, chemical and biological parameters of environment (including air) are determined.

The SES carries out observations of air quality in urban, agricultural populated areas (routing posts, selective observations), as well as air quality control in indoor working zones of industrial facilities. Emissions purifying works are controlled as well [4].

3. Reporting

3.1. The GHG inventory, emissions per sector

	Unit	2007
CO2 emissions: fuel combustion (reference approach)	ktco2	294013,6
CO2 emissions from oil combustion	ktco2	41677,15
CO2 emissions from coal combustion	ktco2	124949,2
CO2 emissions from gas combustion	ktco2	127387,2
CO2 emissions from fuel combustion (sectoral approach)	ktco2	305993,7
CO2 emissions from oil combustion (sectoral approach)	ktco2	40176,5
CO2 emissions from coal combustion (sectoral approach)	ktco2	140480,4
CO2 emissions from gas combustion (sectoral approach)	ktco2	125348
CO2 emissions in energy sector	ktco2	153369,5
CO2 emissions from industries (incl. autoproducers)	ktco2	81504,44
CO2 emissions from households, tertiary, agriculture	ktco2	46009,69
CO2 emissions from transport	ktco2	25110,14
CO2 emissions: oil consumption in energy sector	ktco2	3283,918
CO2 emissions : coal consumption in energy sector	ktco2	94384,77
CO2 emissions : gas consumption in energy sector	ktco2	55700,77
CO2 emissions in public electricity production	ktco2	83607,03
CO2 emissions - oil combustion in public electricity and heat production	ktco2	769,517
CO2 emissions - coal combustion in public electricity and heat production	ktco2	68232,72
CO2 emissions - gas combustion in public electricity and heat production	ktco2	14604,79
CO2 emissions in refining	ktco2	1358,692
CO2 emissions from oil combustion in manufacturing	ktco2	4926,182
CO2 emissions from coal combustion in manufacturing	ktco2	33987,95
CO2 emissions from gas combustion in manufacturing	ktco2	28597,18
CO2 emissions from autoproducers	ktco2	12940,15
CO2 emissions from oil combustion for autoproducers		n.a.
CO2 emissions from coal combustion for autoproducers	ktco2	9241,011
CO2 emissions from gas combustion for autoproducers	ktco2	3699,142
CO2 emissions from steel industries	ktco2	35489,98
CO2 emissions from oil combustion in steel	ktco2	1174,446
CO2 emissions from coal combustion in steel	ktco2	21763,3
CO2 emissions from gas combustion in steel	ktco2	12552,23
CO2 emissions in non ferrous industries	ktco2	1813,262

Table 3.1.1 Emissions per sector.

CO2 emissions from oil consumption for non ferrous	ktco2	18,733
CO2 emissions from coal consumption for non ferrous	ktco2	86,951
CO2 emissions from gas consumption for non ferrous	ktco2	1707,578
CO2 emissions from non metallic industries	ktco2	7359,683
CO2 emissions from oil consumption for non metallic	ktco2	286,207
CO2 emissions from coal consumption for non metallic	ktco2	1389,587
CO2 emissions from gas consumption for non metallic	ktco2	5683,889
CO2 emissions from chemicals industries	ktco2	1770,068
CO2 emissions from oil consumption for chemicals	ktco2	77,992
CO2 emissions from coal consumption for chemicals	ktco2	82,512
CO2 emissions from gas consumption for chemicals	ktco2	1609,564
CO2 emissions from paper industries	ktco2	94,454
CO2 emissions from oil consumption for paper	ktco2	18,733
CO2 emissions from coal consumption for paper	ktco2	2,022
CO2 emissions from gas consumption for paper	ktco2	73,699
CO2 emissions from food industries	ktco2	1443,137
CO2 emissions from oil consumption for food	ktco2	534,955
CO2 emissions from coal consumption for food	ktco2	190,789
CO2 emissions from gas consumption for food	ktco2	717,394
CO2 emissions from other industries	ktco2	261,216
CO2 emissions from oil consumption for other industries	ktco2	149,78
CO2 emissions from coal consumption for other industries	ktco2	15,683
CO2 emissions from gas consumption for other industries	ktco2	95,753
CO2 emissions from oil consumption for households, tertiary, agriculture	ktco2	6277,427
CO2 emissions from coal consumption for households, tertiary, agriculture	ktco2	6933,244
CO2 emissions from gas consumption for households, tertiary, agriculture	ktco2	32799,01
CO2 emissions from households	ktco2	38839,93
CO2 emissions from oil consumption for households	ktco2	1879,093
CO2 emissions from coal consumption for households	ktco2	5726,529
CO2 emissions from gas consumption for households	ktco2	31234,31
CO2 emissions from tertiary	ktco2	2517,443
CO2 emissions from oil consumption for tertiary	ktco2	159,779
CO2 emissions from coal consumption for tertiary	ktco2	1106,846
CO2 emissions from gas consumption for tertiary	ktco2	1250,817
CO2 emissions from agriculture	ktco2	4652,31
CO2 emissions from oil consumption for agriculture	ktco2	4238,556
CO2 emissions from coal consumption for agriculture	ktco2	99,869
CO2 emissions from gas consumption for agriculture	ktco2	313,885

Table 3.1.1 (continued) Emissions per sector.

