STRATEGIC ENVIRONMENTAL ASSESSMENT REPORT

Object : a document of state planning

Draft Action Plan for 2019-2021
for the implementation of the National Transport Strategy of Ukraine
for the period up to 2030

Kyiv - 2019

Content

5. Obligations in the field of environmental protection, including those related to the prevention of negative impact on public health, established at the international, state and other levels related to the state planning document, as well as ways to take into account such obligations under time of preparation of the state planning document

6. Description of the consequences for the environment, including for the health of the population, including secondary, cumulative, synergistic, short-, medium- and long-term (1, 3-5 and 10-15 years, respectively, and, if necessary, 50 -100 years), permanent and temporary, positive and negative consequences

7. Measures to be taken to prevent, reduce and mitigate the negative consequences of the implementation of the state planning document

8. Justification for the choice of justified alternatives considered, description of the way in which the strategic environmental assessment was carried out, including any complications (lack of information and technical means during such an assessment)

9. Measures envisaged for monitoring the consequences of the implementation of the state planning document for the environment, including for public health

10. Description of the likely transboundary effects on the environment, including public health

11. Summary of non-technical nature of information

11. 1. The content and main objectives of the state planning document, its connection with other state planning documents

11. 2. Characteristics of the current state of the environment, including public health, and forecast changes in this state, if the state planning document is not approved

11.3. Characteristics of the state of the environment, living conditions of the population and the state of its health in the territories that are likely to be affected

11.4. Environmental issues, including risks to public health, related to the state planning document, in particular to areas with environmental status

11.5. Environmental obligations, including those related to the prevention of adverse effects on public health, are established at the international, state and other levels related to the state planning document, as well as ways to take such obligations into account during the preparation state planning document

11.6. Description of the consequences for the environment, including for the health of the population, including secondary, cumulative, synergistic, short-, medium- and long-term (1, 3–5 and 10–15 years, respectively, and, if necessary, 50–100 years), permanent and temporary, positive and negative consequences

11.7. Measures to be taken to prevent, reduce and mitigate the negative consequences of the implementation of the state planning document

11.8. Justification for the choice of justified alternatives considered, description of the way in which the strategic environmental assessment was carried out, including any complications (lack of information and technical means during such an assessment)

11. 9. Measures envisaged for monitoring the consequences of the implementation of the state planning document for the environment, including for public health

11. 10. Description of the likely transboundary effects on the environment, including public health

references

The scope of strategic environmental assessment

According to Article 10 of the Law of Ukraine on Strategic Environmental Assessment , as well as Guidelines for Strategic Environmental Assessment of state planning documents approved by the order of the Ministry of Ecology and Natural Resources of Ukraine dated 10.08.2018 № 296 , in the process of strategic environmental assessment of the draft Action Plan for 2019– 2021 on the implementation of the National Transport Strategy of Ukraine for the period up to 2030 (hereinafter - the Action Plan) at the stage of determining the scope of strategic environmental assessment established the structure and main objectives of the draft state planning document, their relationship with other legislation, environmental objectives, including health related to the Plan of measures for and the amount of information used in the evaluation process, previously identified possible environmental impacts and justifiable alternatives considered in the report, the extent of research and moat e n b detail information included in the report in on strategic environmental assessment , method and environmental assessment, as well as developed the structure and content of the report on strategic environmental assessment.

In order to discuss public statement on strategic environmental scoping first assessment of a plan, the draft Action Plan and a draft Cabinet of Ministers of Ukraine, which provides for the approval of the Action Plan , published on the official website of the Ministry of Infrastructure of 15 April 2019 www.mtu. gov.ua in the section "Activities → Draft regulations".

Notice of publication of the application for determining the amount of strategic environmental assessment of a plan and the draft Action Plan with a view to obtaining and considering public comments and suggestions as at you post of Old in such national print media :

Highway from _____ 2019;

Express from _____ 2019.

With ayavu of determining the amount of strategic environmental assessment of a plan (on paper and in electronic form) letter of 22.04.2019 number 1227 / 35 / 14-19 sent to the Ministry of Ecology and Natural Resources of Ukraine and the Ministry of Health of Ukraine.

No written comments or suggestions from the public were received during the 15-day public discussion of the application to determine the scope of the strategic environmental assessment of the draft Action Plan .

Ministries th Ecology and Natural Resources of Ukraine letter of 08.05.2019 number 5 / 3-10 / 4882-19 provided comments and suggestions to the application for determining the amount of strategic environmental assessment of a plan that takes into account the report of the strategic environmental assessment of a plan.

No written comments or suggestions were received from the Ministry of Health of Ukraine .

The methodological basis of the strategic environmental assessment of the project action plan to identify all significant impacts and risks, evaluate their size and importance, to prevent, reduce and mitigate the negative consequences for the environment, is a systematic approach , based on a combination of strategic th analysis of (the study provided strategic priorities, goals and objectives) and impact -analysis (study of the impacts and risks and prediction I expected consequences of exposure) . The results of the strategic environmental assessment for this approach is somewhat limited , since the measures and objectives of the draft Action Plan does not always make it possible to identify quantitative indicators of the impact on the environment, security of life and health of the population . Such restrictions can be further eliminated in the process of practical implementation and feasibility study of the measures of the state planning document. However, a systematic approach has provided an opportunity to develop a system of measures to prevent, reduce and mitigate adverse effects on the environment, including public health.

1. The content and main objectives of the state planning document, its connection with other state planning documents

According to paragraph 3 of the first part of Article 1 of the Law of Ukraine "On Strategic Environmental Assessment", state planning documents - strategies, plans, schemes, urban planning documentation, national programs, state target programs and other programs and program documents, including amendments to them and / or subject to approval by a public authority, local government.

According to Article 2 of the Law of Ukraine "On Strategic Environmental Assessment", this Law applies to state planning documents relating to, in particular, transport, and the implementation of which will provide for the implementation of activities (or containing activities and facilities) implementation of the environmental impact assessment procedure, or which require assessment, taking into account the probable consequences for the territories and objects of the nature reserve fund and the ecological network.

The Ministry of Infrastructure of Ukraine has developed a draft Action Plan for 2019-2021 for the implementation of the National Transport Strategy of Ukraine for the period up to 2030 (hereinafter - the Action Plan), which is proposed for approval by order of the Cabinet of Ministers of Ukraine.

The draft Action Plan was developed by the Ministry of Infrastructure of Ukraine in pursuance of paragraph 3 of the order of the Cabinet of Ministers of Ukraine of May 30 , 2018 № 430 "On approval of the National Transport Strategy of Ukraine for the period up to 2030".

Tasks and activities of the Action Plan will be performed in the following main areas:

competitive and efficient transport system;

innovative development of the transport industry and global investment projects;

safe for society, environmentally friendly and energy efficient transport;

unhindered mobility and interregional integration.

Thus, the draft Action Plan defines the mechanisms for implementing the strategy for all subsectors of the transport sector, as well as cross-cutting and special measures to be implemented in all transport sectors during 2019-2021 to create a safe and efficient transport complex integrated into the world transport network. meeting the needs of the population in transportation and improving the conditions for doing business to ensure the competitiveness and efficiency of the national economy.

The draft Action Plan also provides a comprehensive solution to existing problems in the transport sector and contains priorities for its development, in particular in the context of implementing the European integration course and implementing the Association Agreement between Ukraine, on the one hand, and the European Union, the European Atomic Energy Community and their states. -members, on the other hand, ratified by the Law of Ukraine of September 16, 2014 № 1678-VII, as well as changes in the geopolitical environment in the region; Agreement on certain aspects of air services of 1 December 2005 and the initialed draft Agreement between the EU and its Member States on the Common Aviation Area, the Sustainable Development Strategy "Ukraine - 2020", approved by the Decree of the President of Ukraine of 12 January 2015 № 5, UN Framework Convention on Climate Change, ratified by the Law of Ukraine of October 29, 1996 № 435/96-VR, Paris Agreement, ratified by the Law of Ukraine of July 14, 2016 № 1469-VIII, UN General Assembly Resolution of September 25, 2015 № 70/1 "Transforming our world: Sustainable Development Agenda until 2030", the medium-term priority action plan of the Government until 2020 , approved by the order of the Cabinet of Ministers of Ukraine dated April 3 , 2017 № 275, as well as strategic goals and tasks of the Basic principles (strategy) of the state ecological policy of Ukraine for the period till 2030, approved by the Law of Ukraine from February 28, 2019 № 2697-VIII.

2. Characteristics of the current state of the environment, including public health, and forecast changes in this state, if the state planning document is not approved

2.1 . Emissions of pollutants into the atmosphere . Climate

According to the State Statistics Service of Ukraine , in 2015 emissions of air pollutants from stationary and mobile sources of glass ly 4,521.3 ths. Tons . , while in 2017 only from stationary - 258 4.9 thousand tons (Table 2.1).

By 2017 r. Emitted into the atmosphere 124,217.9 ths. Tons of carbon dioxide that affect the change in climate - 1, 7 , 5 % lower than the same indicator 2016 r. At the same time in 2008 in Ukraine there is a clear tendency to reduce emissions of pollutants and carbon dioxide into the atmosphere, in particular mobile sources (see Table 2.1., Fig. 2.1 , 2.2).

Given the current trends and the assumption that the state planning document will not be approved, the forecast of emissions of pollutants and carbon dioxide into the atmosphere indicates that the trend of reducing emissions continues. Weather emissions of other pollutants in the air (Fig. 2 1-2.3) also evidence of preservation of existing things ndentsiyi reduction wiki ing all pollutants except zinc.

According to the sources of pollutant emissions in 2015, out of the total volume , 63.2 % were discharged from stationary sources, 36.8 % **- from** mobile sources , while carbon dioxide - 85.7 % from stationary sources , 14.3 % **- from** mobile sources.

Regarding emissions of certain pollutants into the air from mobile sources by type of vehicle with a separate, volumes you throw along with methane , which is owned and count to greenhouse gases, according to Table. 2.4, decreased by 1 7 , 2 %, and nitric oxide emissions - by 1 2 , 5 %.

At the same time, motor transport of the population is a source of 64.7 % of all emissions of pollutants into the atmosphere from mobile sources of pollution and 45.4 % of emissions of carbon dioxide from mobile sources of pollution (Table 2.5).

Reg and of our leaders emissions of pollutants and greenhouse gases into the atmosphere from mobile sources in 2015 were Dnipropetrovsk (9.2 % of total), m. Kyiv (8.7 %) and Kyiv region ast (7.5 %) (Table 2.6). These regions are also leaders in methane and carbon dioxide emissions (Tables 2.7, 2.8). In terms of carbon dioxide emissions into the atmosphere from vehicles in 2015, the Dnipropetrovsk region is in the lead. (9.5 % of the total), m . Kyiv (8.9 %) and Lviv region (8.0 %) (Table 2.9).

Table data. 2. 10 show that the leaders in terms of emissions of pollutants into the atmosphere from stationary sources of pollution by region are Dnipropetrovsk and Donetsk regions. In particular, in 2017 . From 2,584.9 ths. Tons of emissions 657.3 and 784.8 ths. Tons Answer n o emitted in these regions.

By types of economic activity, the leaders in emissions of pollutants into the atmosphere from stationary sources of pollution in 2017 are such industries as electricity, gas, steam and air conditioning, manufacturing, mining and quarrying (Table 2. 11).

Table 2.1

Emissions of pollutants and carbon dioxide into the atmosphere *

Years	Volumes of pollutant emissions			In addition, carbon dioxide emissions		
	total, thousand tons	including		total, million tons	including	
		stationary sources	mobile sources[1]		stationary sources	mobile sources [1]
1990	15549.4	9439.1	6110.3	...	...	...
1995	7483.5	5687.0	1796.5	...	...	...
2000	5908.6	3959.4	1949.2	...	...	...
2001	6049.5	4054.8	1994.7	...	...	...
2002	6101.9	4075.0	2026.9	...	...	...
2003	6191.3	4087.8	2103.5	...	...	...
2004	6325.9	4151.9	2174.0	126.9	126.9	...
2005	6615.6	4464.1	2151.5	152.0	152.0	...
2006	7027.6	4822.2	2205.4	178.8	178.8	...
2007	7380.0	4813.3	2566.7	218.1	184.0	34.1
2008	7210.3	4524.9	2685.4	209.4	174.2	35.2
2009	6442.9	3928.1	2514.8	185.2	152.8	32.4
2010	6678.0	4131.6	2546.4	198.2	165.0	33.2
2011	6877.3	4374.6	2502.7	236.0	202.2	33.8
2012	6821.1	4335.3	2485.8	232.0	198.2	33.8
2013	6719.8	4295.1	2424.7	230.7	197.6	33.1
2014[2]	5346.2	3350.0	1996.2	194.7	166.9	27.8
2015 [2]	4521.3	2857.4	1663,9	162.0	138.9	23.1
2016 [2]	3078.1	3078.1	…	150.6	150.6	…
2017 [2]	2584.9	2584.9	…	124, 2	124.2	…

* Source: according to [8 ; 11].

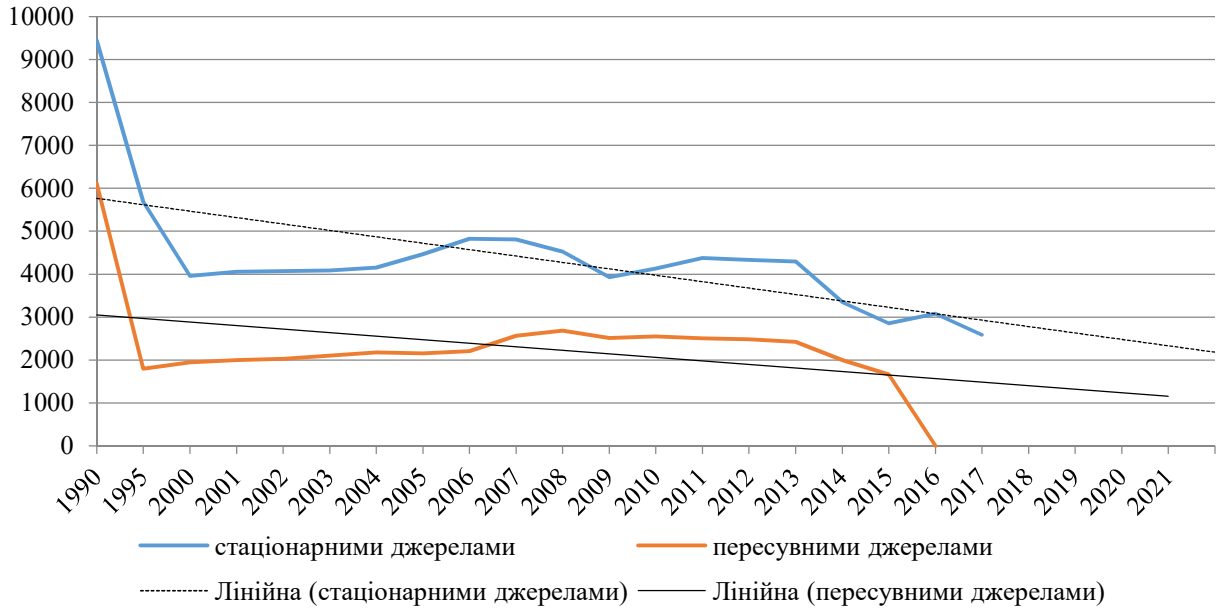


Fig. 2.1. Trends and forecast of pollutant emissions into the atmosphere , thousand tons (calculated according to [8 ; 11])

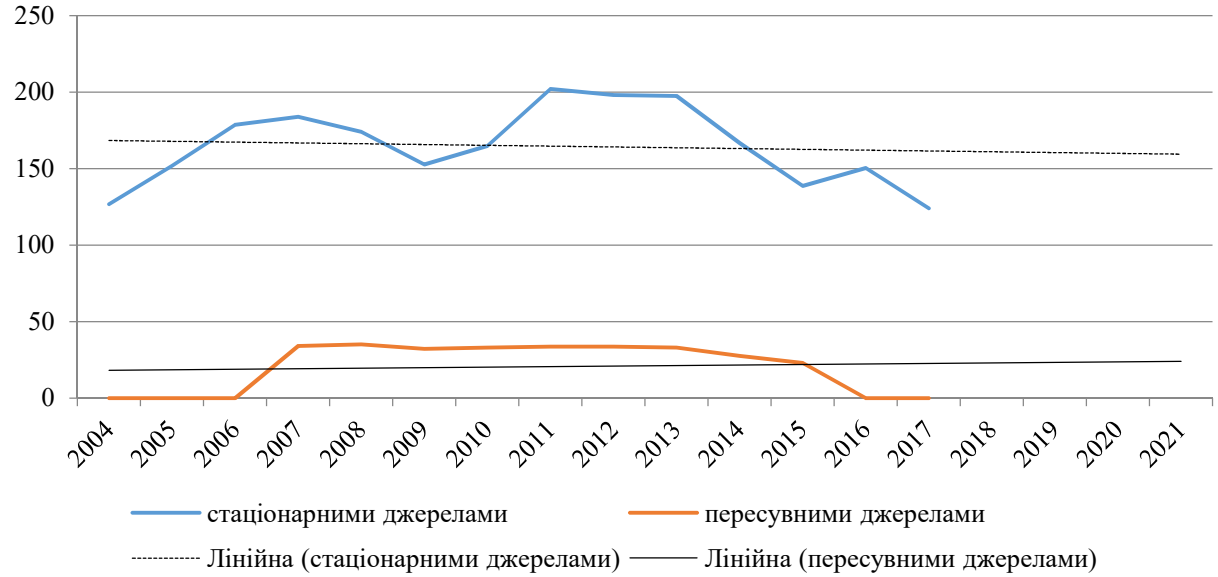


Fig. 2.2. Trends and forecast of carbon dioxide emissions into the atmosphere, million tons (calculated according to [8 ; 11])

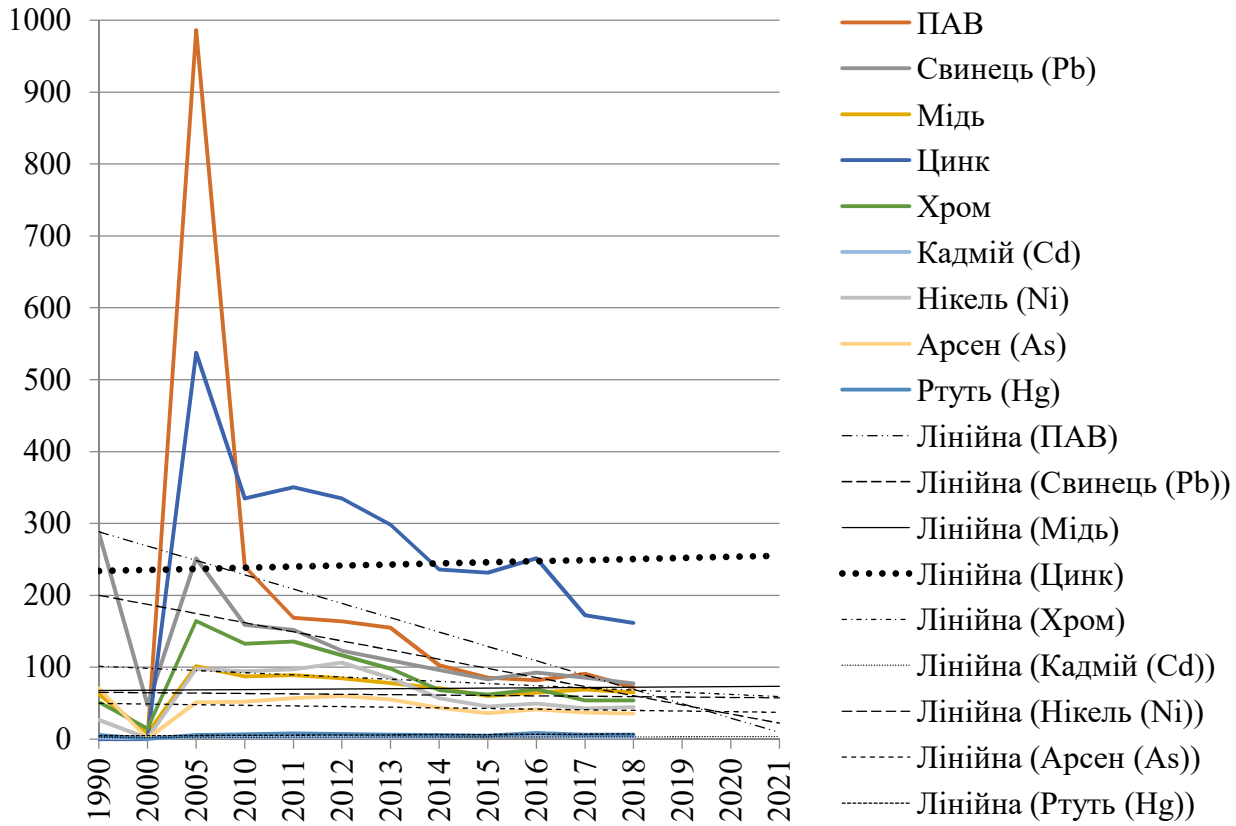


Fig. 2.3. Trends and forecast of emissions of other pollutants into the atmosphere, t / year (calculated according to [10])

Table 2.2

Emissions of pollutants into the air of Ukraine for 1990-2018, thousand tons / year *

Types of substances	1990	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018
Sulfur dioxide (SO_2)	**2782.3**	**984.8**	**1132.8**	**1235.2**	**1363.4**	**1430.3**	**1413.3**	**1160.6**	**854.0**	**1076.4**	**726.2**	**698.1**
stationary sources	2782.3	976.6	1119.5	1206.3	1333.1	1399.2	1381.8	1133.3	830.3	1076.4	726.2	698.1
mobile sources[3]	…	8.2	13.3	28.9	30.3	31.1	31.5	27.3	23.7	…	…	…
Nitrogen oxides (NO_2)	**760.8**	**440.6**	**523.9**	**603.7**	**633.0**	**634.6**	**633.4**	**541.4**	**453.0**	**240.2**	**215.5**	**215.3**
stationary sources	760.8	320.0	343.7	310.5	333.0	332.5	333.3	288.1	233.8	240.2	215.5	215.3
mobile sources [1]	…	120.6	180.2	293.2	300.0	302.1	300.1	253.3	219.2	…	…	…
NMLOS	…	…	**96.5**	**359.3**	**350.8**	**338.1**	**325.7**	**270.1**	**225.8**	**52.2**	**53.1**	**43.7**
stationary sources	…	…	91.1	66.0	65.2	57.5	54.5	50.0	47.3	52.2	53.1	43.7
mobile sources [1]	…	…	5.4	293.3	285.6	280.6	271.2	220.1	178.5	…	…	…
Ammonia (NH_3)	**23.1**	**8.3**	**17.9**	**25.1**	**25.9**	**24.0**	**22.6**	**21.3**	**18.8**	**18.8**	**17.4**	**16.8**
stationary sources	23.1	8.3	17.9	25.1	25.9	24.0	22.6	21.3	18.8	18.8	17.4	16.8
mobile sources [1]	…	…	…	0.022 th most common	0.021	0.020	0.019 th most common	0.014	0.011	…	…	…
Carbon monoxide (CO)	**3273.7**	**2776.8**	**2975.2**	**2951.9**	**2908.2**	**2830.5**	**2782.1**	**2283.4**	**1971.9**	**802.8**	**728.4**	**744.3**
stationary sources	3273.7	1230.6	1320.5	1063.8	1066.1	1004.6	1007.2	828.4	764.1	802.8	728.4	744.3
mobile sources [1]	…	1546.2	1654.7	1888.1	1842.1	1825.9	1774.9	1455.0	1207.8	…	…	…
Total HF (HF)	**2018.8**	**729.6**	**741.7**	**594.5**	**641.0**	**609.6**	**553.8**	**434.1**	**377.4**	**395.8**	**319.5**	**317.5**
stationary sources	2018.8	729.6	697.9	562.1	606.6	573.7	516.8	401.8	349.6	395.8	319.5	317.5

mobile sources [1]	…	…	43.8	32.4	34.4	35.9	37.0	32.3	27.8	…	…	…
PM 10	…	…	**175.7**	**133.2**	**142.3**	**135.1**	**125.7**	**84.6**	**67.9**	**73.1**	**46.8**	**54.1**
stationary sources	…	…	175.7	133.2	142.3	135.1	125.7	84.6	67.9	73.1	46.8	54.1
mobile sources [1]	…	…	…	…	…	…	…	…	…	…	…	…
PM 2,5	…	…	**70.2**	**40.7**	**42.3**	**34.5**	**27.1**	**24.0**	**19.7**	**34.1**	**13.5**	**21.2**
stationary sources	…	…	70.2	40.7	42.3	34.5	27.1	24.0	19.7	34.1	13.5	21.2
mobile sources [1]	…	…	…	…	…	…	…	…	…	…	…	…

* Source: according to [10].

Abbreviations used in table. 2.2

ZZCh - the total volume of suspended particles

PM 10 - substances in the form of suspended solids larger than 2.5 μm and less than 10 μm

PM 2,5 - substances in the form of suspended solids of 2.5 μm or less

NMVOCs are non-methane volatile organic compounds

Surfactants - polycyclic aromatic hydrocarbons

… - no information

Table 2.3

Emissions of other pollutants into the atmosphere of Ukraine for 1990-2018, t / year *

Types of substances	1990	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018
PAV	…	…	986.1	240.1	168.8	163.8	155.0	103.0	85.6	82.0	90.7	71.9
Lead (Pb)	287.0	47.4	251.4	159.1	152.0	123.0	109.7	96.2	83.2	92.6	85.5	77.5
Copper	62.7	8.0	101.4	87.4	88.9	84.7	77.8	70.8	60.0	64.7	68.8	64.9
Zinc	…	…	537.2	335.0	350.2	334.6	298.2	236.1	231.5	251.7	172.2	161.7
Chrome	51.7	14.7	164.4	132.6	135.8	116.5	97.8	67.9	61.8	69.3	54.0	54.0
Cadmium (Cd)	2.4	0.9	3.6	2.8	2.8	2.6	2.5	3.3	4.0	3.9	2.6	2.8

Mercury (Hg)	5.8	0.4	5.8	6.8	7.8	7.3	6.4	5.7	4.9	8.6	6.4	6.4
Nickel (Ni)	26.7	1.2	98.0	94.4	97.1	106.2	84.8	57.0	45.4	49.6	42.6	44.6
Arsenic (As)	70.7	0.7	51.2	52.2	56.8	60.2	55.1	43.4	36.0	41.2	37.0	35.8

* Source: according to [10].