CO2 emissions from oil consumption for transport	ktco2	24765,35
CO2 emissions from coal consumption for transport	ktco2	157,725
CO2 emissions from gas consumption for transport	ktco2	198,238
CO2 emissions from road transport	ktco2	23677,5
CO2 emissions from gasoline consumption for road transport	ktco2	15792,29
CO2 emissions from diesel consumption for road transport	ktco2	7652,463
CO2 emissions from LPG consumption for road transport	ktco2	34,506
CO2 emissions from gas consumption for road transport	ktco2	198,238
CO2 emissions from rail transport	ktco2	1011,358
CO2 emissions from domestic air transport	ktco2	6,032
CO2 emissions from navigation	ktco2	415,25
CO2 emissions due from flared gas		n.a.
CO2 emissions from industrial process	ktco2	30785,36
CO2 emissions from wastes		n.a.
CO2 emissions from solvent uses		n.a.
CO2 emissions : combustion & industrial process	ktco2	112289,8
CO2 emissions : combustion & industrial process for steel	ktco2	35489,98
CO2 emissions from industrial process for steel	ktco2	0
CO2 emissions : combustion & industrial process for non metallic	ktco2	26475,01
CO2 emissions from industrial process for non metallic	ktco2	19115,33
CO2 emissions : combustion & industrial process for chemicals	ktco2	13270,64
CO2 emissions from industrial process for chemicals	ktco2	11500,57

Table 3.1.1 (continued) Emissions per sector.

Source: Enerdata - Global Energy & CO2 Data[23].

	1990	1995	2000	2005	2006	2007	2008	% change 90-08
Ukraine, mt CO2	678,9	392,8	292	305,7	310,5	314,2	309,6	-55,00%

Table 3.1.2 Total emissions for Ukraine. Source: IEA Statistics[24].

3.2. GHG inventory, emissions per type

Emissions from energy generating companies and power stations, which belong to statutory fund of the National Stock Company (NSC) «Energy Company of Ukraine» [13]

[23] http://www.enerdata.net/enerdatauk/knowledge/subscriptions/database/energy-market-data-and-co2-emissions-data.php
[24] http://www.iea.org/co2highlights/co2highlights.pdf

As of 1.01.2009 (based on the latest data , 2008)

	Emissions, thousand of tons			
	CO_2	SO_2	NO_x	Solid particles
Heat power plants of NCS «ESU», total	**62304,3**	**811,0**	**113,8**	**196,5**
including:				
Energy generating thermal power plants, total	**55690,2**	**810,7**	**106,6**	**196,4**
including:				
OSC "Dniproenergo"	**15984,2**	**224,0**	**41,7**	**42,0**
Kryvorizka TPP	*6566,8*	*114,05*	*12,87*	*18,19*
Prydniprovska TPP	*4011,5*	*52,46*	*14,48*	*16,87*
Zaporizka TPP	*5405,9*	*57,46*	*14,35*	*6,96*
OSC "Donbasenergo"	**7322,2**	**67,0**	**14,3**	**52,2**
Starobeshivska TPP	*4755,3*	*41,87*	*9,34*	*46,18*
Slavanska TPP	*2567,0*	*25,17*	*5,0*	*6,06*
OSC "Zahidenergo"	**1417,1**	**313,9**	**19,7**	**46,7**
Burshtynska TPP	*8889,0*	*179,55*	*11,72*	*25,69*
Dobrotvirska TPP	*2064,5*	*42,32*	*3,32*	*13,39*
Ladyzhynska TPP	*3763,6*	*92,03*	*4,69*	*7,63*
OSC "Centrenergo"	**17666,7**	**205,7**	**30,8**	**55,4**
Vulegirska TPP	*4450,7*	*85,19*	*8,62*	*5,68*
Trypilska TPP	*6883,3*	*46,36*	*14,49*	*17,75*
Zmiivska TPP	*6332,7*	*74,19*	*7,72*	*32,01*
Heat and power plants	**6614,1**	**0,4**	**7,2**	**0,1**
OSC Dniprodzerzhynska HPP	*101,7*	*0,00*	*0,14*	*0,00*
OSC Mykolaivska HPP	*122,1*	*0,00*	*0,11*	*0,00*
OSC Khersonska HPP	*191,3*	*0,00*	*0,10*	*0,00*
OSC Odesska HPP	*150,3*	*0,00*	*0,12*	*0,00*
OSC Kharkivska OSC	*898,6*	*0,27*	*0,87*	*0,01*
SC HPP "Kievenergo"	*5150,1*	*0,10*	*5,83*	*0,10*

Table 3.2.1 Emissions from energy generating companies and power stations, which belong to statutory fund of the National Stock Company (NSC) «Energy Company of Ukraine». Source:National Ecological Center of Ukraine[25].

3.3. Information publicly available

Currently, public access through internet interface is allowed only for the following database content components:

- international texts;
- answers to frequently asked questions;
- glossary of terminology;
- links to other information sources;
- conditions of registry system usage.