Table 2.4

Emissions of certain pollutants into the atmosphere from mobile sources of pollution by type of vehicle , thousand tons *

Types of substances	2010	2012	2013	2014[4]	2015
Mobile sources - total					
sulfur dioxide	28.9	31.1	31.5	27.3	23.7
carbon monoxide	1888.1	1825.9	1774.9	1455.0	1207.8
nitrogen dioxide	293.2	302.1	300.1	253.3	219.2
nitric oxide	2.1	2.1	2.0	1.6	1.4
non-methane volatile organic compounds	293.3	280.6	271.2	220.1	178.5
ammonia	0.022 th most common	0.020	0.019 th most common	0.014	0.011
methane	8.2	8.0	7.8	6.4	5.3
soot	32.4	35.9	37.0	32.3	27.8
benz (a) pyrene	0.2	0.2	0.2	0.2	0.1
carbon dioxide	33188.9	33822.2	33088.1	27813.1	23139.8
Road transport					
sulfur dioxide	19.8	21.5	22.1	18.9	15.8
carbon monoxide	1782.7	1718.9	1672.1	1364.9	1123.2
nitrogen dioxide	206.1	213.5	215.1	180.7	149.9
nitric oxide	1.3	1.3	1.3	1.1	0.8
non-methane volatile organic compounds	272.4	259.3	250.1	200.4	160.1
ammonia	0.018	0.016	0.016	0.012	0.009
methane	7.6	7.4	7.2	5.9	4.8
soot	23.8	27.0	28.3	24.5	20.5
benz (a) pyrene	0.1	0.1	0.1	0.1	0.1

carbon dioxide	25627.3	25846.9	25716.8	21180.4	16911.3
Railway, aviation, water transport and production equipment					
sulfur dioxide	9.1	9.6	9.4	8.4	7.9
carbon monoxide	105.4	107.0	102.8	90.1	84.6
nitrogen dioxide	87.1	88.6	85.0	72.6	69.3
nitric oxide	0.8	0.8	0.7	0.6	0.6
non-methane volatile organic compounds	20.9	21.3	21.1	19.7	18.4
ammonia	0.004	0.004	0.003	0.002	0.002
methane	0.6	0.6	0.6	0.5	0.5
soot	8.6	8.9	8.7	7.8	7.3
benz (a) pyrene	0.1	0.1	0.1	0.1	0.0
carbon dioxide	7561.6	7975.3	7371.3	6632.7	6228.5

* Source: according to [11].

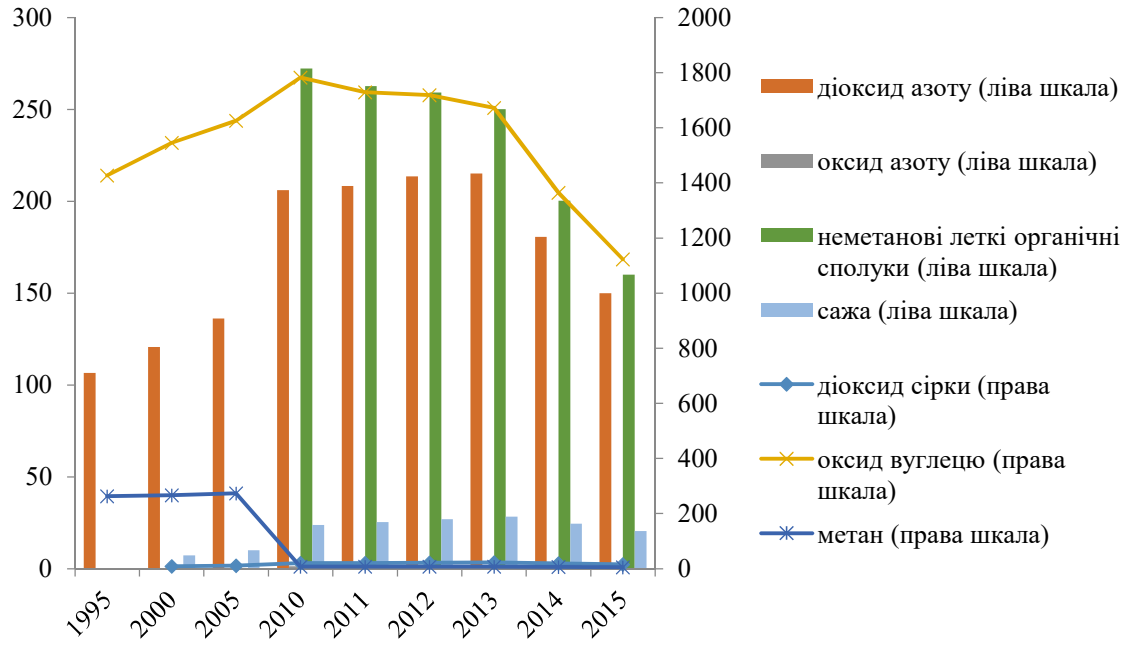


Fig. 2.4. Emissions of pollutants into the atmosphere by road, thousand tons (according to [13])

Table 2.5

Emissions of pollutants and greenhouse gases from mobile sources in 2015 *

Means of transport	Emissions		
	t	in% 2014 r.	in% to the end
Total pollutants and greenhouse gases	**1663906.7**	**83.4**	**100.0**
by mode of transport			
road transport	1475213.7	82.1	88.7
motor transport of economic entities	399309.1	90.4	24.0
motor transport of the population	1075904.6	79.4	64.7
railway, aviation, water transport and production equipment, total	188693.0	94.5	11.3
railways	29747.6	106.4	1.8
air transport	8497.9	97.3	0.5
water transport	5768.0	102.9	0.3
river transport	3553.8	98.4	0.2
sea transport	2214.2	111.0	0.1
production equipment	144679.5	91.9	8.7
In addition, carbon dioxide emissions	**23139839.3**	**83.2**	**100.0**
by mode of transport			
road transport	16911295.6	79.8	73.1
motor transport of business entities	6414978.1	91.2	27.7
motor transport of the population	10496317.5	74.2	45.4

Means of transport	Emissions		
	t	in% 2014 r.	in% to the end
railway, aviation, water transport and production equipment, total	6228543.7	93.9	26.9
railways	738587.0	106.4	3.2
air transport	393413.9	97.1	1.7
water transport	141131.6	97.5	0.6
river transport	102862.1	99.5	0.4
sea transport	38269.5	92.5	0.2
production equipment	4955411.2	92.0	21.4

* Source: [9].

Table 2.6

Emissions of pollutants and greenhouse gases into the atmosphere from mobile sources of pollution by region in 2015 *

Regions	Emissions		
	t	in% 2014 r.	in% to the end
Ukraine	**1663906.7**	**83.4**	**100.0**
Vinnytsia	59924.7	83.1	3.6
Volyn	38142.7	91.8	2.3
Dnepropetrovsk	152640.8	84.2	9.2
Donetsk[5]	57108.0	59.8	3.4
Zhytomyr	60714.8	91.3	3.6
Transcarpathian	49851.8	88.0	3.0
Zaporozhye	76694.2	85.3	4.6
Ivano-Frankivsk	42500.5	87.8	2.5
Kyiv	125483.9	80.5	7.5
Kirovograd	47491.9	90.9	2.9
Luhansk [1]	17824.8	38.2	1.1

Regions	Emissions		
	t	in% 2014 r.	in% to the end
Lviv	100704.0	92.0	6.1
Mykolayivska	47724.9	88.7	2.9
Odessa	103556.8	80.2	6.2
Poltava	85375.5	82.3	5.1
Rivne	41945.1	92.9	2.5
Sumy	40388.4	93.0	2.4
Ternopil	37870.8	92.7	2.3
Kharkiv	95253.1	84.6	5.7
Kherson	48152.7	85.1	2.9
Khmelnytsky	57208.3	92.1	3.4
Cherkasy	62812.1	89.9	3.8
Chernivtsi	30862.8	89.4	1.9
Chernihiv	39405.7	86.6	2.4
m. Kyiv	144268.4	78.9	8.7

* Source: [9].

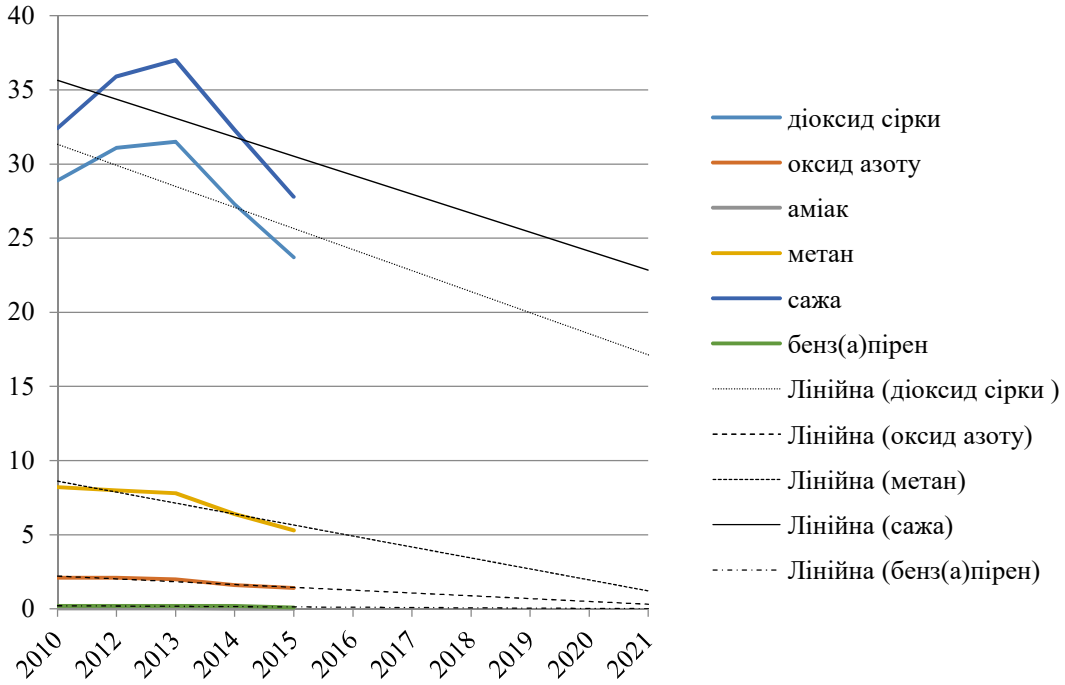


Fig. 2. 5 . Trends and forecast of emissions of certain pollutants into the atmosphere from mobile sources of pollution, thousand tons (calculated according to [11])

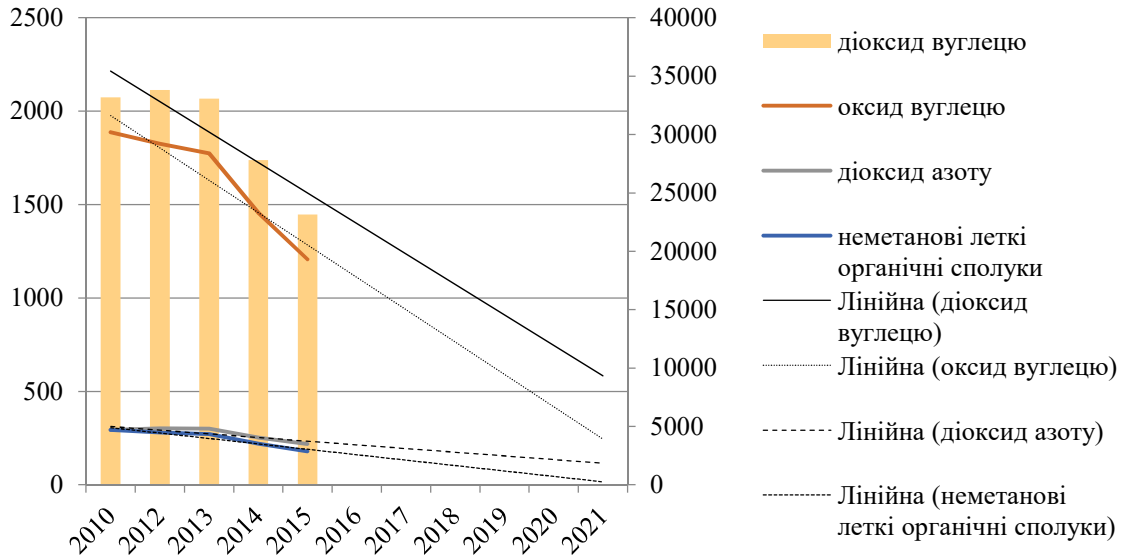


Fig. 2. 6 . Trends and forecast of emissions of certain pollutants into the atmosphere from mobile sources of pollution, thousand tons (calculated according to [11])

Table 2.7

Methane emissions from mobile sources of pollution by region in 2015 *

Regions	Emissions		
	t	in% 2014 r.	in% to the end
Ukraine	**5344.0**	**83.3**	**100.0**
Vinnytsia	188.1	83.2	3.5
Volyn	112.8	93.6	2.1
Dnepropetrovsk	507.1	84.7	9.5
Donetsk[6]	185.5	57.8	3.5

Zhytomyr	186.2	91.5	3.5
Transcarpathian	154.3	88.4	2.9
Zaporozhye	249.1	85.0	4.7
Ivano-Frankivsk	133.6	89.2	2.5
Kyiv	419.0	80.6	7.8
Kirovograd	154.8	92.5	2.9
Luhansk [1]	54.3	35.5	1.0
Lviv	317.6	93.6	5.9
Mykolayivska	149.5	90.6	2.8
Odessa	343.0	80.6	6.4
Poltava	264.8	81.5	5.0
Rivne	129.8	95.3	2.4
Sumy	128.9	94.2	2.4
Ternopil	117.1	93.4	2.2
Kharkiv	312.8	84.5	5.9
Kherson	160.1	86.3	3.0
Khmelnytsky	181.7	92.7	3.4
Cherkasy	204.7	90.6	3.8
Chernivtsi	95.4	90.4	1.8
Chernihiv	126.3	87.3	2.4
m. Kyiv	467.5	77.4	8.7

* Source: [9].

Table 2.8

Carbon dioxide emissions from mobile sources by region in 2015 *

Regions	Emissions		
	t	in% 2014 r.	in% to the end
Ukraine	**23139839.3**	**83.2**	**100.0**
Vinnytsia	902589.8	83.1	3.9
Volyn	617300.9	90.0	2.7
Dnepropetrovsk	2313247.1	83.4	10.0
Donetsk[7]	734988.4	68.4	3.2
Zhytomyr	768676.3	89.0	3.3
Transcarpathian	699839.0	86.9	3.0
Zaporozhye	981070.0	84.9	4.2
Ivano-Frankivsk	620451.7	87.1	2.7
Kyiv	1540637.8	78.6	6.7
Kirovograd	668128.9	89.1	2.9
Luhansk [1]	265864.3	49.2	1.1
Lviv	1490134.4	90.1	6.4
Mykolayivska	683528.9	85.7	3.0
Odessa	1501236.6	78.0	6.5
Poltava	1341533.6	78.1	5.8
Rivne	640203.9	87.6	2.8
Sumy	477533.4	89.7	2.1
Ternopil	557792.1	86.1	2.4
Kharkiv	1161894.7	85.5	5.0
Kherson	593132.9	83.6	2.6
Khmelnytsky	824709.9	89.5	3.6
Cherkasy	862401.5	88.6	3.7
Chernivtsi	447616.3	86.7	1.9
Chernihiv	513513.3	88.1	2.2
m. Kyiv	1931813.6	82.7	8.3

* Source: [9].

Table 2.9

Carbon dioxide emissions from vehicles by region in 2015 *

Regions	Emissions		
	t	in% 2014 r.	in% to as a result
Ukraine	**16911295.6**	**79.8**	**100.0**
Vinnytsia	588082.7	78.6	3.5
Volyn	511671.7	88.0	3.0
Dnepropetrovsk	1614457.5	80.7	9.5
Donetsk[8]	544435.6	65.3	3.2
Zhytomyr	603890.7	86.2	3.6
Transcarpathian	670833.1	86.2	4.0
Zaporozhye	650556.1	75.8	3.8
Ivano-Frankivsk	560269.9	86.7	3.3
Kyiv	1286217.0	75.5	7.6
Kirovograd	391510.9	82.2	2.3
Luhansk [2]	146646.1	34.1	0.9
Lviv	1345009.6	87.9	8.0
Mykolayivska	398077.4	78.1	2.4
Odessa	1052044.3	79.0	6.2
Poltava	745308.1	74.1	4.4
Rivne	532563.9	88.5	3.1
Sumy	297042.0	88.7	1.8
Ternopil	413273.1	90.2	2.4
Kharkiv	826290.7	81.9	4.9
Kherson	426265.5	77.2	2.5
Khmelnytsky	542699.1	80.2	3.2
Cherkasy	571821.0	84.4	3.4
Chernivtsi	389174.5	84.9	2.3

Regions	Emissions		
	t	in% 2014 r.	in% to as a result
Chernihiv	304825.4	78.9	1.8
m. Kyiv	1498329.7	79.2	8.9

* Source: [9].

According to the National Report on the state of the environment in Ukraine in 2015 [24 , p. 23] from mobile sources in 2015 received 1663.9 thousand tons of pollutants into the atmosphere, which is 4673.3 thousand tons or 16.8% less than in 2014 (see Table 2.1). The largest amount of pollutants was emitted by road transport 1475.2 thousand tons (88.7 % of the total), including road transport 1075.9 thousand tons (64.7 %). Emissions from industrial equipment amounted to 144.7 thousand tons (8.7 %), rail transport - 29.7 thousand tons (1.8 %), aviation - 8.5 thousand tons (0.5 %), water - 5.8 thousand tons (0.3 %). During 2015, emissions of pollutants into the atmosphere were carried out by 11,303 industrial enterprises. From them, 2857.4 thousand tons of pollutants entered the atmosphere, which is 14.7 % more than in 2014.

Table 2.10

Emissions of pollutants into the atmosphere from stationary sources of pollution by region, thousand tons *

Regions	2010	2014	2015	2016	2017
Ukraine	4131.6	3350.0	2857.4	3078.1	2584.9
Autonomous Republic of Crimea	32.3	…	…	…	…
Vinnytsia	103.0	124.5	134.7	119.8	155.8
Volyn	8.2	4.3	4.7	4.7	5.1
Dnepropetrovsk	933.1	855.8	723.9	833.0	657.3
Donetsk	1378.1	1043.0	917.6	981.4	784.8
Zhytomyr	18.4	10.9	9.0	9.3	10.3
Transcarpathian	17.4	3.9	4.4	4.9	3.2
Zaporozhye	217.5	206.7	193.7	167.0	180.9
Ivano-Frankivsk	169.2	228.8	223.9	196.7	198.3
Kyiv	106.8	96.2	78.1	98.2	48.2
Kirovograd	14.8	11.8	14.2	11.8	12.2
Luhansk	511.7	197.8	115.2	155.5	75.1

Regions	2010	2014	2015	2016	2017
Lviv	113.2	100.2	102.4	103.1	109.1
Mykolayivska	21.5	15.9	15.8	13.9	14.2
Odessa	29.2	23.2	26.1	26.4	29.6
Poltava	72.8	62.9	55.6	56.2	55.9
Rivne	12.9	11.6	10.2	9.1	9.6
Sumy	31.7	27.0	17.5	19.8	20.3
Ternopil	18.5	8.2	8.5	9.0	10.6
Kharkiv	151.9	150.5	53.4	100.2	45.0
Kherson	5.3	7.2	8.9	9.7	9.6
Khmelnytsky	19.1	17.1	18.3	21.7	21.1
Cherkasy	61.2	66.7	57.5	52.3	48.3
Chernivtsi	3.8	2.5	3.2	3.0	3.3
Chernihiv	47.4	41.9	33.9	37.1	31.6
m. Kyiv	28.6	31.4	26.7	34.3	45.5
Sevastopol	4.0	…	…	…	…

* Source: according to [11].

Table 2. 11

Emissions of pollutants into the atmosphere from stationary sources of pollution in terms of economic activities by region in 2017, thousand tons *

Regions	All types of economic activity	Including					
		agriculture, forestry and fisheries	mining and quarrying	re-manufacturing industry	supply of electricity, gas, steam and air conditioning	water supply, sewerage, waste management	transport, warehousing , postal and courier activities
Ukraine	2584.9	80.3	479.3	874.3	1011.0	15.8	60.4
Vinnytsia	155.8	18.4	0.3	5.6	126.8	0.1	3.4
Volyn	5.1	1.0	0.5	1.8	0.3	0.0	0.2
Dnepropetrovsk	657.3	1.8	200.2	365.1	78.7	7.5	2.4
Donetsk	784.8	1.7	172.6	310.1	290.6	0.2	1.0
Zhytomyr	10.3	3.2	1.3	2.8	0.5	0.1	1.1
Transcarpathian	3.2	0.0	0.1	0.5	0.1	0.0	1.8
Zaporozhye	180.9	0.9	0.8	70.7	106.4	0.1	0.3
Ivano-Frankivsk	198.3	2.0	5.7	3.1	183.0	0.1	3.8
Kyiv	48.2	9.7	0.1	4.2	27.1	2.2	3.8
Kirovograd	12.2	0.7	1.7	5.9	0.2	0.0	2.9
Luhansk	75.1	0.4	15.1	11.4	46.3	0.0	1.2
Lviv	109.1	1.6	41.4	3.8	52.5	0.3	5.2
Mykolayivska	14.2	0.8	0.2	5.4	3.3	0.1	2.6
Odessa	29.6	0.8	-	5.3	12.1	1.1	5.7
Poltava	55.9	5.9	18.5	15.2	5.8	0.1	9.4
Rivne	9.6	0.5	0.4	7.2	0.6	0.0	0.3
Sumy	20.3	1.2	5.3	5.3	3.2	0.6	3.7
Ternopil	10.6	2.5	1.0	2.8	1.2	0.0	2.0
Kharkiv	45.0	2.0	11.0	6.6	19.3	0.7	3.1
Kherson	9.6	0.7	0.2	0.9	4.6	0.0	0.4
Khmelnytsky	21.1	1.3	0.4	14.7	0.7	0.0	1.7
Cherkasy	48.3	12.0	0.2	13.6	0.5	0.7	2.4

Regions	All types of economic activity	Including					
		agriculture, forestry and fisheries	mining and quarrying	re-manufacturing industry	supply of electricity, gas, steam and air conditioning	water supply, sewerage, waste management	transport, warehousing , postal and courier activities
Chernivtsi	3.3	0.7	0.1	1.6	0.1	0.0	0.1
Chernihiv	31.6	10.5	2.2	3.0	11.9	1.2	1.1
m. Kyiv	45.5	0.0	-	7.7	35.2	0.7	0.8

* Source: according to [11].

According to the Ministry of Ecology and Natural Resources of Ukraine lideramy- biggest polluters of the environment in terms of emissions of pollutants into the atmosphere from stationary sources in 2017 were Donetsk, Dnipropetrovsk, Ivano-Frankivsk Asti (tab. 2.12).

Table 2.12

List of areas[9] , which are the largest polluters in terms of emissions of pollutants into the atmosphere from stationary sources in 2017 *

Region	thousand tons	as a percentage of the total
Donetsk	784.8	30.4
Dnepropetrovsk	657.3	25.4
Ivano-Frankivsk	198.3	7.7
Zaporozhye	180.9	7.0
Vinnytsia	155.8	6.0
Lviv	109.1	4.2
Luhansk	75.1	2.9
Poltava	55.9	2.2
Cherkasy	48.3	1.9
Kyiv	48.2	1.9
m. Kyiv	45.5	1.8
Kharkiv	45.0	1.7
Chernihiv	31.6	1.2

Region	thousand tons	as a percentage of the total
Odessa	29.6	1.1
Khmelnytsky	21.1	0.8
Sumy	20.3	0.8
Mykolayivska	14.2	0.5
Kirovograd	12.2	0.5
Ternopil	10.6	0.4
Zhytomyr	10.3	0.4
Rivne	9.6	0.4
Kherson	9.6	0.4
Volyn	5.1	0.2
Chernivtsi	3.3	0.1
Transcarpathian	3.2	0.1
Total	**2584.9**	**100.0**

* Source: [26].

In total, in 2015 , every inhabitant of Ukraine had 105.5 kg of pollutant emissions into the atmosphere. In terms of territory, for every square kilometer of the country there were 7.8 tons of air pollutants. Among the settlements of the largest anthropogenic load (over 100 thousand tons of pollutants) were 6 cities of Ukraine (Table 2.1 3). The total emissions of pollutants into the air of these cities is 38.2% of all emissions [24].

Table 2. 1 3

Dynamics of emissions of pollutants into the atmosphere in the cities of Ukraine, thousand tons *

Name of the settlement	2010	2011	2012	2013	2014	2015	% of the total in the country
Amber	146.8	198.7	174.7	182.7	199.8	198.0	6.9
Dniprodzerzhynsk	108.5	124.7	116.4	115.5	105.0	101.0	3.5
Cocks	123.9	166.2	148.4	166.0	125.0	112.7	3.9
Energodar	100.3	104.9	107.7	145.5	113.5	103.9	3.6
Krivoy Rog	395.0	358.6	354.6	351.8	327.4	327.0	11.4
Mariupol	364.3	382.4	330.4	333.8	289.4	249.6	8.7
Total	1238.8	1335.5	1232.2	1295.3	1160.1	1092.2	38.2

* Source: [24].

The assessment of the state of atmospheric air pollution in the cities of Ukraine was carried out by the Borys Sreznevsky Central Geophysical Observatory according to observations in 39 cities at 129 stationary posts of the hydrometeorological monitoring network [40] .

The content of 22 pollutants, including eight heavy metals, was determined in the air. The average annual concentration of formaldehyde in the cities of Ukraine, where the observations were conducted, was at the level of 2.3 maximum permissible concentrations (MPC). [10] , nitrogen dioxide - 1.5 MPC, phenol - 1.3 MP .

Exceeding the relevant MPC $_{s.d.}$ Formaldehyde concentrations were observed in 25 cities, nitrogen dioxide in 22, suspended solids in 11, phenol in 7, carbon monoxide in 3 , hydrogen fluoride and nitric oxide in 2, ammonia and soot in one city.

According to the Air Pollution Index (EAI), which takes into account the degree of air pollution in the five priority pollutants, a very high level of pollution, as in the previous year, was observed in Mariupol and Dnieper, high - in Odessa, Kamyansk, Kiev, Kryvyi Rih, Lutsk, Mykolayiv, Slovyansk, Kramatorsk, Rubizhne, Lviv, Zaporizhia, Lysychansk, Kherson, Kremenchug. The high level of air pollution in these cities was mainly due to the high content of specific harmful substances - formaldehyde, phenol, hydrogen fluoride, ammonia, the main impurities - suspended solids, nitrogen dioxide, carbon monoxide (Fig. 2.7).

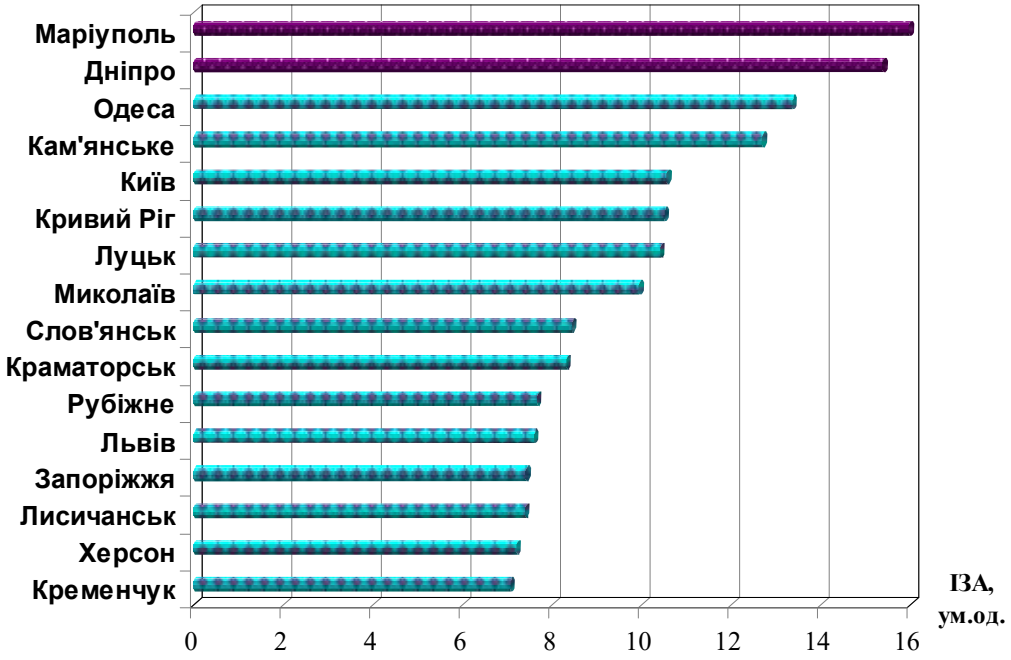


Fig. 2.7. The value of the air pollution index (AMS) in the most polluted cities of Ukraine in 2018 [40]

A large number of cities with very high and high levels of air pollution are located in Dnipropetrovsk region - 3 cities, in Donetsk region - 3, in Luhansk region - 2 cities and one city - in Poltava region. Other cities are six regional centers and the capital of Ukraine.

In 2018, three cases of high pollution were recorded[11] (VZ) of atmospheric air with carbon monoxide in Obukhiv (Kyiv region) in February with a maximum concentration of 8.8 MPC. (for comparison, in 2017 there was one case of VZ with nitrogen dioxide in Vinnytsia).

The total level of air pollution in Ukraine according to the ISA in 2018 was 7.6 and was assessed as high. Compared to the previous year, it increased slightly (it was 7.2) due to the increase in the average annual phenol content.

Observations of the chemical composition of precipitation were carried out at 36 meteorological stations of the monitoring network of hydrometeorological organizations. Precipitation acidity (pH) was monitored at 44 meteorological stations.

The main components in precipitation remain from anions - sulfates, bicarbonates and nitrates, from cations - calcium, sodium, potassium. Sulfate-hydrocarbonate remained the dominant type of precipitation in most of Ukraine [40].

At two existing monitoring stations for *transboundary transfer of pollutants* - M Svityaz (Svityaz village, Shatsk district, Volyn region) and M Rava-Ruska (Shabelnya village, Zhovkva district, Lviv region), where the average daily sampling of atmospheric air, average annual dioxide concentrations sulfur and nitrogen dioxide did not exceed sanitary and hygienic standards [40].

At single concentrations[12] from nitrogen dioxide on M Svityaz were recorded three cases of exceeding the MPC s.d. (0.8% of the total number of observations), on M Rava-Ruska - 11 cases of exceeding the MPC. (3.0 %).

Compared to the previous year, the average annual concentrations of sulfur dioxide at M Svityaz increased slightly, while those of nitrogen dioxide did not change; at M Rava-Ruska, the average annual concentrations of sulfur dioxide decreased almost twice, and those of nitrogen dioxide did not change.

Concentrations of chemical compounds in precipitation in the area of meteorological stations fluctuated within the limits typical of long-term observations. The average annual pH values of precipitation on M Svityaz were mostly weakly acidic, and on M Rava-Ruska they were neutral [40].

Regarding *radioactive air pollution,* according to the network of observations of hydrometeorological organizations [40], the exposure dose rate (hereinafter - DER) of gamma radiation in most of Ukraine was within the levels due to radiation of natural radionuclides and cosmic radiation. year At the control point located in the exclusion zone (Chernobyl meteorological station), the gamma background was 12–25 μR / h.

In the areas where the existing nuclear power plants are located, the gamma radiation DER was in the range: Zaporizhzhya NPP - 6 - 24 μR / h, South-Ukrainian NPP - 8 - 17 μR / h, Rivne NPP - 8 - 17 μR / h, Khmelnitsky NPP - 6 - 16 μR / year.

In Kyiv during 2018, the gamma background fluctuated in the range of 8–19 μR / h, with an average value of 12 μR / h.

The total beta activity of the surface layer of the atmosphere is currently determined mainly by radionuclides of natural origin (uranium isotopes, thorium and their fission products) and in the last 20 years corresponds to levels close to pre-emergency values. According to observations, in 2018 the total beta activity of the surface air layer averaged 17.0 ×□10 $^{-5}$ Bq / m ^{3} (in 2017 14.2 ×□10 $^{-5}$ Bq / m ^{3}). The average annual density of beta-active elements was 1.7 Bq / m ^{2} (1.6 Bq / m ^{2} per day in the previous year).

The main source of man-made radioactive elements (primarily reactor and explosive cesium-137 and strontium-90) in Ukraine is the secondary wind uplift of radioactive isotopes from the surface of the soil contaminated by the Chernobyl accident and as a result of testing nuclear weapons. half of the last century.

The concentration of cesium-137 at most control points (except for the exclusion zone) averaged 0.33 ×□10 $^{-5}$Bq / m ^{3}for the reporting year , the concentration of strontium-90 - 0.04 ×□10 $^{-5}$Bq / m ^{3}(in In 2017, 0.27 ×□10 $^{-5}$Bq / m ^{3}and 0.04 ×□10 $^{-5}$Bq / m ^{3}, respectively). The density of cesium-137 in the country (except for its part, classified as contaminated by the Chernobyl accident), averaged 3.70 Bq / m ^{2}per year, strontium-90 - 2.01 Bq / m ^{2}per year (in 2017 , 3.84 Bq / m ^{2}per year and 1.85 Bq / m ^{2}per year, respectively). At the control points of the guaranteed voluntary resettlement zone (Korosten, Ovruch) the content of cesium-137 in precipitation was on average at the level of 9.7 Bq / m ^{2}per year, strontium-90 - 2.88 Bq / m ^{2}per year (Last year, the corresponding figures were 10.8 Bq / m ^{2}per year and 2.89 Bq / m ^{2}per year).

At the Chernobyl control point (exclusion zone, distance to the Chernobyl NPP 16 km), the average volume activity of cesium-137 in atmospheric aerosols in 2018 was 2.05 ×□10 $^{-5}$Bq / m ^{3}, the volume activity of strontium-90 - 0 25 ×□10 $^{-5}$Bq / m ^{3}(in 2017 2,18 ×□10 $^{-5}$Bq / m ^{3}and 0,27 ×□10 $^{-5}$Bq / m ^{3}, respectively). The density of cesium-137 was 17.1 Bq / m ^{2}per year, strontium-90 - 18.9 Bq / m ^{2}per year (in 2017 17.8 Bq / m ^{2}per year and 19.9 Bq / m ^{2}per year, respectively).

During 2018, no exceedances of the permissible levels of radionuclide concentrations in the air established by NRBU-97 for the population (category B) were registered on the territory of Ukraine.

In general, the processes of purification of the atmosphere from radionuclides of man-made origin continue in Ukraine . The concentration of cesium-137 and strontium-90 in the surface layer of the atmosphere, since about 1998, fluctuates within close to pre-emergency levels. At the same time, the absolute values of cesium-137 and strontium-90 air pollution remained 4–5 orders of magnitude lower than the permissible concentrations established by NRBU-97 [40] .

Therefore, the concentration of radioactive elements of both natural and artificial origin in the surface layer of the atmosphere is in a stable state.

The gradual further decrease in the concentration of artificial radionuclides will occur both due to their natural decay and due to a decrease in their entry into the surface layer of the atmosphere due to secondary wind rise, due to the migration of these radionuclides into the lower soil layers. However, against the background of this general trend, the possibility of increasing the radioactivity of the surface atmosphere in case of man-made accidents at radiation-hazardous objects both in Ukraine and abroad, as well as due to dangerous and natural meteorological phenomena is not excluded [40].

Regarding climate and its change , we note that over the past decades, climatic conditions in Ukraine have changed significantly, leading to increased risks to human health and life, natural ecosystems and sectors of the economy. Since the beginning of the XXI century olittya Ukraine has seen intense increase in surface air temperature (Fig . 2.8).

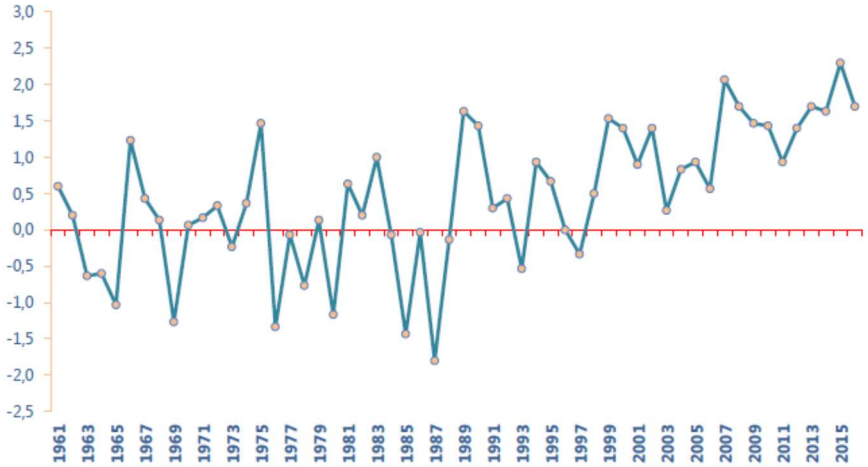


Fig. 2.8. Anomalies of the average annual air temperature in Ukraine relative to the climatic norm (base period - 1961–1990): norm in 1961–1990: +7.8 ° C; average in 1991–2016: +8.8 ° C ; average in 2007–2016: +9.4 ° C [37]

Global climate change affects Ukraine's climate and affects its components. Direct and total radiation changed more in medium cloudy conditions than in clear weather; scattered radiation increased in both cloudy and clear weather. Atmospheric pressure dropped markedly in January and rose in July. The average wind speed decreased by almost 10-15% throughout the territory. The air temperature increased in winter and decreased in summer, ie the contrasts between winter and summer temperatures decreased. Precipitation increased (by 10–15%) in the southeast and decreased (by 5–10 %) in the northwest. The increase in precipitation in the south of the country led to a decrease in the number of dust storms. Due to significant climate fluctuations, cases of extreme weather conditions have become more frequent: especially dangerous showers, floods, intense thaws, early frosts, increased maximum wind speed, etc. [28].

Warming leads to [37]:

–□abrupt changes in weather;

–□increase in frequency and intensity of dangerous and spontaneous hydrometeorological

–□phenomena in the warm season (showers, thunderstorms, squalls, hail, long hot periods - heat waves) and in the cold (heavy snowfall, ice, difficult sediments);

–□increasing the frequency and intensity of droughts and expanding the areas covered by them;

–reduction of river runoff in the south and south-east of Ukraine, increase of flood intensity on the rivers of the west of the country (Prykarpattia and Zakarpattia), in particular in the Dniester basin, changes of internal annual distribution of river runoff of Ukraine;

–rising levels of the Black and Azov Seas, which intensifies the processes of erosion, erosion of shores and leads to flooding, flooding and salinization of soils in the coastal zone.

Significant consequences of climate change have been identified to increase risks [37]:

–for human health, associated with virtually all manifestations of climate change;

– α significant reduction in the yields of major crops due to the intensification of droughts and the spread of previously uncharacteristic pests and pathogenic diseases of agricultural plants, as well as through other extreme weather events;

–aggravation of problems with water supply of the southern and south-eastern regions, which suffer from drought in summer and whose population is the least supplied with drinking water of proper quality;

–intensification of land degradation and desertification due to the rapid pace of climate change;

–reduction of productivity, viability and resilience of forests in conditions of significant water stress, which increases the likelihood of fires and mass reproduction of dangerous pests;

–accelerated degradation of ecosystems;

–occurrence of accidents and unstable functioning of electric networks and centralized heating systems, other infrastructure facilities.

The largest greenhouse gas emissions in Ukraine occur in the energy sector. In 2017, the share of this sector amounted to 73.0% of total emissions of such gases without taking into account ZZZLG. About 80.0% of emissions in the structure of the energy sector account for emissions in the category "Fuel combustion", which covers such accounting categories of greenhouse gas sources as energy, manufacturing and construction, transport, other sectors and others, and 20, 0% - emissions in the category "Emissions related to fuel leaks".

In 2017, emissions in the Transport category amounted to 35.0 million tons of CO2-eq. Compared to 1990, emissions decreased by 68.7%, since 2016 - decreased by 6.4 % [4].

The largest share of greenhouse gas emissions in the category "Transport" in 2017 falls on road transport and other modes of transport - 70.6% and 27.1%, respectively [4] (Fig. 2.9, 2.10).

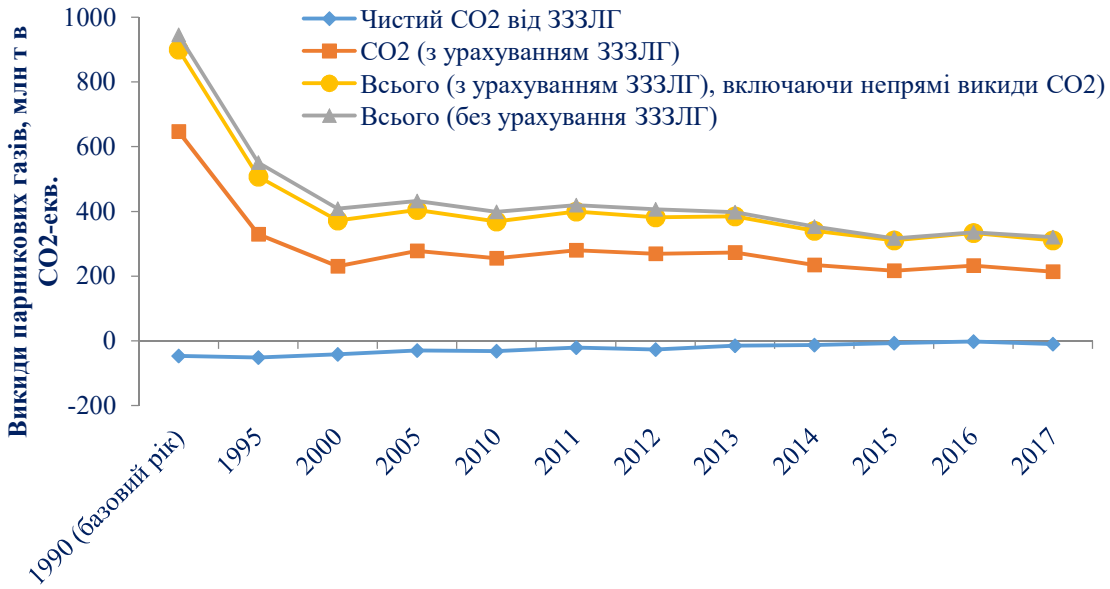


Fig. 2.9. Greenhouse gas emissions in Ukraine, 1990-2017, million tons in CO_2-eq. (according to [3 ; 4])

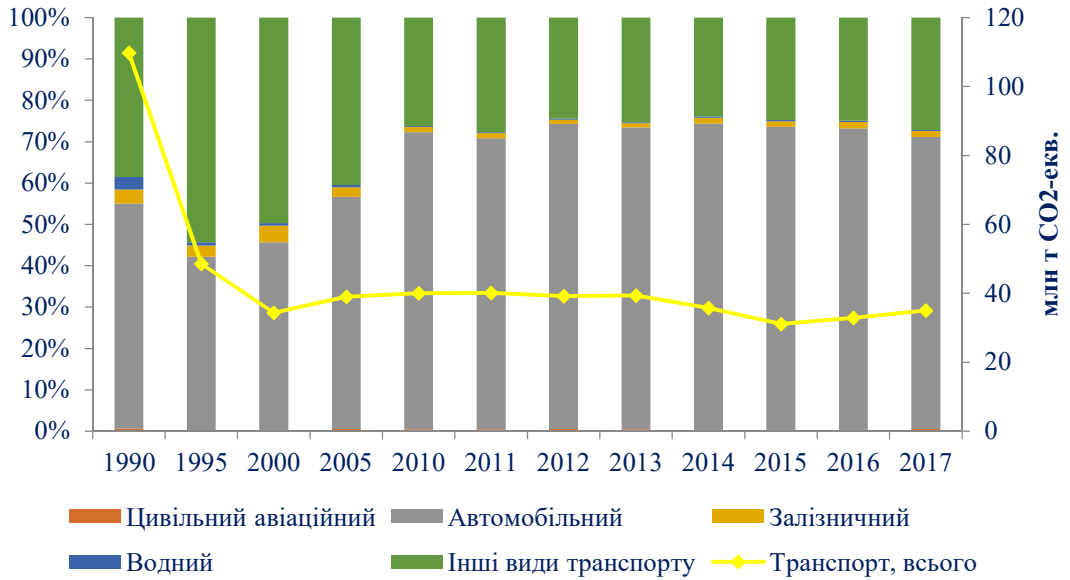


Fig. 2.10. GHG emissions in the category "Transport", 1990 - 2017 (according to [3 ; 4])

2.2. Soils and changes in land use

The area of Ukraine is 60,354.9 thousand hectares. According to the State Service of Ukraine for Geodesy, Cartography and Cadastre, the structure of the country's land fund on January 1, 2016 is presented in table. 2.14 , fig. 2.11 shows that agricultural lands occupy 70.8 % of the territory of Ukraine, of which 68.8% are agricultural lands. Structure of agricultural lands of Ukraine (Fig. 2.12): 53.9% - arable land; 9.0% - pastures; 4.0% - hayfields; 1.5 % - perennial plantings; 0.4 % - par. Forests and other wooded areas occupy 17.6% of the country's territory ; built-up lands - 4.2 %; water - 4.0%; open wetlands - 1.6%; others - 1.7%.

The largest area of agricultural land (46%) is located in the Steppe zone, 34.9% - Forest-Steppe and 19.1% in the Polissya zone. Plowing of soils on average in Ukraine is 78.4%. The greatest plowing is observed in Kherson region 90.3%, Cherkasy, Kirovohrad, Vinnytsia, Zaporizhia, Dnipropetrovsk and Mykolayiv regions - 85-87%.

The lowest plowing of soils was observed in Zakarpattia, Lviv, Ivano-Frankivsk and Volyn regions - 44–64% [27].

The structure of the land fund of Ukraine and its changes in terms of the main land lands and economic activity testify to the significant plowing and agricultural development of the territory, the indicators of which exceed the ecologically justified limits.

Table 2.14

Land Fund of Ukraine as of January 1, 2016 and the dynamics of its changes compared to data as of January 1, 2015 *

Types of basic land and economic activity	as of 01.01.2016		as of 01.01.2015		Dynamics (thousand hectares)
	total, thousand hectares	% to the total area of Ukraine (territory)	total, thousand hectares	% to the total area of Ukraine (territory)	
Agricultural lands	42726.4	70.8	42731.5	70.8	-5.1
including: agricultural land	41507.9	68.8	41511.7	68.8	-3.8
of them: *arable land*	32541.3	53.9	32531.1	53.9	10.2
fallows	233.7	0.4	239.4	0.4	-5.7
perennial plantings	892.4	1.5	892.9	1.5	-0.5
hayfields	2406.4	4.0	2407.3	4.0	-0.9

Types of basic land and economic activity	as of 01.01.2016		as of 01.01.2015		Dynamics (thousand hectares)
	total, thousand hectares	% to the total area of Ukraine (territory)	total, thousand hectares	% to the total area of Ukraine (territory)	
pastures	5434.1	9.0	5441	9.0	-6.9
other agricultural lands	1218.5	2.0	1219.8	2.0	-1.3
Forests and other wooded areas	10633.1	17.6	10630.3	17.6	2.8
including:					0
covered with forest vegetation	9698.9	16.1	9695.2	16.1	3.7
not covered with forest vegetation	216.9	0.4	217.3	0.4	-0.4
other forest lands	313.2	0.5	313.5	0.5	-0.3
shrubs	404.1	0.7	404.3	0.7	-0.2
Built-up land	2552.9	4.2	2550.4	4.2	2.5
including:					
under housing	488.9	0.8	487.7	0.8	1.2
land industry	224.7	0.4	224.1	0.4	0.6
land under open pits , quarries , mines and relevant structures	157.1	0.3	156.3	0.3	0.8
land for commercial and other use	55.4	0.1	54.9	0.1	0.5
public lands	281.3	0.5	281.7	0.5	-0.4
land of mixed use	29.0	0.0	29.3	0.0	-0.3
land used for transport and communications	496.8	0.8	496.7	0.8	0.1
land used for technical infrastructure	74.2	0.1	74.4	0.1	-0.2
lands used for recreation and other open lands	745.5	1.2	745.3	1.2	0.2
Open wetlands	982.3	1.6	982.6	1.6	-0.3
Dry open lands with special vegetation	13.2	0.0	17.9	0.0	-4.7
Open lands without vegetation cover or with insignificant vegetation cover (stony places, sands, other ravines)	1020.6	1.7	1015.8	1.7	-5.2
Total land (land)	57928.5	96.0	57928.5	96.0	0
Waters (areas covered by surface waters)	2426.4	4.0	2426.4	4.0	0

Types of basic land and economic activity	as of 01.01.2016		as of 01.01.2015		Dynamics (thousand hectares)
	total, thousand hectares	% to the total area of Ukraine (territory)	total, thousand hectares	% to the total area of Ukraine (territory)	
Total (territory)	60354.9	100.0	60354.9	100.0	0

* Source: according to the State Service of Ukraine for Geodesy, Cartography and Cadastre. URL: https://land.gov.ua/info/zemelnyi-fond-ukrainy-stanom-na-1-sichnia-2016-roku-ta-dynamika-ioho-zmin-u-porivnianni-z-danymy-na- January 1, 2015 /

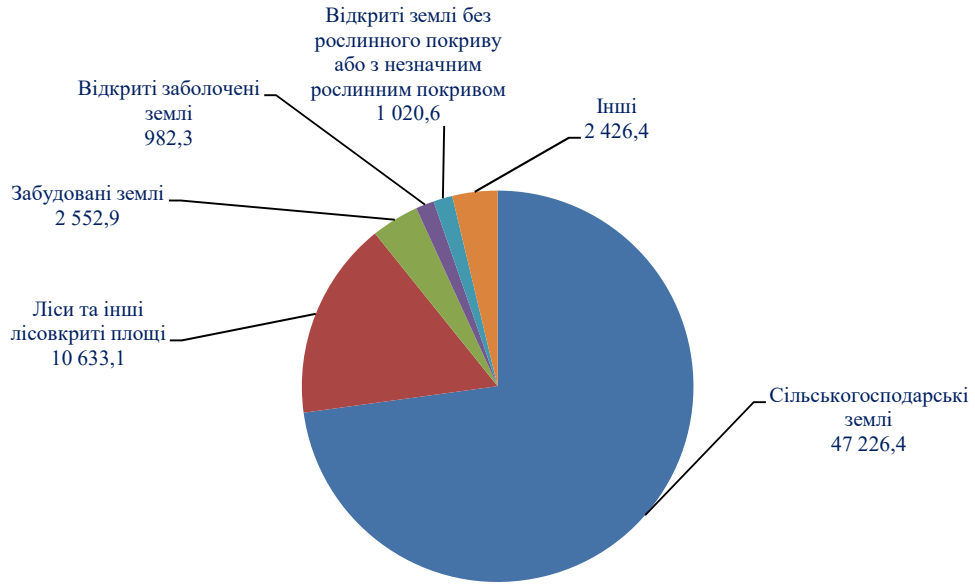


Fig. 2.11. Structure of the land fund of Ukraine, thousand hectares (according to the State Service of Ukraine for Geodesy, Cartography and Cadastre, 2016)

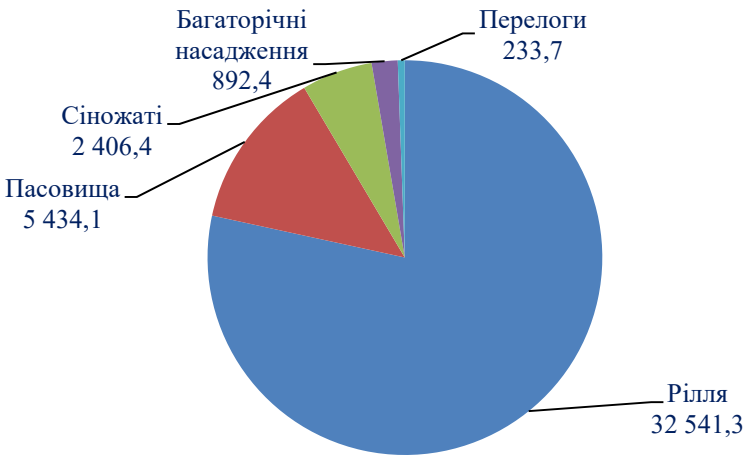


Fig. 2.12 . Structure of agricultural lands of Ukraine, thousand hectares (according to the State Service of Ukraine for Geodesy, Cartography and Cadastre, 2016)

Table 2.15

Distribution of land fund in Ukraine by forms of ownership as of 01.01.2016 *

Type of ownership	Land area		+, - until 2015
	thousand hectares	%	
State	28758.4	47.6	- 66.2
Private	31489.2	52.2	+ 46.5
Collective (according to state acts)	55.1	0.1	- 0.2
Communal	52.2	0.1	+ 19.9
Total land	**60354.9**	**100.0**	

* Source: according to the State Service of Ukraine for Geodesy, Cartography and Cadastre.