For enabling access to the information indicated in decision 19/CP.7, paragraphs 45-48, a special regulation of the MEP is required, which is possible to adopt shortly [10].

[25] http://climategroup.org.ua/wp-content/uploads/2010/06/Ukraine_coal-sector_web201011.pdf

4. Verification

4.1. Statistical methods for QA/QC analyses

Inventory methodologies and GHG emissions estimates

Estimation of direct and indirect GHG emissions is conducted in accordance with IPCC Good Practice Guidance (GPG) recommendations, mostly using Tier 2 and Tier 1 approaches.

For key source categories, Tier 2 is used primarily. For coalbed methane emissions, Tier 3 measurement-based approach is used. In preparing the inventory of GHG emissions from fuel combustion, both for stationary sources and transport, specially developed software is used.

For non-key emission source categories, GHG inventory is prepared mostly based on Tier 1 approaches [10].

Uncertainty assessment

Uncertainty assessment is based on IPCC Tier 1 method for all direct GHGs, all categories, sectors, and country as a whole. It implies separate uncertainty assessments of activity data and emission factors for individual emission source categories and their subsequent integrated estimation according to the methodology provided by the IPCC GPG [10].

Key emission sources

Key emission source categories are determined in accordance with IPCC GPG requirements. Tier 1 approach is used, including GHG emissions/removals level and trend analysis, with and without account of LULUCF sector.

Recalculation of previously submitted inventory data

Necessity to recalculate Ukrainian inventory results is conditioned by the following main reasons:

- improvement of activity data;
- improvement of emission factors (as a result of shifting to national emission factors);
- upgrading of emissions estimation methodologies (e.g., when shifting from Tier 1 to Tier 2 approaches);
- addition of missing emission categories.

Recalculations are made in accordance with IPCC GPG recommendations, for all years of inventory, using the same methodology and consistent emission factors [10].

Quality assurance and quality control

In accordance with IPCC GPG recommendations, for inventory preparation general QC procedures are used together with source category-specific QC procedures. General QC procedures (Tier 1) are used during data input, calculations, and preparing the reporting tables and inventory report. Relevant checks include [10]:

- documenting of assumptions and criteria with respect to activity data and emission factors selection;
- accuracy of references and input data entry;
- correctness of emissions calculation;
- consistency of measurement units;
- integrity of input data and calculation files;
- consistency of data usage between different source categories;
- correctness of data transfer among processing steps ;
- correctness of estimates or calculations of uncertainty;
- completeness and adequacy of documentation;
- changes in methodologies and initial data leading to recalculations;
- completeness of source categories and years in time series starting from the base year;
- consistency with previous estimates.

Detailed source category-specific QC procedures (Tier 2) are applied as necessary and include, primarily, QC of emission factors, activity data and emissions estimates. Most attention is paid to key emission source categories.

For QA purposes, review of inventory results is performed by the experts who did not participate in the inventory development. Such review is made in two stages. At the first stage, as soon as preliminary estimates for individual categories are completed, they are forwarded to leading experts in relevant sectors. Besides, currently available emissions/removals estimates for individual categories and sectors are, to the extent possible, presented and discussed at sectoral workshops and conferences.

At the second stage, after finalising preliminary estimates with account of received comments, draft text of inventory report and reporting tables with emissions estimates are prepared. These documents are posted on the MEP web-site at the address: www.menr.gov.ua and leading experts and organisations are notified accordingly. In addition, direct distribution of inventory report by the MEP to relevant ministries, organisations and individual experts is carried out. Making the inventory publicly accessible through internet also provides an opportunity for public review of the inventory and receiving comments from all interested parties. These comments are forwarded to inventory developer for analysis and addressing. An important factor for development of the inventory submitted in 2006 was in-country review of the previous inventory by an expert review team of the UNFCCC Secretariat.

Practically all the comments of this expert team were addressed in the 2006 inventory submission.

In order to ensure continuity of approaches to inventory development and their permanent improvement, documenting of all initial data, methodologies and assumptions is performed. Such documenting also facilitates the process of conducting necessary external examination, including inventory reviews by experts of the UNFCCC Secretariat [10].

4.2. Calculation of data-verification indices

N/A.

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Appendix

CHP	Cogeneration of Heating and Power
EOP	Earth Orientation Parameters
GDP	Gross Domestic Products
GHG	GreenHouse Gas
GNI	Gross National Income
GPS	Global Positioning System
GRT	Gross Register Tonnage
HDI	Health Development Index
HPP	HydroPower Plant
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
LULUCF	Land Use, Land Use Change and Forestry
MEP	Ministry of Environmental Protection of Ukraine
NSC	National Stock Company
QA	Quality Assurance
QC	Quality Control
SLR	Satellite Laser Ranging
SSL	Secure Sockets Layer
TPP	Thermal Power Plant
UAH	Ukrainian Hryvnia
UNEP-GEF-BINU	United Nations Environmental Programme Global Environmental Facility Biodiversity Indicators for National Use
UNFCCC	United Nations Framework Convention on Climate Change

VLBI	Very Long Base Interferometry
VPN	Virtual Private Network
WTO	World Trade Organization