There are significant disparities in the structure of land resources and land use, the deepening of which can pose a threat to the environment and living environment, as well as the efficiency of economic activity, sustainable development of

the national economy as a whole. The actual forest cover of the territory of Ukraine is insufficient to ensure ecological balance.

Excessive plowing of lands (53.9 % of Ukraine's land fund), including on the slopes, led to a violation of the ecologically balanced ratio of agricultural lands, forests and reservoirs, which negatively affected the sustainability of agricultural landscapes and caused a significant man-made load on the ecological sphere [38].

On the territory of Ukraine are concentrated a quarter of the world's reserves of chernozems, which were formed under the steppe vegetation in a climate that, in contrast to the steppes of Eurasia, is softer and wetter. In terms of physical, chemical, agrochemical and mineralogical composition, Ukrainian chernozem is considered to be the best among soil-forming rocks. In terms of soil quality and land productivity, Ukraine is one of the richest countries in the world [28].

The most important criterion for assessing soil quality is the presence of humus. The average humus content in arable land is 3.2 %. Soils with a high content of humus are concentrated in the Kharkiv region - 4.9 % of humus, in Kirovograd and Dnipropetrovsk regions - 4.5 % (Table 2.16).

Table 2.16

Types of soils of Ukraine *

Types of soils	Soil area		Arable land area		
	thousand hectares	%	thousand hectares	% of the total area	% of arable land
Sod-podzolic sandy and clay-sandy	1573.0	3.5	1015.0	64.5	3.5
Sod-podzolic gleyed	1916.3	4.3	1140.7	59.5	3.6
Gray forest	7924.0	17.8	6719.1	84.8	21.3
Typical chernozems (unwashed and washed away) on forest rocks	6272.2	14.1	5731.4	91.4	18.1
Ordinary chernozems (unwashed and washed away) on forest rocks	10395.0	23.4	8760.0	84.3	27.7
(unwashed and washed away) on forest rocks	6237.9	14.1	4662.4	74.7	14.8
Meadow-chernozem mainly on forest rocks	1124.9	2.5	700.7	62.3	2.2
Dark chestnut and chestnut on forest rocks	1489.9	3.4	1241.0	83.3	3.9
Meadows mainly on alluvial deposits	1939.1	4.4	663.0	34.2	2.1
Swamps, peat-swamps, peatlands	2061.8	4.6	83.5	3.8	0.26
Salt and sweetened	537.8	1.2	256.1	47.6	0.8
Turf	1627.1	3.7	396.3	24.4	1.3

Types of soils	Soil area		Arable land area		
	thousand hectares	%	thousand hectares	% of the total area	% of arable land
Brown earth, sod-brown earth	956.4	2.2	192.7	20.1	0.6
Brown mountain, mountain-meadow	41.8	0.1	7.2	17.2	0.02
Breed yields	311.0	0.7	21.6	6.9	0.1
Total	44406	100.0	31586.3	71.7	100.0

* Source: [2].

In Ukraine, there are more than 1.1 million hectares of degraded, unproductive and man-made contaminated land subject to conservation, 143.4 thousand hectares of disturbed land in need of reclamation, and 315.6 thousand hectares of unproductive land in need of improvement. The most significant factor in reducing land productivity and increasing degradation of agricultural landscapes is water erosion. The processes of linear erosion and spring formation are intensively developing. The area of ravines is 140.4 thousand hectares, and their number exceeds 500 thousand. The intensity of erosion in some ravine-beam systems exceeds the average by 10–20 times. More than 6 million hectares of land are systematically exposed to wind erosion and up to 20 million hectares to dust storms . The quality of land resources is also affected by other negative factors, including salinity, salinity, waterlogging, acidity, stony. More than 19% of soils are acidic. Intensive agricultural land use leads to a decrease in soil fertility due to their compaction, in particular chernozems, loss of lumpy-grained structure, water permeability and aeration capacity with all environmental consequences [38 ; 27].

The agricultural lands surveyed in the tenth round (2011–2015) of the agrochemical survey of agricultural lands are distributed according to the qualitative assessment as follows [27]:

– τηε□best lands and high quality lands make up only 19.2%;

– τηε□vast majority of such lands are located in the Forest-Steppe zone (21.8 %) and the Steppe zone (21.7%);

–□medium quality - almost 57%; the vast majority - in the Steppe and Forest-Steppe zones (58–61%);

–□low quality - 23%; the vast majority - in the Polissya area (more than 45 %).

The best in terms of quality assessment in points (agroecological score) are the surveyed soils in Kirovograd (67 points), Kharkiv (66 points), Ternopil (57 points) regions (Table 30).

Soil pollution. In 2018 p. sample surveys to determine the content of residual amounts of *pesticides* , conducted by hydrometeorological organizations of the State Emergency Service of Ukraine , covered agricultural land of 30 farms, 27

districts, 13 regions of the country [40]. A total of 167 soil samples were taken during the year on a total area of 2064.2 ha to determine the residual amounts (LC) of organochlorine pesticides - dichlorodiphenyltrichloroethane (DDT) in the amount of dichlorodiphenylethylene (DDE), isomers of alpha- and hexamethexamine-halomathexamate.

On the territory of agricultural lands of Ukraine surveyed in 2018, the average content of LD ∑□DDT in soils was significantly below the level of maximum permissible norms and amounted to 0.007 MPC (in 2017 the average content was 0.002 MPC). In almost all selected soil samples, pesticide concentrations were below the limit of determination. The average content of SC ∑□HCH in soil samples of all surveyed areas was at the level of 0.001 MPC. Soil contamination is local in nature and is observed mainly on land plots where there used to be gardens, vineyards, hop gardens, or near the location of warehouses with chemical plant protection products.

According to observations, the content of *nitrates* in the soils of agricultural lands was generally below the permissible level. In the soils of farms in general, the average concentration of nitrates in the regions was 7 (million $^{-1}$) - 0.05 MPC, the maximum - 46 (million $^{-1}$) - 0.35 MPC. The highest content of nitrates was found in the soils of Cherkasy, Rivne, Odessa regions, where the average concentrations were in the range of 10-20 (million $^{-1}$) - 0.08-0.15 MPC, maximum - 19-46 (million $^{-1}$) - 0, 15–0.35 MPC.

Soils in 17 settlements of Ukraine were selectively examined for the content of *industrial toxicants* [40]: cities of Zaporizhia, Kyiv, Odessa, Ternopil, Kherson, Uzhhorod; Mohyliv-Podilskyi, Vinnytsia region, Volodymyr-Volynskyi, Volyn region, Mariupol, Donetsk region, Melitopol, Zaporizhia region, Vasylkiv, Bila Tserkva, in the village of Baryshivka, Kyiv region, Stryy, Lviv region, Belgorod-Dniester, Chernomorsk, Odessa region, in the village of Pobuzke. A total of 571 soil samples were taken in 2018, which were analyzed for the mass fraction of six metals - cadmium, manganese, copper, nickel, lead and zinc. According to observations, the soils of the cities of Zaporizhia, Mariupol, Uzhhorod and the village of Pobuzke were the most polluted . In some cities, one-time concentrations of metals were recorded at a sufficiently high level (Table 2 .1 7).

In general, soils in Ukraine are the most contaminated with lead, zinc, copper, less - manganese, cadmium and nickel.

In industrial settlements due to long-term emissions of pollutants into the atmosphere around the enterprises formed zones of increased soil contamination with heavy metals.

Table 2 .1 7

The content of industrial toxicants (in mg / kg of air-dry mass) in the soils of settlements according to the observations of hydrometeorological organizations in 2018 *

Settlement	Kiel kist samples	Pollutants

		(average / maximum content in mg / kg)					
		CD	Mn	With	Ni	Pb	Zn
Mohyliv-Podilskyi	15	0.10 / 0.25	481/657	23/70	29/53	38/98	164/272
Volodymyr-Volynskyi	40	0.03 / 0.25	311/577	14/58	12 /, 19	35/359	136/321
Mariupol	30	0.86 / 2.00	1552/4044	55/210	31/51	31/78	252/476
Zaporizhzhia	60	1.14 / 4.75	1783/4708	42/185	58/709	39/158	266/1623
Melitopol	25	0.51 / 3.75	378/815	20/84	20/47	30/83	175/355
Uzhhorod	55	0.30 / 1.25	1002/1630	45/546	39/83	81/1860	167/727
Kiev	59	0.12 / 0.50	308/587	10/27	10/17	10/25	107/221
Baryshivka	20	0.14 / 0.50	375/1901	11/26	10/24	9/21	79/202
Cornflowers	20	0.03 / 0.25	356/519	27/125	12/24	27/119	162/401
White Church	20	0.49 / 1.00	371/470	11/29	15/21	15/51	55/197
Stryi	15	0.30 / 1.25	525/782	31/73	21/29	28/85	436/659
Pobuzke	11	15.7 / 75.0	1431/3845	25/49	1090/2115	41/101	358/832
Odessa	60	0.17 / 0.75	526/736	61/510	30/40	68/159	238/462
Belgorod-Dniester	26	0.10 / 0.50	516/969	53/602	21/32	12/25	226/817
Chernomorsk	25	0.62 / 1.25	708/950	26/147	29/41	23/80	146/414
Ternopil	40	0.15 / 1.25	503/663	15/23	20/28	20/32	152/281

Kherson	50	0.15 / 1.75	425/868	33/64	25/40	22/76	136/523

* Source: [40].

2. 3 . Aquatic resources

Ukraine's water resources consist of surface and groundwater.

Surface water bodies cover 24.1 thousand km ^{2}, or 4% of the territory of Ukraine. There are 63,119 rivers in Ukraine , of which large (catchment area more than 50 thousand km ^{2}) - 9, medium (from 2 to 50 thousand km ^{2}) - 87 and 63,029 small rivers (less than 2 thousand km $^{2)}$). Large rivers within Ukraine include the Dnieper, the Southern Bug, the Dniester, the Seversky Donets, the Desna, the Western Bug, the Tisza, the Pripyat, and the Danube.

Most of the rivers flows into the Black and Azov seas and only 4.4 % - in the Baltic Sea. The largest number of rivers falls on the Dnieper basin - 27.7%, the Danube - 26.3 %, the Dniester - 23.7 % and the Southern Bug - 9.3%. The total length of rivers is 206.4 thousand km, of which 90 % are small rivers. There are 3.3 thousand rivers longer than 10 km; their total length is 94.4 thousand km. The average density of the river network is 0.34 km / km ^{2}. The average density of the river network of the main river basins is the Dnieper - 0.26, the Dniester - 0.60, the Southern Bug - 0.35, the Seversky Donets - 0.22, the Vistula (within Ukraine) - 0.52, the Danube (within Ukraine)) - 0.68 km / km ^{2}. On the rivers of the Azov Sea it is equal to 0.36, in the Crimea - 0.24, in the interfluves Danube - Dniester - 0.17, Dniester-Southern Bug - 0.009. Among all the rivers of Ukraine, the largest catchment area is the Dnieper - 504 thousand km ^{2}.

The Dnieper is a typical plain river with a wide floodplain. Its right bank is steep and rises above the water to 50-150 m, and the left bank is lowland, sloping. The largest tributaries - the Pripyat and Desna - are navigable.

The Danube flows downstream on the territory of Ukraine. It flows into the Black Sea, forming a large delta of three arms. The Danube is an important waterway that connects Ukraine with many European countries. The largest tributaries of the Danube in Ukraine - the Tisza and Prut.

To provide the population and sectors of the national economy with sufficient water, 1,103 reservoirs with a total volume of over 55 billion m ^{3}, about 40,000 ponds, seven large canals with a length of 1,021 km with a capacity of 1,000 m ^{3} ^{of} water per second were built . water enters low-water regions.

According to long-term observations, the potential resources of river waters of Ukraine (including the Danube) are 209.8 km ^{3}, of which 25% are formed within Ukraine and are considered as Ukraine's own water fund, and the rest - comes from foreign countries - Romania, Moldova, Hungary, Poland, Belarus, Russia.

Ukraine also has groundwater reserves. Estimated groundwater resources are 57.2 million m ^{3} per day, of which explored - 15.7 million m ^{3} per day. Groundwater is unevenly distributed on the territory of Ukraine.

In Ukraine, there are 7,000 lakes, occupying 0.3% of the territory, the volume of which reaches 2.3 km ^{3} of water; 28 thousand ponds with an area of 160 thousand hectares and a water volume of 2.5 km ^{3}. Water from such sources is used for water supply of rural settlements, livestock farms and complexes, development of fisheries, waterfowl breeding, etc. They are located mainly in Polissya, the Black Sea lowlands and in the Steppe Crimea. The largest freshwater lakes are Yalpug in the Danube floodplain and Svityaz in Polissya. The lakes of the Black Sea lowlands and the steppe Crimea were formed mainly as a result of flooding of river valleys and gullies by the sea. Some of them are called estuaries (Dniester, Tiligul, Kuyalnytsky, Molochny).

Ukraine is one of the least water-supplied countries in Europe, as the reserves of local resources of river runoff per person are about 1.0 thousand m ^{3} per year. The western regions are the most provided with local runoff resources, where from 200 to 600 thousand m ^{3} per 1 km ^{2} of territory , and from 2 to 7 thousand m ^{3} per capita . The least provided with surface water resources are Kherson, Donetsk, Dnipropetrovsk and Zaporizhia regions - from 0.1 to 0.3 thousand m ^{3} of water [24 ; 28].

Ukraine has rich resources of mineral waters, diverse in chemical composition and balneological effects on the body. According to the classification of mineral waters of Ukraine (2001), there are 9 types of mineral waters with specific components [28]: 1) carbon dioxide; 2) sulfide waters; 3) water enriched with organic matter; 4) boric waters; 5) siliceous waters; 6) bromine, iodine waters; 7) ferrous waters; 8) radon waters; 9) polymetallic waters. There are 119 deposits with total reserves of 102,156.5 m ^{3} / day. Mineral water deposits are found in almost all regions of Ukraine, but most of them are in Zakarpattia, Lviv, Odessa, Donetsk regions and Crimea.

In Ukraine, thermal waters are common in the Transcarpathian, Precarpathian, Black Sea and Dnieper artesian basins and are characterized by a large depth of aquifers with thermal water, their significant mineralization and environmental problems [24 ; 28] .

The use of water resources in Ukraine is multifaceted. Consumer properties of water determine the possibility of their integrated and diverse use. The main areas of water use in Ukraine are water supply to the population, agriculture and industry. The structure of water consumption in Ukraine (main sectors of the economy) is shown in Fig. 2.13 , and the main indicators of water supply and drainage - in table . 2.18– 2.20 .

Fig. 2.13. Structure and forecast of water use in Ukraine (compiled by [11 ; 23])

Table 2.18

The main indicators of water use and drainage, million m ^{3} *

Indexes	2010	2014	2015	2016	2017
Water was taken from natural water bodies - in total	14846	11505	9699	9907	9224
from surface sources	12823	10002	8413	8637	8046
including fresh	11893	9396	7823	8055	7457
from underground sources	2023	1503	1286	1270	1178

Indexes	2010	2014	2015	2016	2017
Used fresh water					
(including marine) - total	9817	8710	7125	7169	6853
including fresh	8886	8104	6556	6608	6284
used for needs:					
production	5511	4871	4491	4591	4015
drinking and sanitary	1917	1500	1267	1239	1174
irrigation	1377	1218	1237	1211	1549
other needs	1012	1121	130	128	115
Water loss during transportation	2158	1350	1139	1143	1145
Reversible and re-sequential water supply	43138	43049	40306	39619	38716
Capacity of treatment facilities	7425	7190	5801	5690	5415
General drainage[thirteen]	8141	6587	5581	5612	4921
return (sewage)	7012	5957	4915	5002	4401
mine-quarry	672	308	327	295	228
collector and drainage	457	322	339	315	292
Dropped into surface water bodies	7817	6354	5343	5399	4715
contaminated return water	1744	923	875	698	997
without cleaning	312	175	184	164	158
insufficiently cleaned	1432	748	691	534	839
normatively purified	1760	1416	1389	1381	1023
normatively clean without cleaning	4313	4015	3079	3120	2550
in the underground horizons	11	9	17	9	9
in storage, depressions and more	313	224	221	204	198
Reset transit water	2121	956	823	1090	732
Discharged return (sewage) into the canals	38	38	33	36	30

* Source: [11].

Table 2.19

Total drainage by region, million m ^{3} *

Regions	2010	2014	2015	2016	2017
Ukraine	**8141**	**6587**	**5581**	**5612**	**4921**
Autonomous Republic of Crimea	237	…	…	…	…
Vinnytsia	77	76	70	65	67
Volyn	60	56	44	41	43
Dnepropetrovsk	1262	1194	751	926	680
Donetsk	1503	917	846	822	802
Zhytomyr	155	161	70	66	74
Transcarpathian	43	33	32	35	37
Zaporozhye	863	831	955	873	980
Ivano-Frankivsk	92	74	58	59	60
Kyiv	822	736	680	638	285
Kirovograd	48	96	43	48	50
Luhansk	333	54	83	84	42
Lviv	240	224	220	217	178
Mykolayivska	92	128	77	70	64
Odessa	303	214	184	167	166
Poltava	217	221	96	82	83
Rivne	112	112	60	54	57
Sumy	59	52	49	52	50
Ternopil	64	72	32	31	31
Kharkiv	303	303	292	329	274
Kherson	85	60	74	66	73
Khmelnytsky	55	32	43	38	38
Cherkasy	231	184	124	128	124
Chernivtsi	53	64	42	42	41
Chernihiv	127	109	85	94	79
m. Kyiv	650	584	571	585	543
Sevastopol	55	…	…	…	…

* Source: [11].

Table 2.20

General drainage by sewage receivers and water categories by regions in 2017 *

Regions	Number of enterprises that discharged return (waste) water, units	Discharged return (sewage)							
		total, million m³	by receivers			by categories of water		
			in surface water bodies	in the subterranean mountains-umbrellas	in objects not related to water	sewage	mine-quarry	collector-drainage-them
Ukraine	**1860**	**4921**	**4715**	**9**	**197**	**4401**	**228**	**292**
Vinnytsia	97	67	63	-	4	66	1	-
Volyn	45	43	30	-	thirteen	40	3	-
Dnepropetrovsk	61	680	617	0	63	579	75	26
Donetsk	116	802	801	-	1	739	62	1
Zhytomyr	137	74	72	-	2	63	10	1
Transcarpathian	135	37	36	-	1	20	0	17
Zaporozhye	86	980	956	-	24	955	15	10
Ivano-Frankivsk	90	60	60	-	0	33	-	27
Kyiv	83	285	271	-	14	280	2	3
Kirovograd	54	50	44	2	4	40	10	-
Luhansk	28	42	42	-	0	26	14	2
Lviv	179	178	167	-	11	97	-	81
Mykolayivska	19	64	60	-	4	64	-	-
Odessa	48	166	159	-	7	117	-	49
Poltava	46	83	70	1	12	60	15	8
Rivne	125	57	57	-	0	47	8	2
Sumy	79	50	47	2	1	48	2	-
Ternopil	68	31	29	-	2	31	-	-
Kharkiv	98	274	270	0	4	271	2	1
Kherson	24	73	69	-	4	37	-	36
Khmelnytsky	73	38	35	-	3	37	1	-
Cherkasy	65	124	107	-	17	98	2	24
Chernivtsi	64	41	38	-	3	36	1	4
Chernihiv	32	79	72	4	3	74	5	-
m. Kyiv	8	543	543	-	0	543	-	-

* Source: [11].

According to the International Bank for Reconstruction and Development / World Bank, the main causes of surface water pollution are discharge of polluted urban and industrial wastewater into reservoirs directly or through a sewerage system, discharge of contaminated effluents from built-up areas and farmland and soil erosion in groundwater supply areas. In Donetsk, Dnepropetrovsk, Lugansk and Odessa regions account for approximately 75% of all discharges into surface waters. The main sources of discharged polluted water are industrial enterprises (894 million m^3), housing and communal services (538 million m^3) and agricultural sector (71 million m^3). Due to the low quality of wastewater treatment, the volume of discharged polluted wastewater into the surface water of reservoirs is not reduced.

Observations of the *state of surface water pollution* by hydrochemical indicators were carried out by hydrometeorological organizations at 123 water bodies (105 rivers, 9 reservoirs, 7 lakes, 1 canal, 1 estuary) at 204 points and 329 targets. The number of samples was 3358 [40]. As in previous years, water bodies in Ukraine were polluted mainly with heavy metal compounds, nitrogen compounds, phenols, sulfates, and petroleum products.

During the period of 2018, seven cases of extremely high pollution (EMF) were detected in water bodies of Ukraine[14] surface waters at one water body: on the Poltva River near the city of Lviv (Lviv region) six cases were registered with the content of dissolved oxygen in the range of 0.64–1.92 mgO_2/ dm^3 and one the case of increasing BSC_5 (biochemical oxygen demand for 5 days) to 68.8 mgO_2/ DM^3.

High pollution[15] (VZ) were detected in 566 cases on 66 water bodies (54 % of the total number of objects where observations were made).

A decrease in the content of dissolved oxygen below 3 mgO_2/ dm^3 was observed during the year in the Poltva River near the cities of Lviv and Busk (11 cases); two cases of low oxygen content at the level of VZ were noted on the Ustya River - Rivne and one case on the Ingul River - Kropyvnytskyi. In the water of the Poltva River near the city of Lviv, an increase in biochemical oxygen consumption (BSC_5) to the level of OZ was observed in 11 cases, one case of increase (BSC_5) was recorded in the area of Busk.

According to other ingredients, the number of cases of high pollution was [40]: hexavalent chromium compounds - 140, manganese - 125 cases, nitrite nitrogen - 96, ammonium nitrogen - 86, sulfates - 62, zinc compounds - 22, total iron - 7, copper - 2 cases.

In most river basins continued to experience a trend towards reduction or complete absence of phenol in water and petroleum products, stabilization nitrite content of nitrogen compounds and zinc.

In the rivers of the Dnieper basin in 2018, a slight decrease in the content of ammonium nitrogen compounds, copper, zinc, manganese and hexavalent chromium was observed. The content of zinc, manganese, and hexavalent chromium compounds decreased in the Danube riverbeds, and manganese compounds in most rivers of the Southern Bug.

Increases in hexavalent chromium concentrations were observed at the Dniester, Pivdennyi Bug, and Priazovya rivers.

In most water bodies of the Southern Bug and the Seversky Donets, the water quality deteriorated due to ammonium nitrogen compounds , the Danube rivers, the Rata rivers , and the Solokiya (bass of the Western Bug) - according to the total water compounds .

Western Bug River Basin. According to observations in 2018 [40], the quality of surface waters of the Western Bug basin in terms of hydrochemical parameters did not meet fishery standards for such common substances as nitrogen compounds, heavy metal compounds and dissolved oxygen.

Ammonium and nitrite forms of nitrogen prevailed in the water of most points of the Western Bug basin during the year. The average and maximum content of nitrogen compounds exceeded the maximum allowable concentrations (MPC)[16] .

The largest single values of ammonium nitrogen at the level of 44 G DC were recorded in the Poltva River near Lviv, nitrite nitrogen - 42 MPC in the Poltva River - Busk (chronic pollution points) (Table 2. 2 1.).

At the points of the Western Bug River, the recurrence rate of cases that reached the level of high pollution (HF) was 92 % for ammonium nitrogen compounds and 61 % for nitrite nitrogen compounds (of the total number of samples taken).

The content of heavy metals in the waters of the basin was relatively low, except for the content of copper compounds. Increased concentrations of this ingredient in [40], p. Western Bug - p. Lytovezh, p. Poltva - m. Lviv.

Slightly higher than in the previous year, will be noted for the pollution of the rivers Rata and Luga with compounds of total iron.

Table 2.21

Chemical pollution of surface waters of individual river basins according to observations of hydrometeorological organizations in 2018 *

River basins, rivers, reservoirs	*Lightly oxidizing organic substances according to (BSC_5)*	*Oil products*	*Ammonium nitrogen*	*Nitrite is nitrite*	*Copper compounds*	*Zinc compounds*	*Compounds manganese*	*Compounds of chromium six valence-tion*	*Common iron compounds*	*Phenols*	*Everything you-pad-kiv VZ*
Average values for the year / Maximum values, MPC[17]											

River basins											
Western Bug	<1-1 / <1-3	<1 / <1	1-14 / 4-25	4-18 / 10-42	5-7 / 8-14	2-3 / 4-7	2-3 / 4-9	3-5 / 5-7	<1-1 / 1	<1-1 / 1-2	43
Poltva	3-16 / 5-23	<1 / <1-1	19-29 / 32-44	7-10 / 39-42	9/17	2/3	5/8	6-7 / 8-9	1/1	2-3 / 3	51
Rata, Solokia, Luga (Lake Svityaz)	<1-1 / <1-1	<1 / <1	<1-6 / <1-22	<1-3 / 3-13	3-11 / 5-30	<1-2 / <1-9	1-3 / 2-8	2-4 / 3-6	<1-2 / 1-4	1 / 1-2	<5
Danube	<1 / <1-1	<1 / <1	<1 / <1	1 / <1-2	6-7 / 13-20	<1 / 1-4	1-2 / 3-5	1-2 / 2-8	2 / 6-9	<1-2 / 2-4	-
Tributaries of the Danube	<1-1 / <1-2	<1 / <1	<1-3 / <1-9	<1-1 / <1-3	3-7 / 4-11	<1-1 / <1-2	1-3 / 1-8	1-7 / 2-17	<1-7 / 1-18	1-4 / 1-6	6
Dniester	<1-1 / <1-1	<1 / <1	<1-1 / <1-3	<1-1 / <1-2	3-6 / 4-11	<1 / <1-1	2 / 3-4	3-8 / 5-24	<1-4 / <1-9	1-3 / 1-4	2
Tributaries of the Dniester, reservoir, estuary	<1-2 / <1-3	<1 / <1	<1-5 / <1-10	<1-2 / <1-12	2-7 / 3-17	<1-2 / <1-6	2-3 / 2-7	<1-7 / 2-17	<1-3 / <1-9	1-2 / 1-3	4
Southern Bug	<1-3 / <1-4	<1 / <1-1	<1-20 / 2-32	<1-8 / 1-22	1-6 / 2-14	<1-11 / <1-16	3-7 / 6-11	3-14 / 4-46	<1-1 / <1-5	1-4 / 2-6	48
Tributaries of the Southern Bug	<1-1 / <1-1	<1 / <1	<1-3 / 1-11	<1-7 / <1-12	1-6 / 2-10	<1-6 / <1-14	2-9 / 3-15	4-13 / 8-31	<1-1 / <1-3	1-6 / 1-8	26
Dnipro	<1 / <1-1	<1 / <1	<1-1 / <1-2	<1-1 / <1-5	2 / 2-5	1-5 / 3-18	<1-2 / 2-6	1-6 / 3-14	<1-2 / <1-9	<1-1 / 1-5	3
Tributaries of the Dnieper	<1-2 / <1-3	<1-1 / <1-1	<1-7 / <1-19	<1-8 / <1-26	<1-15 / <1-41	<1-9 / <1-14	<1-14 / <1-30	<1-15 / 2-42	<1-8 / <1-30	1-8 / 1-10	135
Seversky Donets	<1-1 / 1-2	<1-1 / <1-1	<1-4 / <1-14	<1-8 / 1-18	1-3 / 2-5	<1-2 / 1-10	2-3 / 3-6	2-7 / 4-10	<1-2 / <1-4	1-3 / 1-5	9
Tributaries of the Seversky Donets, reservoirs	<1-3 / <1-4	<1-1 / <1-2	<1-13 / <1-23	<1-12 / <1-18	2-3 / 3-11	1-3 / 2-7	2-10 / 3-18	1-10 / 2-14	<1-2 / <1-4	1-3 / 1-5	61
Rivers of the Azov region	<1-2 / <1-3	<1-1 / <1-10	<1-7 / 2-10	1-16 / 2-26	2-4 / 4-10	1-2 / 1-6	2-10 / 4-21	3-12 / 4-27	<1-1 / <1-3	<1-3 / 1-3	69
Rivers of the Northern Black Sea Coast	<1-2 / <1-4	<1 / <1	<1-2 / <1-4	1-5 / 1-10	<1-4 / 1-6	2-3 / 2-3	2-7 / 3-10	4-9- / 4-18	<1-2 / 1-3	1-3 / 1-4	4
Reservoirs											
Kyiv, Kaniv	<1-1 / 1-2	<1 / <1	1-2 / 2-8	<1-2 / <1-8	1-4 / 2-22	2-5 / 3-16	2-12 / 3-29	5-10 / 9-14	<1-3 / <1-7	<1-2 / 1-5	63
Kremenchug, Kamyanske	<1 / <1-2	<1 / <1	<1-1 / 1-2	<1-1 / <1-3	1-4 / 3-9	3-4 / 4-11	5-9 / 13-16	4-7 / 6-10	<1-1 / 1-3	2-6 / 3-7	26
Dniprovske	<1 / <1-1	-	<1 / <1	<1 / 1-2	2-3 / 3-6	1-2 / 4-10	3-8 / 11-33	3 / 4-7	<1 / 1-2	1-2 / 2-4	10
Kakhovka	<1-1 / <1-1	<1 / <1	<1 / <1-1	<1 / <1	1-2 / 2-3	2 / 4-7	<1-3 / 6-13	1-2 / 3	<1 / 1-5	1 / 1-3	1

* Source: [40].

Danube river basin. In the lower reaches of the river in the points of Reni, Izmail, Vilkove in 2018 there was a slight improvement in water quality due to a decrease in the content of compounds of zinc, manganese, hexavalent chromium. Concentrations of nitrogen, copper, total iron, oil products and phenols remained almost the same as in the previous year. The water quality of the Danube tributaries has not changed significantly due to copper and hexavalent chromium compounds. Below the MPC level, pollution of most rivers with nitrite and zinc nitrogen has been recorded. Pollution of rivers with total iron compounds tends to worsen.

Dniester river basin. In 2018, there were no significant changes in such hydrochemical indicators as petroleum products, phenols, copper and zinc compounds compared to the previous year. In most of the observation points, the concentrations of hexavalent chromium compounds increased, and in the Halych area, the single maximum concentrations reached the level of VZ and amounted to 17–24 MPC.

The water quality of the Dniester tributaries did not change significantly and in most control points remained almost at the level of the previous year. The water quality of the Tysmenytsia River in the Drohobych area has been improved due to a decrease in the content of nitrogen compounds, and manganese compounds in the Dniester Reservoir.

Slightly higher than in the previous year, pollution of the rivers Strvyazh, Tysmenytsia, Luzhanka, Bystrytsia-Solotvynska and the Dniester reservoir with compounds of total iron was observed [40].

The Southern Bug River Basin. The high content of mineral nitrogen compounds is not typical for the observation points of the Southern Bug River. However, it should be noted a wide range of fluctuations of ammonium nitrogen compounds from 0.13 mgN / DM ^{3} to 12.36 mgN / DM ^{3} and nitrite nitrogen - from 0.002 mgN / DM ^{3} to 0.300 mgN / DM ^{3}. As in previous years, the maximum values are recorded in the riverbed below the city of Khmelnytsky, especially for ammonium nitrogen compounds, where the average annual content in 2018 exceeded the MPC by 20 times, the maximum - 32 times.

In 2018, the content of oil products in the area of Vinnytsia decreased at the checkpoints of the Southern Bug. Concentrations of hexavalent chromium compounds and zinc increased in most parts of the river. The maximum single concentrations of hexavalent chromium and zinc were recorded in the line of sight. Oleksandrivka and were at the level of 46 MPC and 16 MPC, respectively.

Water quality deteriorated somewhat in most water bodies of the Southern Bug due to ammonium nitrogen compounds, and in the Ingul River - due to nitrite nitrogen compounds. In addition, river water quality has improved in terms of manganese compounds [40].

Dnieper river basin. In the water of the Dnieper River in the cities of Kherson and Nova Kakhovka in 2018 there was a low content of nitrogen compounds, petroleum products, phenols, synthetic surfactants (SPAR). The average annual concentrations did not exceed the MPC level, and the maximum ranged from 1 to 3 MPC.

The most polluted part of the Dnieper River is the area near the village. Nedanchichi, where almost all pollutants exceed the relevant standards.

Rivers. According to observations, the oxygen regime of the rivers was generally satisfactory, but two cases of VZ were recorded in terms of the content of dissolved oxygen in the water - on the Ustya River near the city of Rivne.

In the water bodies of the Dnieper, the average annual concentrations of major pollutants (in units of MPC) reached [40]: for compounds of ammonium nitrogen 7 MPC, nitrogen nitrite and total iron - 8, zinc - 9, manganese - 14, copper and hexavalent compounds - 15, phenols - 8 MPC. The average annual concentrations of petroleum products did not exceed the level of the relevant standards.

In the water of most rivers there was some decrease in the content of ammonium nitrogen compounds, copper, zinc, manganese and hexavalent chromium compounds.

One-time maximum concentrations of ammonium nitrogen with exceeding the MPC by 12–19 times were observed at the Styr, Sluch, and Trubizh rivers.

The average and maximum concentrations of copper compounds in the water of most rivers decreased slightly. But in the water of the Stokhid River near the village of Lyubeshiv, the content of copper compounds is still quite significant. The maximum concentration exceeded the maximum concentration limit 41 times, and in the previous year in this water body the excess was recorded 56 times.

The content of zinc compounds remains quite stable with slight fluctuations in average and maximum concentrations. An increase in the maximum concentrations to 14 MPC was recorded in the water of the Ubort River.

In such water bodies as Styr, Ubort, Oster, Gnilopyat, Irsha, Irpin, Unava, Sula, Tyasmin, Psel, Khorol, Vorskla, Ingulets there was a decrease in the content of manganese compounds, although in most rivers of the Dnieper manganese pollution remains. significant. The maximum single concentration of manganese compounds at the level of 30 MPC was observed in the water of the Sluch River near Sarny.

The concentrations of hexavalent chromium compounds in the Trubizh River in both sections of the village significantly decreased . Baryshivka on average and maximum content from 17-18 MPC to 6 MPC and from 87-93 MPC to 12 MPC, respectively. Thus in water of the river the Diet - with. Mutin content of hexavalent chromium (average and maximum) increased and exceeded the MPC by 15 and 42 times, respectively, and this is the highest recorded concentration of hexavalent chromium compounds in the rivers of the Dnieper basin.

Pollution of the rivers of the Dnieper by compounds of total iron remains without significant changes. As in previous years, significant contamination with total iron compounds was observed in the water of the Ubort River near the village of Ambrosia. The maximum concentration of this chemical reached 30 MPC .

There were no significant changes in the pollution of the Dnieper tributaries with nitrite nitrogen compounds, phenols, sulfates [40].

Reservoirs. Monitoring of surface water pollution was carried out at Kyiv, Kaniv, Kremenchug, Kamyansk, Dnipro and Kakhovka reservoirs [40] . According to observations, the average content of dissolved oxygen in water was satisfactory and was in the range of 8.42–10.37 mgO_2/ dm^3.

The main pollutants of the Dnieper cascade of reservoirs, as in previous years, are compounds of heavy metals (compounds of manganese, copper, zinc, chromium hexavalent, total iron), the content of which constantly exceeded the level of fishery standards.

In the points of Kyiv, Kamyansk, Dnieper (above Zaporizhia) reservoirs in the reporting year there was an increase in the water content of manganese compounds. At the same time, water quality improved due to a decrease in the concentrations of manganese compounds at the points of the Kaniv Reservoir - Ukrainka and Rzhyshchiv, Kremenchug - mm. Cherkasy Svitlovodsk, Dniprovskoho - the cities of Kamyanske, Dnipro.

In all points of the Dnieper reservoirs the content of copper compounds exceeded the permissible standards. In Kyiv, Kaniv (above Ukrainka), Kremenchug (Cherkasy) reservoirs, the level of water pollution by copper compounds has decreased.

Concentrations of hexavalent chromium compounds increased slightly in the Kremenchug and Kamyansk reservoirs, but the highest level of hexavalent chromium contamination was observed in the Kyiv and Kaniv reservoirs.

Compared to the previous year, the concentrations of total iron in Kaniv and Kremenchug reservoirs decreased.

The water quality of most reservoirs in terms of zinc compounds and phenols remained almost at the level of last year. As in previous years, the reservoirs have a low content of nitrogen compounds and petroleum products [40].

Seversky Donets River Basin. The Seversky Donets River is intensively used in economic activities. In the basin there are enterprises that use the waters of the Seversky Donets and accordingly discharge them into the river with varying degrees of purification.

The salt composition of the river water is dominated by sulfates, chlorides, bicarbonates and the water is quite mineralized. The average mineralization varied from 649 to 1434 mg / DM^3. The maximum content of dissolved salts was observed in the water of the rivers Seversky Donets, Bilenka (Lysychansk), Krasna (Kreminna), Borova (Severodonetsk).

In the reporting year, in the points of the Seversky Donets River (Zmiiv, Balakleya, Izyum) and in most rivers of the basin, an increase in the level of ammonium nitrogen pollution was recorded. The average value reached 5.23 mgN / DM ^{3} (13.4 MPC), and the maximum single value was 8.94 mgN / DM ^{3} (22.9 MPC) (Udy River - Kharkiv).

In areas of the river - with. Ogirtseve, Balakleya, Izyum, on the tributaries - Uda, Lopan, Kharkiv, Oskil there was a tendency to increase the content of total iron compounds.

Concentrations of nitrogen compounds of nitrite, manganese, copper, zinc, hexavalent chromium, phenols and oil products remain almost at the level of the previous year.

Rivers Priazovya. The surface waters of the Azov Sea are among the most mineralized waters. The average amount of dissolved salts in the waters of the basin exceeded 4000 mg / DM ^{3}, while the fluctuation limits were wide - from 853 to 4702 mg / DM ^{3}. The maximum concentrations of the sum of ions were recorded in the rivers Kalmius and Kalchyk.

The composition of river water belongs to the sulphate-sodium. One of the main reasons for the high concentrations of sulfates is the natural conditions of the area. Maximum concentrations of sulfates were observed in the water of the rivers Kalmius and Kalchyk and ranged from 1018 to 2190 mg / DM ^{3}. In 2018, 40 cases of high sulfate water pollution were recorded in these rivers. In the same rivers the largest number of cases of high pollution by nitrite nitrogen compounds was recorded - 11 cases.

The highest level of manganese pollution was observed in the sections of the Molochna River (below Melitopol), Lozuvatka River, Kalchyk River (Mariupol). At these points, the maximum concentrations exceeded the relevant standards by 12–21 times.

Compared to the previous year, in most rivers of the basin there was an increase in the average and maximum content of hexavalent chromium compounds [40].

Hydrobiological assessment of water quality. Observations of land surface water quality by hydrobiological indicators were carried out [40] on 43 rivers and 7 reservoirs, in 91 points, 173 lines, 195 verticals. The number of analyzed samples was 1434. The data on the state of hydrobiocenoses showed that the average values of the saprobity index for all water bodies, as last year, there was moderate water pollution - class 3 water quality. But some observations often showed a much higher level of pollution. In general, water quality class 3 is moderately polluted. At the same time, compared to the surface waters of other river basins in Ukraine, the surface waters of Donbass and Priazovye remain polluted, but in 2018 there was some improvement in the ecological status of the rivers of Donbass [40].

Transboundary surface water pollution. Rivers on the *western border* with Poland: Western Bug - 3 km below the village. Litovezh, Rata - 0.5 km below the village. Mezhyrichchya, Solokiya - within the city of Chervonohrad, Luha - 3

km below the city of Volodymyr-Volynskyi. In 2018, the deterioration of water quality was recorded due to an increase in the content of nitrite nitrogen compounds in the Western Bug River below the village. Litovezh and in the river Solokiya - Chervonohrad. Maximum concentrations reached 19 and 13 MPC (VZ level). Slightly higher than in the previous year, the pollution of the Luha River was observed in the lower line of observations with ammonium and zinc nitrogen compounds. The maximum concentrations at the level of 16 were recorded; 22 MPC and 9 MPC respectively. In the rivers Rata, Luha, and the Western Bug (the village of Litovezh), the level of pollution by total iron compounds has increased. The concentrations of ammonium nitrogen at the point of the Western Bug River below the village decreased slightly. Litovezh, copper compounds - in the rivers Rata and Solokia. Signs such as hexavalent chromium compounds and phenols did not change significantly. According to hydrobiological indicators - 3rd class of water quality, moderately polluted waters [40].

State of pollution of the Danube rivers (Reni, 54 miles, 115 km, Izmail, Kiliya, Vilkove), Tisza - (0.5 km below Rakhiv, 10 km below Tyachiv, within the town of Vylok, within the town of Chop), Latorytsia - 1 km below Chop, Uzh - 2 km below Uzhhorod, Siret - 0.5 km below Storozhynets, Prut - 7 km below Chernivtsi, Yalpug Lakes - s. Kosa, Kugurlui - s. Nova Nekrasivka in border crossings with *Moldova, Romania, Hungary, Slovakia* . In the lower reaches of the river in the points of Reni, Izmail, Vilkove in 2018 there was a slight improvement in water quality due to a decrease in the content of compounds of zinc, manganese, hexavalent chromium. Concentrations of nitrogen, copper, total iron, oil products and phenols remained at the level of the previous year. Pollution of rivers with total iron compounds tends to worsen. The improvement of water quality occurred in the rivers Siret and Prut (below Chernivtsi) due to the decrease in the content of zinc compounds, in the river Siret also hexavalent chromium compounds . In the transboundary points of the Danube River, the content of compounds of nitrite nitrogen and ammonium nitrogen, phenols was stable and low. According to hydrobiological indicators - 3rd class of water quality - moderately polluted [40] .

During the year, the ecological situation in all observation sites of the Tisza River was stable and prosperous. The river waters were mostly clean, quality class 2, the deterioration of macrozoobenthos was insignificant and short-term. During the year, the water quality of the Uzh River (Uzhhorod) corresponded to the 2nd class, clean water, in September there was a sharp deterioration of the ecological situation in the area 2 km below the city: 4th quality class - polluted water. The ecological condition of the bottom groups of the Prut River was stable and prosperous. In the area 7 km below Chernivtsi, the state of the aquatic ecosystem according to the development of macrozoobenthos corresponded to the 1-2nd quality class - clean water [40] .

In the border checkpoints with Moldova (Dniester - Mohyliv-Podilskyi, Dniester estuary - Belgorod-Dniesteri) the content of total iron compounds , hexavalent chromium and phenols remained almost at the level of last year .

Concentrations of oil products in the Dniester estuary increased slightly, but they did not exceed the corresponding maximum concentration limits. The average annual content of nitrogen compounds was below the sanitary and hygienic standards, and the maximum was almost at the level of the MPC.

Pr otyahom, the water in the middle reaches of the Dniester answered 2 - 3rd grade quality - clean, moderately polluted water. The ecological condition of the river, in addition to the impact of pollution, is also due to the peculiarities of the hydrological and thermal regime [40] .

In the north and north-eastern border with Belarus and Russia in the river basins of the Dnieper (Dnipro - p. Nedanchychi, Solders ' Five - p. Rechitsia, Stokhid - town . Lyubeshiv, Stir - 1.5 km below the city. Luck, Gorin - 1 km below the town of Orzhiv, Ubort - the village of Perga, Desna - 0.5 km above the town of Novgorod-Siversky, the Sejm - the village of Mutino, Psel - 0.5 km above the town of Sumy, Vorskla - 2 km above the village of Chernechchyna) and in the Kyiv Reservoir - 1 km above the city of Chernobyl, the level of pollution of water bodies compared to the previous year has changed slightly in such indicators as nitrogen, total iron, manganese, copper, hexavalent chromium. Compared to 2017 in the rivers of the Dnieper - with. Nedanchychi, Pripyat, Stokhid, Styr, the average annual content of ammonium nitrogen compounds increased to 3 MPC, and the maximum single concentration reached 12 MPC at the point of the Styr River - Lutsk. Slightly higher than in the previous year, water pollution of the Stokhid, Styr, and Ubort rivers with total iron compounds was observed. The highest average annual concentration of this chemical was 8 MPC, and the maximum - 30 MPC and recorded at the point of the river Ubort - p. Ambrosia. The most polluted with zinc compounds is the Ubort River below the village. Perga and the Dnieper River - with. Nedanchichi, where single concentrations exceeded the MPC by 14 - 18 times, respectively.

In 2018, there were 8 cases of manganese compounds in the following points: Pripyat - p. Richytsia (11 MPC), Ubort - village Perga (12; 21 MPC), Vorskla river - s. Chernechchyna (23; 27 MPC) and in the Kyiv Reservoir - above the city of Chornobyl (11.1; 11.2; 11.3 MPC).

Deterioration of water quality was due to an increase in the content of hexavalent chromium compounds in the rivers Dnipro (Nedanchychi *)* , Pripyat, Styr, Seym, Psel, Kyiv Reservoir (Chornobyl). In the water of the Sejm - with. Mutin content of hexavalent chromium (average and maximum) exceeded the MPC by 15 and 42 times, respectively, and this is the highest recorded concentration of hexavalent chromium compounds in cross-border points.

Along with this, some decrease in the concentrations of copper compounds was recorded in the water of the Stokhid River near the village of Lyubeshiv, but the maximum concentration exceeded the MPC by 41 times and the content of copper compounds still remains quite high. Decreased levels of water contamination copper compounds in water rivers Gorin, Ubort, nitrogen compounds and total iron - p. Vorskla, spol kami manganese - years. Dnieper Stir, Psel, hexavalent chromium -

p. Gums. Concentrations of phenols and oil products at cross-border transfer points have not changed significantly. Water quality corresponded to the 3rd class.

The water quality of the Pripyat River corresponded to the 3rd class . The ecological situation on the Psel River is stable. In the spring, the water quality of the Styr River corresponded to the 2-3rd class - clean and moderately polluted water, later there was a deterioration of the saprobiological situation - in October, 1 km below the city - the 5th class of quality, dirty water. P rotyahom year in the district. Gorin observed prosperous environmental situation, 1-2 grade water quality, clean water. According to the results of hydrobiological observations, the state of water cenoses of the Kyiv Reservoir corresponded to the 3rd class of water quality - moderately polluted waters [40] .

In the rivers and settlements *on the eastern border* (pp. Uda - 10 km above the city. Kharkiv, Lopan - 1 km above c. Kharkiv, Kharkiv -in within the city. Kharkiv Oskol - 1 km above the city. Kupiansk) the overall picture of pollution in 2018 did not change significantly. There is a tendency of a slight increase in the content of total iron compounds in rivers. The increase in concentrations of manganese compounds occurred in the water of the Uda River above the city of Kharkiv. The recorded maximum concentration of manganese exceeded the MPC by 12 times (VZ level). In the Lopan River, the maximum content of copper compounds increased to 11 MPC, and the concentrations of zinc and manganese compounds in the Oskil River increased slightly. At the same time, the content of manganese compounds in the water of the Lopan and Kharkiv rivers decreased.

The water quality of the Uda River according to phytoplankton corresponded to the 3rd - 4th class - moderately polluted - polluted waters. The quality of zooplankton waters corresponded to the 3rd - 4th, 4th class - polluted waters. In June 1 km above Kharkiv, the water quality corresponded to the 3rd - 4th class , in October - 2. According to the planktonic indicators of the Oskil River, the 3rd class of water quality. The ecological condition of the bottom layers of water according to the indicators of macrozoobenthos development was prosperous and stable, 2nd - 3rd class of water quality [40] .

Radioactive contamination of surface waters . Indicators of radioactive contamination of surface waters were determined [40] in 9 areas on the rivers Dnieper, Desna, Danube, Southern Bug. Observations of radioactive contamination of the Dnieper reservoirs are carried out by hydrometeorological organizations mainly in their lower parts (in the upper reaches of hydroelectric power stations). Within the framework of the radioecological monitoring program in the zones of influence of the operating NPPs, the levels of radioactive contamination of surface waters were determined on the rivers Styr, Horyn, Pivdennyi Bug and Arbuzynka.

The radiation status of water bodies in the Dnieper basin in 2018, as in other years after the Chernobyl accident, was determined mainly by man-made radionuclides washed away from watersheds that were contaminated as a result of accidental

emissions. Since at present the main route of radionuclide inflow to the Kyiv reservoir (with subsequent migration along the cascade of Dnieper reservoirs) is the waters of the Pripyat River, the conditions of surface runoff formation in its basin (primarily within the exclusion zone) have a decisive impact on radiation state of the entire Dnieper cascade of reservoirs.

Hydrometeorological conditions observed in the 30-km exclusion zone in 2018 did not complicate the radiation situation on the water bodies of the zone and the Dnieper water system. The established critical marks for flooding of the most polluted areas of the floodplain, which are not protected by water protection dams, were not exceeded. Such hydrological conditions contributed to the fact that the content of radionuclides in the water of the Pripyat River in the Chernobyl area in 2018 was one of the lowest for the entire period of observations after the accident. According to SSE " Ecocenter " DAZV of Ukraine, the volume activity of strontium-90 in river water during the year ranged from 28 to 260 Bq / m ^{3} and averaged 91 Bq / m ^{3} (in 2017 - 68 Bq / m ^{3}); the volume activity of cesium-137 was in the range of 12 - 214 Bq / m ^{3} with an average value of 54 Bq / m ^{3} (in 2017 - 35 Bq / m ^{3}) (Table 2.22) .

Table 2.2 2

Radionuclide content in surface waters of Ukraine in 2018 *

Object and point observation	Concentration, Bq / m ^{3}					
	cesium-137[18]			strontium-90		
	min	max.	**among.**	min	max.	**among.**
Pripyat - Chernobyl[19]	12.0	214.0	**54.0**	28.0	260.0	**91.0**
Dnipro river - village Nedanchichi	1.8	10.9	**3.9**	4.5	8.1	**6.3**
Desna river - Chernihiv	0.60	5.1	**1.7**	4.6	7.1	**5.6**
Kyiv Air Force - Vyshhorod	2.4	15.4	**8.2**	30.2	40.4	**35.4**
Kaniv vdsh.- Kyiv	1.7	20.6	**9.9**	24.3	34.0	**28.2**
Kaniv vdsh.- m. Kaniv	1.0	6.1	**3.9**	14.0	21.8	**16.9**
Kakhovka air defense. - Nova Kakhovka	0.40	1.6	**0.68**	16.2	20.2	**18.6**
Dnieper-Bug estuary - Ochakiv	2.4	4.2	**3.4**	11.0	13.5	**12.1**
Southern Bug - Mykolayiv	0.5	6.0	**2.0**	5.3	7.2	**6.2**
Danube - Izmail	0.9	9.2	**2.7**	6.8	10.2	**8.8**
Styr River, RNPP zone of influence	2.61	4.01	**3.19**	4.5	5.7	**5.1**
Goryn River, KhNPP zone of influence	2.60	3.99	**3.21**	4.5	6.8	**6.0**
Southern Bug, zone of influence of the SUNPP	0.5	0.8	**0.62**	6.8	9.1	**8.2**

Arbuzynka River, zone of influence of the SUNPP	0.5	0.7	**0.60**	6.3	7.9	**7.1**
Kakhovka VDSH., Zone of influence of ZNPP	0.5	0.6	**0.58**	12.4	18.2	**15.7**

* Source: [40].

The removal of strontium-90 by the waters of the Pripyat River in the Chernobyl area in 2018 was 1.15×10^{12} Bq (31.1 Ki), which is 60 % more than the removal in 2017. The annual removal of cesium-137 was equal to 0.64×10^{12} Bq (17.3 Ki) - 60 % more than the previous year's removal. The removal of radionuclides strontium-90 and cesium-137 in 2018 was one of the lowest for the period of observations after the accident, but the highest in the last five years. A certain amount of radionuclides strontium-90 and cesium-137 enters the Dnieper reservoirs with water runoff of the Upper Dnieper and Desna, but the contribution of these rivers to the radioactive contamination of the cascade compared to the Pripyat River is much smaller [40].

The total contribution of the Upper Dnieper and Desna to the pollution of the Dnieper reservoirs with strontium-90 and cesium-137 is 0.173×10^{12} Bq (4.67 Ki) and 0.081×10^{12} Bq (2.19 Ki), respectively , which is 12 and 9 % of contribution of the Pripyat River together with the rivers Uzh and Braginka.

The content of radionuclides in the waters of the Upper Dnieper (Nedanchychi) and Desna (Chernihiv) in 2018 was at the pre-emergency level [20] and was one of the lowest for the entire period of observations after the Chernobyl accident [40]: concentrations of strontium-90 in water averaged 6.3 and 5.6 Bq / m^3, respectively (in 2017 - 6 , 5 and 5.7 Bq / m^3); cesium-137 concentrations were equal to 3.9 and 1.7 Bq / m^3, respectively (in 2017 - 3.2 and 0.94 Bq / m^3).

In the cascade of Dnieper reservoirs under the influence of various natural factors is the transformation of runoff of radionuclides coming from river waters from contaminated areas, and there is a gradual decrease in their concentrations due to natural processes of self-purification of water masses. During the passage of polluted Pripyat waters from the city of Chornobyl through the Kyiv Reservoir, the average annual concentration of strontium-90 decreased 2.6 times and in the upper reaches of the Kyiv HPP (Vyshhorod) averaged 35.4 Bq / m per year. ^{3}. Down the Dnieper, due to the dilution of the side tributaries with cleaner waters, the strontium-90 content in the water continued to decrease and in the Kakhovka Reservoir near Nova Kakhovka it averaged 18.6 Bq / m^3 per year , which is 4.9 times less than in the water of Pripyat (in 2017 , similar figures were 34.6 Bq / m^3 in the Kyiv reservoir and 19.2 Bq / m^3 in the Kakhovka).

The decrease in the concentration of cesium-137 along the Dnieper is more intense than strontium-90. In addition to dilution, sedimentation processes play a crucial role in this (a significant part of cesium-137 accumulates in the bottom sediments of reservoirs). In 2018, the average concentration of cesium-137 in the Kyiv reservoir was 8.2 Bq / m^3, which is 6.6 times less than in the Pripyat water; in the Kakhovka Reservoir it was already 0.68 Bq / m^3, ie it was 79 times less than the content of this radionuclide in the water of the Pripyat River (in 2017, 9.9 and 0.70 Bq / m^3, respectively).

In the Dnieper-Bug estuary near the town of Ochakiv, the content of strontium-90 averaged 12.1 Bq / m ^{3} per year , the content of cesium-137 - 3.4 Bq / m ^{3} (in 2017 , the corresponding figures were 11.1 and 3.3 Bq / m ^{3}).

In general, the content of strontium-90 in water ah Dnieper cascade in 2018 was at the level indicators in 2017, the contents of cesium-137 - was close or deviated by 15 - 40% on the previous year.

Volume activity of radionuclides in the waters of the Southern Bug and Danube rivers (in the Ukrainian section) in recent years has fluctuated within long-term values and was also close to pre-emergency levels. The average content of strontium-90 in the water of the Danube near the city of Izmail in 2018 was 8.8 Bq / m ^{3} , cesium-137 - 2.7 Bq / m ^{3} (in 2017, respectively, 9.4 and 2.0 Bq / m ^{3}); in the water of the Southern Bug near the town of Mykolaiv, the concentration of strontium-90 was 6.2 Bq / m ^{3} , cesium-137 - 2.0 Bq / m ^{3} (in 2017, 6.8 and 2.2 Bq / m ^{3} , respectively) .

Volumetric activity of strontium-90 in surface waters in the zones of influence of Rivne (Styr), Khmelnytsky (Goryn), South-Ukrainian (Southern Bug, Arbuzynka) and Zaporizhia (Kakhovka reservoir) nuclear power plants was in 2018 in in the range of 4.5 - 18.2 Bq / m ^{3} . The volume activity of cesium-137 in surface waters in the zones of NPP impact was 0.5 - 4.01 Bq / m ^{3} .

Thus, in 2018, the controlled water bodies did not exceed the permissible concentrations of radionuclides set in the " Permissible levels of radionuclides cesium-137 and strontium-90 in food and drinking water " (DR-2006).[21] .

Dynamics of pollution of the Dnieper reservoirs cesium-137 and strontium-90 in 1987 - 2018 indicates that Mr. ezvazhayuchy at constant tendency to reduce pollution in some years and seasons observed significant fluctuations in the concentrations of radionuclides due to complications of radiation situation in the water about of exclusion zone during high spring floods, rain floods, etc.

The above results, taking into account the fact that the Chornobyl Exclusion Zone is constantly working to prevent the removal of radionuclides in the Kiev reservoir, give reason to predict that the situation with pollution of the Dnieper cascade by man-made strontium-90 and cesium-137 will remain stable with a tendency to state of surface waters of Ukraine [40] .

Ecological condition of the Black and Azov seas. Monitoring of seawater quality by hydrochemical indicators in 2018 was carried out in the north-western part of the Black Sea at 29 stations of the basic network of hydrometeorological organizations, in the Sea of Azov - at 26 stations of the basic network and 6 stations in the area of soil dumping [40] .

In the *Black Sea,* the observation area covered the mouths of the main tributaries of the Danube Delta, the Dry Estuary and the Black Sea inlet area, the port area of Odessa, the mouth of the Southern Bug, the Bug estuary, the mouth of the Dnieper and the Dnieper estuary. The state of the Black Sea waters in the observation areas was characterized as stable. The average annual concentrations of most pollutants were significantly lower than the maximum permissible standards for seawater. The average annual concentrations of oil products (NP) in the mouth of the Southern Bug, the Bug

estuary, the mouth of the Dnieper and the Dnieper estuary were in the range from 1.2 to 1.4 MPC, in the port of Odessa - 1.0 MPC; in all other areas of observation, the mean concentrations were below the MPC level. The maximum content of NP at the level of 5.0 MPC was observed in the water area of the port of Odessa, at the level of 2.0-3.0 MPC - in the Dnieper estuary, the mouth of the Dnieper and the mouth of the Southern Bug. Compared to the previous year, the average content of NPs has hardly changed (Table 2. 2 3).

The content of synthetic surfactants (SPAR), as in the previous year, in all areas of observation was low, the average concentrations did not reach the level of MPC. Maximum concentrations at the level of 1.5 MPC were recorded in the waters of the port of Odessa, 1.0 MPC - in the area of the Dry Estuary.

The highest average content of phenols (sum) in the range from 3 to 6 MPC was observed in the mouth of the Southern Bug, the Bug estuary, the mouth of the Dnieper and the Dnieper estuary. In the delta and delta watercourses of the Danube and the port of Odessa, the average content of phenols was at the level of 1.0 MPC, the maximum content - at the level of 4-6 MPC, in the area of the Dry Estuary and the inlet channel and treatment facilities was at the level of "not detected" . Compared to the previous year, phenol concentrations have not changed.

The average content of hexavalent chromium in the Danube water remained at the level of the previous year and amounted to 2 MPC. The maximum concentration - 8 MPC was observed in December below the city of Izmail. In general, 93% of hexavalent chromium samples reached and exceeded the maximum concentration limit.

The average and maximum content of ammonium nitrogen in almost all observation areas, as in the previous year, was below the level of sanitary and hygienic standards. Only in the waters of the mouth of the Southern Bug the maximum concentration of ammonium nitrogen at the level of 3.3 MPC was observed.

Table 2. 2 3

Pollution of annual and sea waters according to the observations of hydrometeorological organizations in 2018 *

Controlled areas of the sea	*Annual concentrations / maximum (minimum for oxygen) values*										
	Petroleum products, MPC	*SPAR, MPC*	*Phenols, MPC*	Chromium (Cr^{6+}), *MPC*	*Ammonium nitrogen, MPC*	*General nitrogen, mg / dm³*	*General phosphorus, mg / dm³*	*Nitrite nitrogen, MPC*	*Nitrate nitrogen, MPC*	*Dissolved oxygen,% saturation*	*Hydrogen sulfide, ml / dm³*
Black Sea											
Danube Delta[22]	n.v./ <1	<1 / <1	1.0 / 4	2.0 / 8	<□1 / <1	-	0.11 / 0.18	1.0 / 2.4	<1 / <1	88/77	-
Delta watercourses [1]	n.v./ <1	<1 / <1	1.0 / 5	-	<□1 / <1	3.23 / 4.90	0.11 / 0.17	1.0 / 2.3	<1 / <1	90/77	-
The mouth of the Southern Bug River, the Bug Estuary [1]	1.2 / 3.0	<1 / <1	3/21	-	<1 / 3.3	1.81 / 3.69	0.20 / 0.59	<1/4	<1 / <1	92/30	-
The mouth of the Dnieper River [1]	1.4 / 3	<1 / <1	5/22	-	<□1 / <□1	0.86 / 1.16	0.15 / 0.37	<1 / <1	<1 / <1	85/41	-
Dniprovsky estuary[23]	1.4 / 2.0	<1 / <1	6/16	-	<□1 / <□1	0.66 / 1.58	0.13 / 0.37	<1 / <□1	<1 / <1	95/74	-.
Dry estuary [2]	<1 / 1.2	<1 / 1.0	n.v./n.v.	-	<□1 / <□1	0.18 / 0.42	0.05 / 0.11	<1 / <1	<1 / <1	74/47	n.v.
Input channel area [2]	<1 / 1.0	<1 / <1	n.v./n.v.	-	<□1 / <□1	0.18 / 0.42	0.05 / 0.10	<1 / <1	<1 / <1	74/50	n.v.
Water area of the port of Odessa [2]	1.0 / 5	<□1 / 1.5	1.0 / 6	-	<□1 / <□1	0.05 / 0.08	0.03 / 0.06	<1 / <1	<1 / <1	101/96	n.v.
Sea of Azov											
PnZ part of Taganrog Bay area of Mariupol [2] (st. I cat)	<1/14	<□1 / <1	1.1 / 4	-	<1 / 2.4	1.32 / 3.07	0.05 / 0.38	1.5 / 13.0	<1 / <1	102/51	n.v.
NW part of Taganrog Bay External raid (Article II cat.) [2]	<1/5	<□1 / <1	<□1 / 1.7	-	<1 / <1	0.94 / 1.63	0.03 / 0.06	<1 / 2.1	<1 / <1	106/52	n.v.
Berdyansk Bay [2]	n.v./n.v. **	<□1 / <□1	<□1 / <□1	-	<1 / <1	0.68 / 1.09	0.01 / 0.02	<1 / <1	<1 / <1	97/75	n.v.
Strait of Tonka [2] (Art. I executioner)	-	-	-	-	-	-	-	-	-	102/88	-

* Source: [40].

** n.v. - not detected or below the definition; - no observations were made.

Contamination of bottom sediments. Observations of contamination of the upper layer of bottom sediments with phenols (sum) and oil products were carried out in March and September in the Dry Estuary, in June and September - in the waters of the port of Odessa [40] . The average and maximum content of phenols in the waters of the port of Odessa was 2 μg / g of absolutely dry soil. In the waters of the Dry Estuary, the average content was 0.14, the maximum - 0.20 μg / g of absolutely dry soil. The average concentration of oil products in bottom sediments in the waters of the port of Odessa was 0.07, the maximum concentration - 0.11 mg / g of absolutely dry soil. In the Dry Estuary, the average concentration was 0.06 and the maximum was 0.07 mg / g of absolutely dry soil.

In *the Sea of Azov,* observations were made in Berdyansk Bay and in the northwestern (NW) part of Taganrog Bay (coastal areas of the sea in the waters of Mariupol and its outer raid), in the Tonka Strait [40] . In the sea waters of the Sea of Azov there was one case of high pollution with nitrite nitrogen at station 34 (northwestern part of the Taganrog Bay, the mouth of the river Kalmius) - 0.260 mg / DM ^{3} (13.0 MPC). The average content of NP in the observation areas was less than the MPC. The maximum content of NP reached the level of 14 MPC in March on the surface horizon near the mouth of the river Kalmius (Taganrog Bay area), at the level of 5.0 MPC - in the area of the external raid of Taganrog Bay.

Contamination of bottom sediments. Observations of pollution of bottom sediments by oil products and phenols (amount) in 2018 were conducted in the north-western part of the Taganrog Bay in June and September [40] . The average concentration of oil products in the bottom sediments in the north-western part of the Taganrog Bay was at the level of "not detected", the maximum concentration reached 0.01 mg / g of absolutely dry soil. The average content of phenols (sum) was 1.99 μg / g of absolutely dry soil, the maximum - 3.66 μg / g of absolutely dry soil. Compared to the previous year , the average content of oil products and phenols in bottom sediments increased slightly.

In terms of regions, the largest polluters of wastewater discharged into water bodies in 2017 were the city of Kyiv (28.6 % of the total), Dnipropetrovsk (23.0 %) and Donetsk region (19.9 %) (Table . 2.24).

Table 2.24

List of regions that are the biggest polluters of the environment in terms of discharges of polluted wastewater into water bodies in 2017 *

Regions[24]	Volume of polluted wastewater , million m ^{3}	as a percentage of the total
m. Kyiv	284.3	28.6

Regions[24]	Volume of polluted wastewater, million m ^{3}	as a percentage of the total
Dnipropetrovsk region	230,293 th most common	23.0
Donetsk region	199,391	19.9
Lviv region	70,809 th most common	7.1
Zaporozhye region	64,173 th most common	6.4
Odessa region	32,657 th most common	3.2
Sumy region	23,033 th most common	2.3
Mykolaiv region	22,357 th most common	2.2
Luhansk region	18,465 th most common	1.8
Chernihiv region	13,944 th most common	1.4
Kharkiv region	9,818 th most common	1.1
Rivne region	4,498 th most common	0.4
Cherkasy region	4,487 th most common	0.4
Transcarpathian region	4,235 th most common	0.4
Ternopil region	2,604 th most common	0.3
Zhytomyr region	1,996 th most common	0.25
Kiev region	1,959 th most common	0.2

Regions[24]	Volume of polluted wastewater , million m ^{3}	as a percentage of the total
Chernivtsi region	1,873 th most common	0.2
Poltava	1,568 th most common	0.2
Kirovograd region	1,328 th most common	0.2
Ivano-Frankivsk region	1,102 th most common	0.1
Kherson region	0.912	0.1
Vinnytsia region	0.833 th most common	0.1
Khmelnytsky region	0.609	0.1
Volyn region	0.106	0.05
Total	**997,35**	**100.0**

* Source: [26].

In general, the main challenges for ensuring water safety in Ukraine are recognized, in particular [23]:

1. Problems of availability of sufficient water resources due to:

a) natural scarcity or lack of local water resources (as of 2015 in 15 oblasts more than 950 thousand people in 1300 settlements used imported water), which is a consequence of uneven geographical distribution of water resources in Ukraine and deepens in the conditions of natural emergencies or situations both in terms of water quantity (during droughts due to drying and / or lowering of water levels in springs, shallow wells and small rivers) and its quality (pollution or flooding of drinking water sources during floods / floods or due to deterioration of water resources during droughts due to water evaporation and lack of surface and river runoff for sufficient dilution of return waters);

b) inefficient management of water resources (unbalanced distribution of water between water users, excessive water intake, high water consumption, water losses in networks and processes, hydromorphological transformations of natural reservoirs and streams, discharges and emissions of pollutants into the environment) leading to depletion and pollution of water bodies / resources and degradation of aquatic ecosystems, which provide natural restoration (self-purification) of water resources.

2. Problems of ensuring equal rights to drinking water and sanitation:

a) inequality between rural and urban population in terms of access to centralized water supply sources, between different oblasts / regions (in 2015 access to centralized water supply in oblasts differs from 85 % for rural population (in Kherson oblast) - up to 3.7%). Chernivtsi), and the coverage of the urban population by centralized water supply services reached 100% in 5 oblasts - Kyiv, Mykolaiv, Ternopil, Kherson, Cherkasy and Kyiv, the lowest value of this indicator was in Chernihiv oblast - 45.7%;

b) unequal access to centralized drainage systems (only 1.9 % of the rural population and 87.1 % of the urban population have such access);

c) insufficient sewerage of settlements (in Kyiv in 2015 there were no sewerage 346 streets, where about 30 thousand Kyivans lived). All these problems create social and economic inequality (primarily for children in rural schools, internally displaced persons, the population and the military in the zone of military conflict / anti-terrorist operation, large families, low-income families, etc.).

3. Problems of quality and safety of drinking water due to:

a) low quality of water in springs (polluted surface waters, which are a source of drinking water for 80% of the population of Ukraine);

b) outdated technologies of water treatment and / or wastewater treatment;

c) inadequate technical condition of the distribution system, means of water transportation or decentralized water supply systems, lack of best practices in water safety planning and sanitation based on risk assessment throughout the technological chain;

d) significant weakening of state monitoring of water quality and control / supervision of drinking water quality due to administrative reforms (liquidation of the State SES) and moratorium on scheduled inspections in 2014-2017, low capacity of the State Food and Consumer Service to conduct proper control of drinking water quality and safety, easing the requirements of local authorities for wastewater treatment.

4. Increased risks of outbreaks of diseases associated with the use of poor quality drinking water (acute intestinal infections: outbreak in Kiev, Bortnichi district in January 2015, outbreaks in Izmail in June-July 2016); water-nitrate methemoglobinemia (Poltava, Chernihiv, Zaporizhia oblasts), fluorosis (Poltava oblast) or use of water for hygienic needs, bathing in polluted reservoirs, consumption of fish from polluted reservoirs (cholera outbreak in Mariupol in 2011 due to pollution) hygienic conditions or improper wastewater treatment.

2 .4 . Habitats, flora and fauna, specially protected areas and landscape

According to the results of the accounting of territories and objects of the nature reserve fund, submitted by the executive authorities at the local level, ensuring the implementation of state policy in the field of environmental protection, as of 01.01.2018 the nature reserve fund of Ukraine consists of 8296 territories and facilities with a total area of 4.318 million hectares within the territory of Ukraine (actual area 3.985 million hectares) and 402500.0 hectares within the Black Sea (Table 2. 25 -2.27) [15] .

Table 2.25

Objects of the nature reserve fund of Ukraine , units *

List of objects[25]	2012	2014	2015	2016	2017
Objects of the nature reserve fund	**8028**	**8154**	**8184**	**8245**	**8296**
nature reserves	19	19	19	19	19
biosphere reserves	4	4	4	5	5
national nature parks	47	48	49	49	49
reserves	3042	3121	3131	3167	3195
of national importance	309	309	310	320	320
of local significance	2733	2812	2821	2847	2875
natural monuments	3388	3411	3422	3441	3460
of national importance	132	132	134	136	136
of local significance	3256	3279	3288	3305	3324
botanical gardens	28	28	28	28	28
of national importance	18	18	18	18	18
of local significance	10	10	10	10	10
zoological parks	thirteen	thirteen	thirteen	thirteen	thirteen
of national importance	7	7	7	7	7
of local significance	6	6	6	6	6
dendrological parks	54	57	57	58	58
of national importance	19	19	19	20	20
of local significance	35	38	38	38	38
parks-monuments of landscape art	556	562	569	572	572
of national importance	89	89	89	89	89
of local significance	467	473	480	483	483
regional landscape parks	69	80	81	81	82

List of objects[25]	2012	2014	2015	2016	2017
protected tracts	808	811	811	812	815

* Source: [11].

Table 2.26

Area of objects of nature reserve fund of Ukraine , ha *

List of objects	2012	2014	2015	2016	2017[26]
Objects of the nature reserve fund	**3650812.7**	**3716541.1**	**3803131.9**	**3985599.3**	**3985022.4**
nature reserves	201537.9	205295.7	205295.7	206630.6	206630.6
biosphere reserves	252146.1	252146.1	252146.1	479110.8	479110.8
national nature parks	1215805.9	1231031.3	1311637.8	1311637.8	1311637.8
reserves	1352792.1	1379278.6	1383514.9	1389674.8	1386781.9
of national importance	460067.3	460067.3	460109.3	464248.9	464248.9
of local significance	892724.8	919211.3	923405.6	925425.9	922533.0
sights of nature	28686.0	28785.2	28833.4	29769.2	29982.5
of national importance	5776.4	5776.4	5821.8	6311.7	6311.7
of local significance	22909.6	23008.8	23011.6	23457.5	23670.8
botanical gardens	1990.2	1990.2	1990.2	1990.2	1990.2
of national importance	1863.2	1863.2	1863.2	1863.2	1863.2
of local significance	127.0	127.0	127.0	127.0	127.0
zoological parks	453.9	453.9	453.9	453.9	453.9
of national importance	111.5	111.5	111.5	111.5	111.5
of local significance	342.4	342.4	342.4	342.4	342.4
dendrological parks	1774.6	1786.8	1786.8	1782.9	1782.9
of national importance	1472.9	1472.9	1472.9	1469,0	1469,0
of local significance	301.7	313.9	313.9	313.9	313.9
parky- monuments of landscape art	13127.2	13180.3	13251.5	13288.7	13255.8
of national importance	5704.4	5713.5	5718.0	5720.2	5720.2
of local significance	7422.8	7466.8	7533.5	7568.5	7535.6
regional landscape parks	758553.5	779902.6	786025.3	786025.3	786492.1

List of objects	2012	2014	2015	2016	2017[26]
protected tracts	95695.8	98670.6	97845.0	97859.9	99528.7
NPF objects that are part of the territories of other NPF objects	271750.5	275980.2	279648.7	332624.8	332624.8
The share of the actual area of the NPF in the total area of the country,%	6.0	6.2	6.3	6.6	6.6

* Source: [11].

Table 2.27

Area of lands of reserves and national natural by regions, ha (at the end of 2017) *

Regions	Total area, ha	Including		
		nature reserves	biosphere reserves	national nature parks
Ukraine	**1997379.2**	**206630.6**	**479110.8**	**1311637.8**
Autonomous Republic of Crimea	74755.1	63855.1	-	10900.0
Vinnytsia	20203.4	-	-	20203.4
Volyn	124743.6	2975.7	-	121767.9
Dnepropetrovsk	3766.2	3766.2	-	-
Donetsk	64359.7	3033.2	-	61326.5
Zhytomyr	50976.8	50976.8	-	-
Transcarpathian	146000.1	-	58035.8	87964.3
Zaporozhye	94982.9	100.0	-	94882.9
Ivano-Frankivsk	125683.9	5344.2	-	120339.7
Kyiv	244171.4	-	226964.7	17206.7
Kirovograd	-	-	-	-
Luhansk	12410.0	5403.0	-	7007.0
Lviv	60435.0	2084.5	-	58350.5
Mykolayivska	47112.9	3010.6	2741.0	41361.3
Odessa	100724.0	-	51547.9	49176.1
Poltava	22792.6	-	-	22792.6
Rivne	52495.1	47046.8	-	5448.3
Sumy	40458.1	882.9	-	39575.2
Ternopil	27297.1	9516.7	-	17780.4

Regions	Total area, ha	Including		
		nature reserves	biosphere reserves	national nature parks
Kharkiv	22690.0	-	-	22690.0
Kherson	290602.3	-	139821.4	150780.9
Khmelnytsky	270078.7	-	-	270078.7
Cherkasy	19862.1	8634.9	-	11227.2
Chernivtsi	27801.6	-	-	27801.6
Chernihiv	41988.5	-	-	41988.5
m. Kyiv	10988.1	-	-	10988.1
Sevastopol	-	-	-	-

* Source: [11].

The ratio of the actual area of the nature reserve fund to the area of the state ("reserve indicator") is 6.6% [15]. At the same time, the indicator of nature reserves according to the Report on the implementation of the national program of formation of the national ecological network of Ukraine for 2015 ranges from 2.24 to 15.7 %. The lowest indicator - 2.24-2.36 % - in Vinnytsia and Kharkiv regions, the highest - 12.8-15.7 % - in Ivano-Frankivsk, Zakarpattia, Khmelnytsky and Chernivtsi regions, in Kyiv - is 21 %, and in Sevastopol - 30.3 %. In Dnipropetrovsk, Donetsk, Zhytomyr, Zaporizhia, Kyiv, Kirovohrad, Luhansk, Mykolaiv, Odesa, Poltava and Cherkasy oblasts protected areas make up about 3-5 %, in Volyn, Lviv, Rivne, Sumy, Ternopil, Kherson, Chernihiv oblasts Crimea - 7.4–11.1 % [18] .

In 2017, 54 territories and objects of the nature reserve fund were created (announced), 7 were expanded, the area was reduced by 3, and the status of 4 objects was abolished. In 2017, the area of the nature reserve fund increased the most in Zakarpattia (by 1664.8 ha), Kyiv (by 511.14 ha), Donetsk (by 407.9 ha) and Luhansk (by 308.2 ha) oblasts [15] .

By the Decree of the President of Ukraine of April 26 , 2016 № 174/2016, the Chornobyl Radiation and Ecological Biosphere Reserve was established within the exclusion zone and the zone of unconditional (mandatory) resettlement of the territory that was radioactively contaminated as a result of the Chornobyl disaster (226,964.7 ha) state-owned lands.

Today there are the following *transboundary biosphere reserves* (TBR) of Ukraine with neighboring countries [18] :

–□Ukrainian-Polish-Slovak TBR "Eastern Carpathians" consisting of Ukrainian Uzhansky National Nature Park and Regional Landscape Park "Nadsyansky";

–□Ukrainian-Romanian TBR "Danube Delta" as part of the Ukrainian Danube Biosphere Reserve;

–□Ukrainian-Belarusian-Polish TBR "Western Polissya" as part of the Ukrainian Shatsk National Nature Park.

–transboundary Ukrainian-Slovak-German serial object of the UNESCO World Natural Heritage "Beech virgin forests of the Carpathians and ancient beech forests of Germany" with areas of the Carpathian Biosphere Reserve and Uzhansky National Nature Park;

–Transboundary Ukrainian-Belarusian wetland 'Proverbs ' Five-Stokhid-Prostyr " consisting of Ukrainian wetlands of international importance" floodplain. Pripyat "and" floodplain. Stokhid. "

According to the World Heritage Committee of UNESCO (document 35 COM 8B. 13), together with Slovakia, Germany and other European countries likely potential is expanding Ukraine-Slovak-German nomination " Primeval Beech Forests of the Carpathians and the Ancient Beech Forests of Germany " by old growth beech forest other biogeographical regions of Europe in order to create a full serial transnational nomination and ensure the preservation of unique forest ecosystems [18] .

There are about 63,000 rivers in the country with a total length of 206,000 km, with an area of coastal protection strips along the rivers of 1.3 million hectares. The area of wetlands in Ukraine is about 4.5 million hectares (Fig. 2.14).

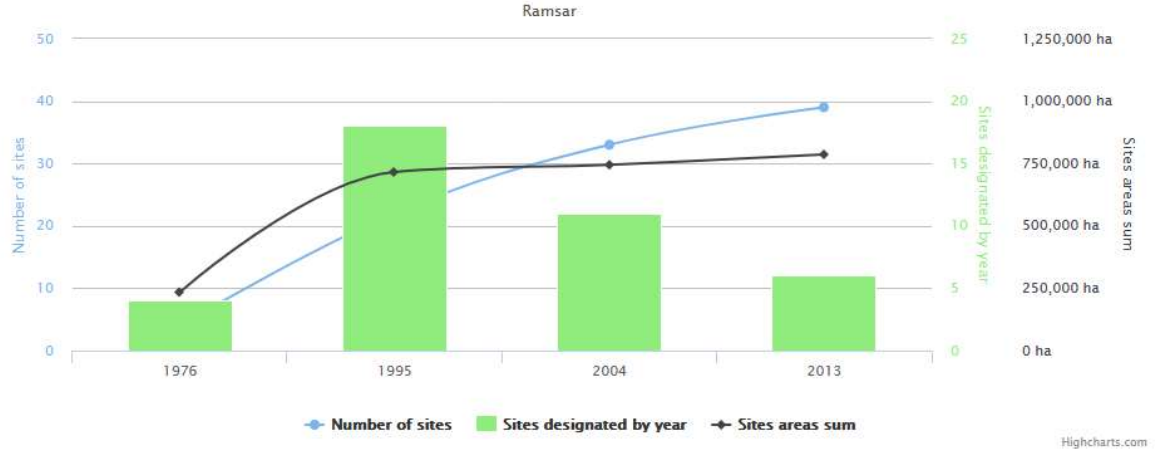


Fig. 2.14. Number and area of Ramsar sites in Ukraine (according to [1])

The area of forest areas belonging to the forest fund of Ukraine is 10.4 million hectares, in particular covered with forest vegetation - 9.6 million hectares. The forest cover of Ukraine is 15.9 %. All forests of Ukraine are included in the ecological network. According to the state forest accounting data (1996 and 2011), the area of land covered with forest vegetation increased by 173.7 thousand hectares (from 9400.2 thousand hectares to 9573.9 thousand hectares), and forest cover increased from 15.6 up to 15.9% (Fig. 2.15) [24 ; 18].

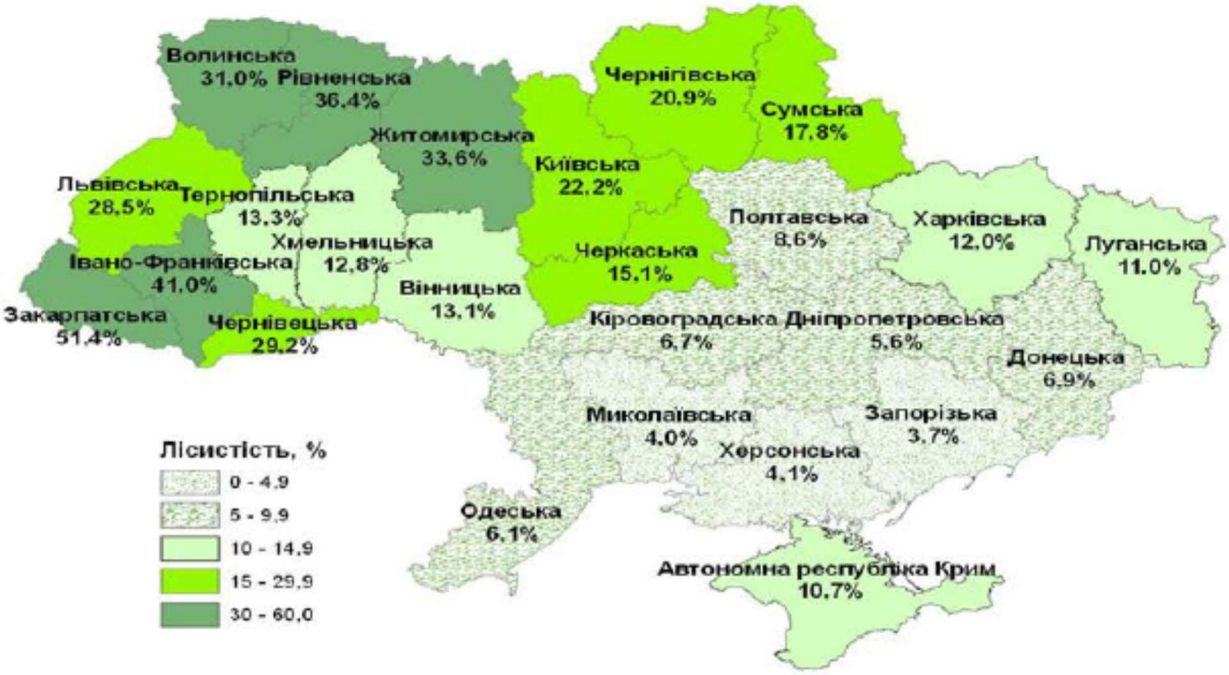


Fig. 2.15. Forest cover of the territory of Ukraine [34]

Today, 16.6 % are bequeathed in the forests belonging to the sphere of management of the State Agency of Forest Resources of Ukraine . In almost all regions, forest reserves are higher than the national ones. Over 30 years, the area of territories and objects of the nature reserve fund on forest lands has increased 4 times: from 315 thousand hectares in 1978 to 1314 thousand hectares in 2018, the reserve, respectively, from 5.5 % to 16, 6 %. In Ukraine, 46.9 % of forested lands are already banned for main use. More than 3,000 territories and objects of the nature reserve fund with a total area of 1.2 million hectares have been created in the forests of the State Agency of Forest Resources of Ukraine [34].

Occupying less than 6 % of Europe's area, Ukraine owns 35 % of its biodiversity. This is due to the favorable location of the country - many migration routes and natural areas are found in the country. Biota (more than 70 thousand species, flora - more than 27 thousand species, fauna - more than 45 thousand species) includes many rare, relict and endemic species [24 ; 41].

The Red Book of Ukraine (2009) includes 826 species of flora and 542 species of fauna that need special protection.

The list of species of plants and fungi that need protection is 826 species; vascular plants (611 species) predominate, mosses are represented by 46 species, algae by 60 species, lichens by 52 species, and fungi by 57 species. The list also includes all members of the Zozulin family (orchids), although many of them are not in imminent danger of extinction (for example, the common nest, the hellebore, etc.), and these plants themselves may even grow in anthropogenically disturbed ecotopes. However, their vulnerability is due to the complex biology of development (the need for specific symbiont fungi, complex pollination ecology), and in many cases high sensitivity to natural changes. The Red Book of Ukraine includes all

representatives of the genus Feathergrass, which characterize the optimal state of development of steppe groups, as the steppes once occupied 40% of the territory of Ukraine, and now preserved only in the area of about 1%. On the one hand, plowing, overgrazing, construction, recreation and other anthropogenic factors, and on the other - the regime of absolute bequest in reserves lead to a reduction and eventually disappearance of populations of feather grass species [41].

The fauna of Ukraine has about 45 thousand species, including many rare, relict or endemic species. The Red Book of Ukraine lists 542 species of animals: hydroid polyps (2 species), round (2) and ring (9) worms, crustaceans (31), arachnids (2) and centipedes (3), pinworms (2), insects (226), mollusks (20), roundmouths (2) and fish (69), amphibians (8), reptiles (11), birds (87), mammals (68) [42].

According to the Green Paper of Ukraine (2009), which contains summary information on the current state of rare and endangered and typical natural plant communities that are subject to protection, the vegetation of Ukraine is characterized by significant syntaxonomic richness, due to its geographical location. There are four geobotanical regions on the territory of Ukraine - European deciduous forest, European-Siberian forest-steppe, European-Asian steppe and Mediterranean. The western part of Ukraine covers the original phytocenotic plan of the Eastern Carpathian mountain sub-province, and in the south is the Mountain-Crimean sub-province. Peculiarities of geographical position, relief and climate led to the formation on the territory of Ukraine of rich natural vegetation, represented by forest, shrub, steppe, meadow, swamp, water, halophytic, tomilar, psammophytic, petrophytic, calceophytic types of vegetation, the grouping of which is almost 38 348 formations. Phytocoenotic richness and phytocenodiversity are also characteristic of the natural regions of Ukraine. 1480 associations of 159 formations have been established for the vegetation of Ukrainian Polissya; Podolsk part of the forest zone - 649 associations of 120 formations; Ukrainian Carpathians - 1305 associations of 140 formations; forest-steppe zone - 1335 associations of 184 formations; steppe zone - 1912 associations of 239 formations; mountainous Crimea - 716 associations of 59 formations [19].

Ukraine has significant water resources (up to 1.5 million hectares of inland surface water), which represent a huge potential for the development of highly efficient fish production. An important aspect of preserving the population of aquatic bioresources is their restoration by inhabiting aquatic bioresources in fishery water bodies of Ukraine. In 2015, 33.7 million copies were introduced. aquatic bioresources in fishery water bodies of Ukraine [24].

The main *threat to the country* 's *biodiversity* is the loss of habitat as a result of agricultural activities, deforestation, urban sprawl and industrial activities. The Fifth National Report of Ukraine to the Convention on Biological Diversity identifies the main threats to biodiversity [31]: uncontrolled use of forest resources, land degradation and excessive exploitation of steppes, recreational activities, as well as sewage pollution of aquatic and coastal ecosystems, regulation of the Dnieper and tributaries that change the natural regime of floods, pollution by organic matter, as well as the destruction of

the natural habitat. Additional key threats are natural factors, such as excessive overgrowth of small rivers with air-water vegetation, which reduces the biodiversity of aquatic organisms (plants and animals), invasive species, climate change.

Invasive species. Biological invasions of alien species Parties to the UN Convention on Biological Diversity assess as the second, after the destruction of habitats, the ecosystem threat to biodiversity. In 2015, there were more than 900 adventitious species of vascular plants in the flora of Ukraine, which is approximately 15%, the predominant group is kenophytes (over 83%), which indicates the progressive modernization of the flora. In the last 10-15 years, about 20 Black Sea mollusk species have been recorded in the Azov Sea basin, which have not been registered here before. In particular, there are data on the appearance in the Azov-Black Sea basin of the most euribiont species of mollusks from remote sea basins. *Rapana thomasiana* , an introductory species from the Sea of Japan that has successfully conquered the entire Black Sea, the Kerch Strait and, in recent years, the southwestern corner of the Sea of Azov, has attracted attention in the Sea of Azov. Also, relatively long ago, the Azov-Black Sea fauna was replenished with the mollusk *Mya arenaria* - an alien from the White Sea. The bivalve mollusk *Anadara inaequivalvis has* been widespread along the Fedotova Spit and Biryuchy Island *since* 2009. About 20 invasive species are known among terrestrial mollusks of Ukraine. *Deroceras caucasicum* and *Krynickillus melanocephalus* snails of Caucasian origin , as well as *Arion lusitanicus* sl (synonymous with *Arion vulgaris*) from the western sea , are of the greatest concern about the threat to the country's biodiversity as a whole and the damage to agriculture and parks . The latter is widely recognized as one of the most destructive mollusks for European ecosystems; it was first introduced in Ukraine a few years ago and is spreading rapidly throughout the country [24].

2.5. Cultural heritage and tangible assets

The cultural heritage of Ukraine reflects the historical epochs of the state's formation by visual methods. Ukrainian historical and cultural heritage is an extremely valuable economic, spiritual and social capital, which is a key component of national self-esteem and proper representation of the state in the international arena. Preservation of cultural heritage is closely connected with the formation of the national mentality, confirms the heredity of ancient values and traditions, forms the basis for stable development of society.

Almost one and a half thousand towns and villages and about 8 thousand villages of Ukraine have valuable objects of cultural and historical heritage. There are about 140,000 monuments on the state register, of which almost 49.8 % are archeological monuments, almost 37 % are historical monuments, more than 11 % are architectural and urban monuments, and 2 % are monuments. monuments of monumental art, science and technology, landscape art. On the basis of complexes

of monuments of special cultural value, there are 63 historical and cultural reserves in Ukraine, a third of which has received the status of national [29].

Ukraine is making efforts to improve its international image and increase its tourism potential by expanding the UNESCO list of domestic cultural sites . The state provides international cooperation in the field of protection of monuments , in particular, coordinates the activities of public authorities for the protection of cultural sites , research institutes and NGOs in the implementation of UNESCO programs, international cooperation within UNESCO and the expansion of multilateral and bilateral international cultural cooperation.

That is why the inclusion of Ukrainian natural and architectural sites in the World Heritage List is important for the formation of an attractive tourist image of Ukraine, as well as its integration into the world community.

The Ukrainian SSR became a member of UNESCO on May 12, 1954. Since December 1962 , the Permanent Mission of Ukraine to UNESCO has been functioning in Paris. The coordination of the activities of national institutions related to Ukraine's participation in UNESCO is carried out by the National Commission for UNESCO (which has been operating since 1956).

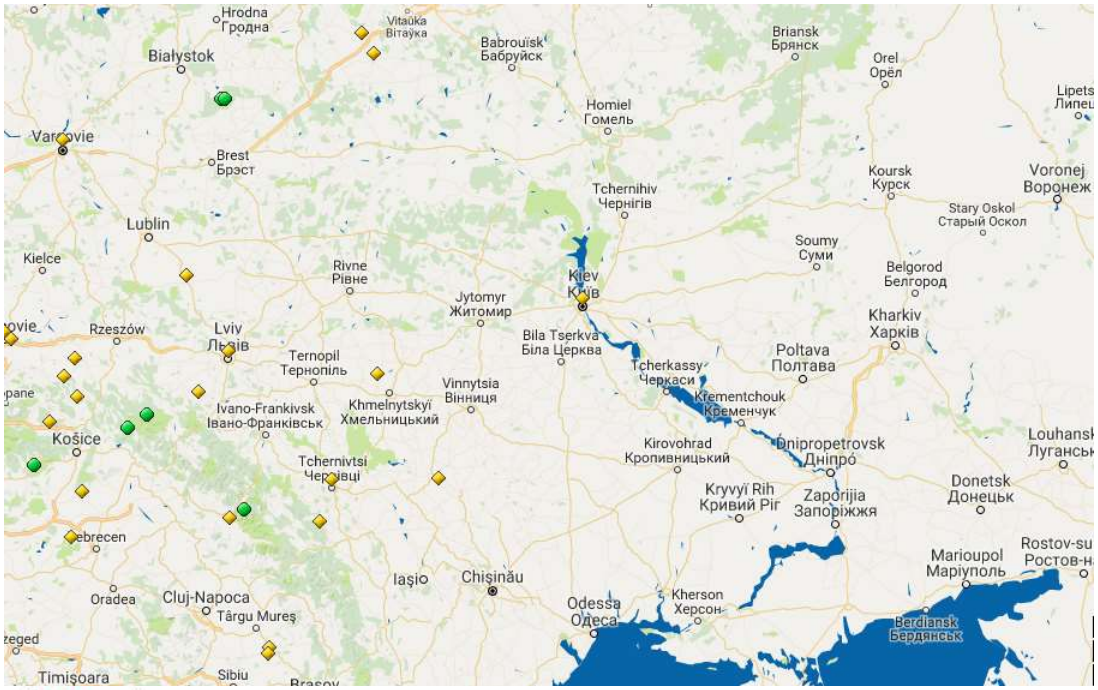
Ukraine ratified the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage on October 12, 1988, and the first Ukrainian site was included in the World Heritage List in 1990 [29].

The List of UNESCO World Heritage Sites in Ukraine includes 7 names, which is about 0.7% of the total number of World Heritage sites in the world (981 in 2013) (Fig. 2.16) [29] :

1. Kyiv: Hagia Sophia with adjacent monastery buildings, Kyiv-Pechersk Lavra (introduced in 1990) .
2. Ensemble of the historical center of Lviv (1998) .
3. Cross-border object (10 countries) "Struve Arc" (geodetic points Baranovka, Katerynivka, Starnekrasovka, Felshtin, 2007) .
4. Natural heritage site "Beech virgin forests of the Carpathians" (joint Ukrainian-Slovak cross-border nomination, 2007) .
5. Residence of the Metropolitan in Bukovina and Dalmatia (2011) .
6. Wooden churches of the Carpathian region of Ukraine and Poland (2013).
7. Ancient city-state of Chersonesos Tavria and its choirs (2013).

Among these 7 objects 6 - cultural and 1 - natural type.

Of the above objects, the Hagia Sophia and the Kiev-Pechersk Lavra are recognized as a masterpiece of creative human genius (criterion and).



Cultural (6)

- Ancient City of Tauric Chersonese and its Chora (2013)
- Kiev: Saint-Sophia Cathedral and Related Monastic Buildings, Kiev-Pechersk Lavra (1990)
- L'viv – the Ensemble of the Historic Centre (1998)
- Residence of Bukovinian and Dalmatian Metropolitans (2011)
- Struve Geodetic Arc (2005)
- Wooden *Tserkvas* of the Carpathian Region in Poland and Ukraine (2013)

Natural (1)

- Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe (2007,2011,2017)

Fig. 2.16. UNESCO World Heritage Sites in Ukraine (according to the UNESCO World Heritage List[27])

The list of monuments was changed and expanded in 2005, 2008 , 2011 and 2017. Thus, in 2005 the buffer zone of the object "Kyiv: Hagia Sophia with adjacent monastery buildings, Kiev-Pechersk Lavra" was changed in 2008. Minor changes

were made to the Ensemble of the Historical Center of Lviv, and in 2011 the natural heritage site "Beech virgin forests of the Carpathians" was expanded by including in the List of World Heritage sites of ancient beech forests of Germany.

4 of the 7 Ukrainian UNESCO World Heritage Sites are entirely located in Ukraine.

3 other attractions are partially located in other countries [29] :

elements of the Struve Arc object are located in Norway, Sweden, Finland, Russia, Estonia, Latvia, Lithuania, Belarus and Moldova;

Beech virgin forests are also found in Germany and Slovakia;

Wooden churches in the Carpathian region are also located in Poland.

In addition to the above, according to the official UNESCO website , the list of candidate sites for inclusion in the World Heritage List includes 1 6 Ukrainian sites , in particular [29] :

1) ten objects of cultural heritage:

the building of the State Industry (2017);

Bakhchisaray Khan's Palace (2012);

"Trade centers and fortifications on the paths of Genoese commerce. From the Mediterranean to the Black Sea ”(2010);

The historical center of the port city of Odessa (2009);

"Kyiv: Hagia Sophia with adjacent monastery buildings, St. Cyril's and St. Andrew's Churches, Kyiv-Pechersk Lavra" (extension of the object "Kyiv: Hagia Sophia with adjacent monastery buildings, Kyiv-Pechersk Lavra"), (2009);

Astronomical Observatory of Ukraine (2008);

Nikolaev Astronomical Observatory (2007);

Complex of objects VI - XVI centuries. Sudak Fortress (2007);

Archaeological complex "Stone Tomb" (2006);

Historical Center of Chernihiv (1989);

The cultural landscape of the canyon and city. Kam ' Kamyanets-Podolsky (1989);

2) one object of natural heritage:

Askania-Nova Biosphere Reserve (1989);

3) two objects of mixed type:

Sofiyivka Arboretum (2000);

Taras Shevchenko's Tomb and the Shevchenko National Reserve (1989).

It is important to note that UNESCO[28] warns of the special propensity of cultural heritage to be threatened with destruction due to its characteristic vulnerability and enormous symbolic significance in situations of armed conflict or natural

disasters. UNESCO contributes to the preservation of cultural heritage through its complementary conventions in the field of culture and cooperation with the international community.

In order to prevent illicit trafficking and destruction of cultural heritage, the Organization coordinates and intensifies cooperation and strengthens ties between the various parties at the national and international levels. This approach has led to emergency measures during the civil unrest and wars in Afghanistan, Iraq, Haiti, Egypt, Libya, Mali and Syria.

In November 2015, the 38th UN General Conference on Education, Science and Culture adopted a strategy to strengthen UNESCO's work to protect culture and promote cultural pluralism in the event of armed conflict.

2.6. Population , health and safety

The number of the available population in Ukraine as of January 1, 2019 was 42,153.2 thousand people [29] . During 2018 , the population decreased by 233.2 thousand people. R 2017 . characterized by the deterioration of the medical and demographic situation among the population in the context of hostilities in the east of the country, which are associated with the anti-terrorist operation. The hostilities led to the forced relocation of large numbers of people from the eastern regions to other regions. Deteriorating economic situations in the country are the cause of significant labor migration, especially in cross-border areas. 2017 was also characterized by a decrease in the priority of health for the population and a responsible attitude of the population to personal health, accompanied by a decrease in timely treatment of the population and an increase in neglected cases of diseases in which medical care requires more resources [43] .

Information on the administrative-territorial structure of Ukraine, the number and natural movement of the population, the level of morbidity are given in table. 2.28.

Every process of Ukraine's demographic development - births, deaths and migrations - is in crisis. During the last quarter of a century, normal demographic development in Ukraine was interrupted and the type of population reproduction inherent in long-running warring countries — ultra-high mortality — and ultra-low birth rates — was established. Demographic dynamics has become permanently depopulated. More than 80 % of the total loss of the population of Ukraine for the period 1993–2017 is due to negative natural increase. Compared to 2017 , the volume of natural decrease increased by 41.7 thousand people. The natural movement of the population in 2018 was characterized by a significant excess of the number of deaths over live births: per 100 deaths - 57 live births [7 ; 43] .

The formation of urban and rural population in the last five years, as in previous periods, was due to three components [43]: natural and migratory loss (increase) and administrative-territorial changes. The main factor in population decline in both urban and rural settlements was natural loss. During 1993- 2017 's. In Ukraine came to 83.4 thousand. People than dropped out that much, however, did not affect the population decline. Trends in population change vary by region of Ukraine

and are determined by the peculiarities of both natural and migratory population movements. The largest demographics of the population were characterized by the oldest demographic regions [43]: Chernihiv (-11.0 ‰), Poltava (-8.7 ‰), Sumy (-8.7 ‰), Cherkasy (-8.5 ‰) , Kirovohrad (-8.2 ‰), Zaporizhia (-7.9 ( ). Relatively high birth rates and lower mortality rates were recorded in the regions of the Western region (Volyn, Zakarpattia, Ivano-Frankivsk, Rivne).

The composition of the population of Ukraine is characterized by a significant gender disparity. The numerical advantage of women over men in the population of Ukraine is observed from 37 years of age and increases with age. There are 1,159 women per 1,000 men.

The average age of the population at the beginning of 2018 was 41 years, in particular, men - 38.4, women - 43.5.

Despite the positive dynamics of the overall mortality rate in recent years, in 2017 it was marked as one of the highest in Europe and the world. In 2017, almost 74 % of all deaths were caused by three classes of causes of death [43]: diseases of the circulatory system, tumors and external causes. Cardiovascular diseases (especially in the middle age groups), neoplasms, external causes (especially in young and middle age), diseases of the digestive and respiratory organs - the main causes of death in Ukraine. It should be noted that the mortality rate from external causes in 2017 decreased compared to 2013 by 17.8 % [43].

Data of the patrol police on road accidents (Table 2.29) indicate a reduction in road deaths per day for the first quarter. 2019, compared to 2018. Therefore, the main reserves for prolonging life expectancy in Ukraine should be considered in overcoming the causes of mortality of the working age population from diseases of the circulatory system, tumors and causes of death caused by non-diseases - the so-called. external causes.

It is the struggle with mortality from accidents and injuries directed a number of objectives of the Action Plan to be regarded as a contribution of the Ministry of Infrastructure of Ukraine in the joint efforts of television and health and other agencies in combating mortality aforementioned reasons.

Table 2.28

Administrative and territorial structure of Ukraine
as of 01/05/2019 *

I. Administrative-territorial structure of regions
without taking into account the united territorial communities

№ p.p.	Autonomous Republic of Crimea, region, city	Areas		Cities				SMT	Rural settlements			For the sake of							
												District			Urban				
		Rural	In the cities	Total	Region znach.	Paradise. znach.	From heaven. divide.		Total	Settlement	Forces	Total	Rural	In the cities	Total	Bridge region znach.	Bridge of Paradise. znach.	Settlements	Rural
1	Autonomous Republic of Crimea	14	3	16	11	5	1	56	947	30	917	314	14	3	16	11	5	38	243
2	Vinnytsia	27		12	6	6		19	1235	106	1129	636	27		thirteen	6	7	21	575
3	Volyn	16		8	4	4		8	466		466	210	16		8	4	4	8	178
4	Dnepropetrovsk	22	18	14	11	3	3	17	600	24	576	194	22	15	14	11	3	15	128
5	Donetsk	18	21	48	27	21	4	124	928	181	747	350	17	9	48	27	21	74	202
6	Zhytomyr	23	2	4	3	1	1	21	742	8	734	556	23	2	9	3	6	33	489
7	Transcarpathian	thirteen		8	5	3		19	544		544	330	thirteen		8	5	3	19	290
8	Zaporozhye	20	7	9	5	4	1	11	363	17	346	169	20		11	5	6	thirteen	125
9	Ivano-Frankivsk	14		12	5	7		thirteen	571	17	554	398	14		thirteen	5	8	14	357
10	Kyiv	25		24	thirteen	11		27	1051	5	1046	635	25		22	12	10	27	561
11	Kirovograd	21	2	9	4	5	1	27	943	14	929	425	21	2	12	4	8	27	363
12	Luhansk	18	4	37	14	23	1	102	642	100	542	304	17	4	37	14	23	82	164
thirteen	Lviv	20	6	40	9	31	1	27	1564		1564	680	20		44	9	35	30	586
14	Mykolayivska	19	4	7	4	3	1	9	606	42	564	268	19		8	4	4	10	231
15	Odessa	26	4	14	7	7	1	24	821	18	803	451	26		16	7	9	29	380
16	Poltava	25	5	10	5	5	2	11	1179	thirteen	1166	466	25	3	12	5	7	17	409
17	Rivne	16		9	3	6		10	679	1	678	281	16		9	3	6	12	244
18	Sumy	18	2	8	6	2	1	9	883	34	849	302	18		10	6	4	10	264
19	Ternopil	17		7	2	5		4	619	1	618	456	17		12	2	10	8	419
20	Kharkiv	27	9	15	6	9	1	47	1382	114	1268	408	27		15	6	9	46	320
21	Kherson	18	3	8	4	4	1	21	434	54	380	293	18	3	9	4	5	28	235
22	Khmelnytsky	20		7	5	2		9	658	2	656	396	20		8	5	3	14	354
23	Cherkasy	20	2	10	5	5	1	7	521	65	456	445	20		11	6	5	10	404
24	Chernivtsi	11		4	1	3		4	256		256	184	11		4	1	3	4	165
25	Chernihiv	22	2	4	3	1	1	9	683	20	663	287	22	2	5	3	2	9	249
26	m. Kyiv		10	1			1					1			1				
27	m. Sevastopol		4	2		1	1	1	29	1	28	11		4	2		1	1	4

№ p.p.	Autonomous Republic of Crimea, region, city	Areas		Cities				SMT	Rural settlements			For the sake of							
												District			Urban				
		Rural	In the cities	Total	Region znach.	Paradise. znach.	From heaven. divide.		Total	Settlement	Forces	Total	Rural	In the cities	Total	Bridge region znach.	Bridge of Paradise. znach.	Settlements	Rural
	Total	490	108	347	168	177	24	636	19346	867	18479	9450	488	47	377	168	207	599	7939

* Source: official website of the Verkhovna Rada of Ukraine. URL : http://static.rada.gov.ua/zakon/new/NEWSAIT/ADM/zmist.html

Continuation of the table. 2.28

II. United territorial communities

№ p.p.	Autonomous Republic of Crimea, region, city	United territorial communities	Cities				SMT	Rural settlements			Councils of united territorial communities					
			Total	Region znach.	Paradise. znach.	From heaven. divide.		Total	Settlement	Forces	Total	Urban			Settlements	Rural
												Total	Bridge region znach.	Bridge of Paradise. znach.		
1	Autonomous Republic of Crimea															
2	Vinnytsia	35	6		6		10	222	23	199	29	5		5	7	17
3	Volyn	50	3		3		14	588		588	50	3		3	thirteen	34
4	Dnepropetrovsk	62	6	2	4		29	835	36	799	62	6	2	4	21	35
5	Donetsk	10	4	1	3		7	187	15	172	10	4	1	3	2	4
6	Zhytomyr	50	8	2	6		22	871	12	859	18	3	2	1	7	8
7	Transcarpathian	6	3		3			34		34	6	3		3		3
8	Zaporozhye	51	5		5		11	551	27	524	41	3		3	9	29
9	Ivano-Frankivsk	30	3	1	2		11	94	3	191	28	2	1	1	10	16
10	Kyiv	9	2		2		3	75		75	9	2		2	3	4
11	Kirovograd	5	3		3			48	2	46	5	3		3		2
12	Luhansk	9					7	138	2	136	9				7	2
thirteen	Lviv	29	4		4		7	286	1	285	16	1		1	4	11
14	Mykolayivska	28	2	1	1		8	279	29	250	17	1	1		6	10

15	Odessa	29	5	2	3		9	302	5	297	15	3	2	1	2	10
16	Poltava	44	6	1	5		9	626	2	624	17	4	1	3	3	10
17	Rivne	29	2	1	1		6	320	2	318	28	2	1	1	4	22
18	Sumy	34	7	1	6		11	572	18	554	28	5	1	4	9	14
19	Ternopil	46	11	2	9		thirteen	404		404	28	6	2	4	9	thirteen
20	Kharkiv	17	2	1	1		14	291	24	267	17	2	1	1	11	4
21	Kherson	29	1		1		10	224	26	198	6				2	4
22	Khmelnytsky	43	6	1	5		15	756	3	753	25	5	1	4	10	10
23	Cherkasy	54	6	1	5		7	303	36	267	36	6	1	5	3	27
24	Chernivtsi	27	7	1	6		4	142		142	27	7	1	6	3	17
25	Chernihiv	43	12	1	11		20	782	37	745	38	11	1	10	17	10
26	m. Kyiv															
27	Sevastopol															
	Total	769	114	19	95		247	9030	303	8727	565	87	19	68	162	316

Continuation of the table. 2.28

III. Total :

№ p.p.	Autonomous Republic of Crimea, region, city	Areas		Cities				SMT	Rural settlements			For the sake of, incl. united territorial communities							
		Rural	In the cities	Total	Region znach.	Paradise. znach.	From heaven. divide.		Total	Settlement	Forces	Total	District		Total	Urban		Settlements, including OTG	Village, incl . OTG
													Rural	In the cities		Bridge region znach.	Bridge of Paradise. znach.		
	Total in Ukraine	490	108	461	187	272	24	883	28376	1170	27206	10015	488	47	464	187	275	761	8255

Thus, according to the Office of the local government and local authorities of the Verkhovna Rada of Ukraine with Tan on 05.01.2019 in Ukraine 29 720 settlements , including 1,344 in urban areas and 769 incorporated municipalities.

Table 2.29

Density of the available population, at the beginning of the year *

Year	2009	2010	2011	2012	2013	2014
Population density, persons per 1 km ^{2}	76.5	76.2	75.8	75.6	75.5	75.3

* Source: [7] .

Table 2.30

Distribution of the available population by type of settlements, at the beginning of the year *

Type of settlements[30]	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Population - total, persons										
Urban settlements and rural areas	46143714	45962947	45778534	45633637	45553047	45426249	42929298	42760516	42584542	42386403
urban settlements	31587203	31524795	31441649	31380874	31378639	31336623	29673113	29584952	29482313	29370995
countryside	14556511	14438152	14336885	14252763	14174408	14089626	13256185	13175564	13102229	13015408
Share in the population of the region,%										
Urban settlements and rural areas	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
urban settlements	68.5	68.6	68.7	68.8	68.9	69.0	69.1	69.2	69.2	69.3
countryside	31.5	31.4	31.3	31.2	31.1	31.0	30.9	30.8	30.8	30.7

* Source: [7].

Table 2.31

Distribution of permanent population by main age groups (persons), at the beginning of the year *

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Urban settlements and rural areas										
At the age of 0-14 years										
Both sexes	6476188	6483560	6495990	6531531	6620598	6710689	6449171	6494293	6535536	6530490
men	3325162	3330609	3338373	3358132	3405479	3453718	3319634	3343782	3365550	3362603
women	3151026	3152951	3157617	3173399	3215119	3256971	3129537	3150511	3169986	3167887
At the age of 15-64 years										
Both sexes	32169795	32130170	32136968	31993311	31846776	31606374	29634710	29327724	29011835	28719006

men	15410003	15390314	15390875	15330294	15277112	15172259	14249749	14116745	13980750	13858299
women	16759792	16739856	16746093	16663017	16569664	16434115	15384961	15210979	15031085	14860707
At the age of 65 and older										
Both sexes	7317376	7168862	6965221	6928440	6905318	6928831	6675780	6768862	6867534	6967270
men	2449767	2386144	2303368	2288286	2280153	2292311	2218443	2257354	2298280	2337278
women	4867609	4782718	4661853	4640154	4625165	4636520	4457337	4511508	4569254	4629992
urban settlements										
At the age of 0-14 years										
Both sexes	4124941	4158541	4191545	4237128	4319273	4401836	4252299	4297338	4327815	4327688
men	2119761	2138306	2156300	2180774	2224135	2267936	2190790	2214144	2230022	2229662
women	2005180	2020235	2035245	2056354	2095138	2133900	2061509	2083194	2097793	2098026
At the age of 15-64 years										
Both sexes	22723640	22697613	22669306	22531021	22408118	22215495	20843859	20591959	20339372	20110813
men	10698648	10681462	10663767	10600636	10556117	10473274	9845374	9739847	9636277	9542050
women	12024992	12016151	12005539	11930385	11852001	11742221	10998485	10852112	10703095	10568763
At the age of 65 and older										
Both sexes	4483006	4413010	4325167	4357094	4395616	4463660	4338158	4456858	4576329	4693690
men	1531333	1498115	1458552	1467363	1479348	1503214	1466962	1509667	1552351	1592096
women	2951673	2914895	2866615	2889731	2916268	2960446	2871196	2947191	3023978	3101594
countryside										
At the age of 0-14 years										
Both sexes	2351247	2325019	2304445	2294403	2301325	2308853	2196872	2196955	2207721	2202802
men	1205401	1192303	1182073	1177358	1181344	1185782	1128844	1129638	1135528	1132941
women	1145846	1132716	1122372	1117045	1119981	1123071	1068028	1067317	1072193	1069861
At the age of 15-64 years										
Both sexes	9446155	9432557	9467662	9462290	9438658	9390879	8790851	8735765	8672463	8608193

men	4711355	4708852	4727108	4729658	4720995	4698985	4404375	4376898	4344473	4316249
women	4734800	4723705	4740554	4732632	4717663	4691894	4386476	4358867	4327990	4291944
At the age of 65 and older										
Both sexes	2834370	2755852	2640054	2571346	2509702	2465171	2337622	2312004	2291205	2273580
men	918434	888029	844816	820923	800805	789097	751481	747687	745929	745182
women	1915936	1867823	1795238	1750423	1708897	1676074	1586141	1564317	1545276	1528398

* Source: [7].

Table 2.32

Average age of the population (years), at the beginning of the year *

Type of settlements	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Urban settlements and rural areas										
Both sexes	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.9	41.1	41.3
men	37.3	37.4	37.5	37.6	37.7	37.8	37.9	38.1	38.3	38.5
women	42.5	42.6	42.7	42.8	42.9	43.0	43.1	43.3	43.5	43.8
urban settlements										
Both sexes	39.7	39.9	40.1	40.2	40.4	40.5	40.7	40.9	41.2	41.5
men	37.2	37.3	37.4	37.6	37.7	37.8	37.9	38.2	38.4	38.7
women	41.9	42.1	42.3	42.5	42.6	42.8	43.0	43.2	43.5	43.8
countryside										
Both sexes	40.8	40.8	40.8	40.8	40.7	40.7	40.8	40.8	40.9	41.0
men	37.6	37.6	37.6	37.6	37.7	37.7	37.8	37.8	37.9	38.1
women	43.6	43.6	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.6

* Source: [7].

Table 2.33

Number of pensioners by region as of January 1, 2018 *

Regions	Total, persons	Including					
		by age	for disability	in case of loss of a breadwinner	for years of service	receive a social pension	lifetime financial support of retired judges
Ukraine	11725370	8922541	1400739	663171	646099	89712	3108
Autonomous Republic of Crimea	…	…	…	…	…	…	…
area							
Vinnytsia	477174	357623	65042	23353	27426	3609	121
Volyn	271749	191824	44030	19496	14276	2059	64
Dnepropetrovsk	984776	790826	76667	62281	48239	6535	228
Donetsk	853862	670663	80173	64248	33468	5120	190
Zhytomyr	387405	272455	61460	26183	24279	2929	99
Transcarpathian	280070	207087	37725	15235	15279	4690	54
Zaporozhye	568494	452969	53820	31137	26004	4386	178
Ivano-Frankivsk	360140	266958	56188	17736	14687	4492	79
Kyiv	562471	433878	69158	27020	28186	4133	96
Kirovograd	287346	220421	30386	16912	16795	2750	82
Luhansk	346844	277170	27058	23842	17011	1671	92
Lviv	695247	504942	109988	42637	33211	4368	101
Mykolayivska	324854	247618	34376	19430	21138	2197	95
Odessa	621590	455416	83260	33519	43950	5270	175
Poltava	444443	335837	53614	24862	27066	2940	124
Rivne	301091	228521	39600	16497	13852	2569	52
Sumy	345430	271004	31686	18515	21683	2434	108
Ternopil	292593	226998	37043	13675	12593	2230	54
Kharkiv	851220	661415	89566	42818	50811	6376	234
Kherson	297395	236880	27048	14543	16462	2380	82
Khmelnytsky	407647	279051	76723	24743	23873	3171	86
Cherkasy	411837	300665	69211	19184	19055	3608	114
Chernivtsi	227424	173166	30294	10105	11537	2268	54
Chernihiv	344398	256790	43487	20358	21281	2372	110

Regions	Total, persons	Including					
		by age	for disability	in case of loss of a breadwinner	for years of service	receive a social pension	lifetime financial support of retired judges
cities							
Kiev	779870	602364	73136	34842	63937	5155	436
Sevastopol	…	…	…	…	…	…	…

* Source: [14] .

Table 2.34

Natural movement of the population of Ukraine *

Indexes	2018	2017
Number of live births, thousand people	335.9	364.0
Number of deaths , thousand people	587.7	574.1
including children under 1 year, persons	2397	2786
Natural increase, reduction (-) of population , thousand people	–251.8	–210.1

* Source: [6].

Among the causes of death of the population of Ukraine in 2018, as in 2017 , the first place was occupied by diseases of the circulatory system, the second - tumors, the third - external causes of death.

Table 2.35

Causes of death of the population of Ukraine *

Causes of death	Persons		In% to the end	
	2018	2017	2018	2017
Total dead	587665	574123	100.0	100.0
including from diseases of the circulatory system	392584	384810	66.8	67.0
neoplasms	78571	78324	13.4	13.6

external causes of death	30065	31185	5.1	5.4
of which from traffic accidents	3931	4529	0.7	0.8
accidental drownings and immersions in water	1653	1699	0.3	0.3
accidental poisoning and alcohol exposure	2478	2971	0.4	0.5
intentional self-harm	6267	6488	1.1	1.1
the consequences of an attack with intent to kill or cause harm	1634	1653	0.3	0.3
diseases of the digestive system	24542	21999	4.2	3.8
respiratory diseases	12959	12166	2.2	2.1

* Source: [6].

Table 2.36

Distribution of deaths by causes of death (persons), by year *

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Died - all	754460	706739	698235	664588	663139	662368	632296	594796	583631	574123
from some infectious and parasitic diseases	17256	15137	14642	14050	13922	12921	10974	9900	9326	8714
from tuberculosis	10357	8383	7621	6951	6862	4013	5240	4602	4064	3735
from diseases caused by human immunodeficiency virus (HIV)	5171	5365	5645	5747	5686	5210	4399	4032	4036	3774
from tumors	89008	88605	88767	88957	92896	92337	83894	79530	78959	78324
from diseases of the circulatory system	480120	460609	465093	440346	436444	440369	425607	404551	392298	384810

from respiratory diseases	23276	21089	19480	17871	17109	16540	14810	13951	13840	12166
from diseases of the digestive system	35195	30079	26817	25230	27719	27953	25225	22818	22013	21999
from external causes of morbidity and mortality	61377	48937	43955	42380	41713	40298	40135	34569	31746	31185

* Source: [7].

Table 2.37

Distribution of deaths by causes of death (persons), by year by region *

Regions[31] / Years	Causes of death (sample)	
	from diseases of the circulatory system	from respiratory diseases
Ukraine		
2005	488 769	27 998
2010	465 093	19 480
2017	384 810	12 166
Autonomous Republic of Crimea		
2005	20 099	945
2010	19 682	548
2017		
Vinnytsia region		
2005	21 856	918
2010	19 549	553
2017	17 548	375
Volyn region		

Regions[31] / Years	Causes of death (sample)	
	from diseases of the circulatory system	from respiratory diseases
2005	9 828	1 394
2010	9 658	820
2017	9 363	409
Dnipropetrovsk region		
2005	38 363	2 271
2010	36 788	1 409
2017	34 106	898
Donetsk region		
2005	52 073	2 251
2010	48 339	1 563
2017	22 275	582
Zhytomyr region		
2005	16 716	887
2010	15 113	655
2017	14 220	404
Transcarpathian region		
2005	8 860	635
2010	8 342	368
2017	9 477	351
Zaporozhye region		
2005	15 043	880
2010	17 924	723
2017	17 870	613
Ivano-Frankivsk region		
2005	11 523	1 073
2010	12 075	395
2017	12 238	289
Kiev region		
2005	22 323	829
2010	20 337	483
2017	19 631	411

Regions[31] / Years	Causes of death (sample)	
	from diseases of the circulatory system	from respiratory diseases
Kirovograd region		
2005	11 259	738
2010	10 984	495
2017	9 846	371
Luhansk region		
2005	27 876	2 052
2010	25 562	1 515
2017	9 699	364
Lviv region		
2005	22 923	1 627
2010	21 203	1 027
2017	20 013	840
Mykolaiv region		
2005	9 271	475
2010	11 185	326
2017	11 768	346
Odessa region		
2005	24 109	1 173
2010	23 089	886
2017	21 791	732
Poltava		
2005	18 141	1 083
2010	16 586	1 277
2017	16 523	309
Rivne region		
2005	10 724	455
2010	10 901	263
2017	10 510	250
Sumy region		
2005	14 811	1 102
2010	12 880	771

Regions[31] / Years	Causes of death (sample)	
	from diseases of the circulatory system	from respiratory diseases
2017	11 480	431
Ternopil region		
2005	11 444	920
2010	11 157	777
2017	10 729	562
Kharkiv region		
2005	32 707	902
2010	30 269	666
2017	28 409	694
Kherson region		
2005	10 530	296
2010	9 725	260
2017	9 819	229
Khmelnytsky region		
2005	13 117	1 178
2010	12 294	798
2017	11 840	682
Cherkasy region		
2005	16 942	1 368
2010	15 202	1,200 th most common
2017	13 981	667
Chernivtsi region		
2005	8 674	498
2010	8 495	348
2017	8 046	257
Chernihiv region		
2005	17 525	1 081
2010	16 058	663
2017	14 085	455
m. Kyiv		
2005	18 650	777

Regions[31] / Years	Causes of death (sample)	
	from diseases of the circulatory system	from respiratory diseases
2010	18 481	532
2017	19 543	645
Sevastopol (city council)		
2005	3 382	190
2010	3 215	159
2017		

* Source: [7] .

Table 2.38

Road accidents for the period from 01.01.2018 to 31.12.2018 *

Region	Total accident			Road accident with victims								
				total			died			injured		
	m.p.	p.p.	%	m.p.	p.p.	%	m.p.	p.p.	%	m.p.	p.p.	%
Crimea	0	0		0	0		0	0		0	0	
Vinnytsia	3223	3002	-6.9	928	651	-29.8	145	133	-8.3	1167	865	-25.9
Volyn	3132	2695	-14.0	798	716	-10.3	111	110	-0.9	1057	884	-16.4
Dnepropetrovsk	11203	10357	-7.6	2198	2008	-8.6	192	220	14.6	2791	2588	-7.3
Donetsk	3534	3399	-3.8	951	878	-7.7	90	117	30.0	1220	1148	-5.9
Zhytomyr	4158	3738	-10.1	1153	924	-19.9	197	165	-16.2	1437	1156	-19.6
Transcarpathian	2874	2819	-1.9	633	606	-4.3	84	126	50.0	812	761	-6.3
Zaporozhye	5923	5497	-7.2	1210	1159	-4.2	138	138	0.0	1620	1554	-4.1
Ivano-Frankivsk	2935	2945	0.3	768	735	-4.3	122	127	4.1	1008	960	-4.8
Kyiv	11530	11474	-0.5	1601	1655	3.4	305	258	-15.4	1995	2207	10.6
m. Kyiv	42639	38073	-10.7	2556	2179	-14.7	180	139	-22.8	2965	2524	-14.9
Kirovograd	1612	1705	5.8	450	397	-11.8	53	58	9.4	512	491	-4.1
Luhansk	839	818	-2.5	321	257	-19.9	29	23	-20.7	472	384	-18.6
Lviv	11576	10779	-6.9	2405	2036	-15.3	319	292	-8.5	3262	2722	-16.6
Mykolayivska	3865	3643	-5.7	948	959	1.2	111	107	-3.6	1216	1300	6.9

Region	Total accident			Road accident with victims								
				total			died			injured		
	m.p.	p.p.	%	m.p.	p.p.	%	m.p.	p.p.	%	m.p.	p.p.	%
Odessa	14609	13594	-6.9	2255	2017	-10.6	260	273	5.0	2790	2410	-13.6
Poltava	4083	3583	-12.2	948	880	-7.2	126	131	4.0	1245	1110	-10.8
Rivne	2386	2306	-3.4	692	565	-18.4	117	110	-6.0	866	684	-21.0
Sumy	1853	1779	-4.0	595	532	-10.6	65	55	-15.4	769	674	-12.4
Ternopil	2325	2222	-4.4	576	421	-26.9	75	84	12.0	847	551	-34.9
Kharkiv	12029	11461	-4.7	1470	1492	1.5	110	159	44.5	1912	1749	-8.5
Kherson	3593	3068	-14.6	875	747	-14.6	147	113	-23.1	1074	934	-13.0
Khmelnytsky	3249	2979	-8.3	837	685	-18.2	100	97	-3.0	1120	902	-19.5
Cherkasy	4064	3652	-10.1	1013	786	-22.4	156	125	-19.9	1310	1025	-21.8
Chernihiv	2728	2240	-17.9	692	585	-15.5	132	108	-18.2	810	775	-4.3
Chernivtsi	2564	2292	-10.6	347	424	22.2	68	82	20.6	400	526	31.5
m. Sevastopol	0	0		0	0		0	0		0	0	
In general	**162526**	**150120**	**-7.6**	**27220**	**24294**	**-10.7**	**3432**	**3350**	**-2.4**	**34677**	**30884**	**-10.9**
For a day	**445**	**411**	**-7.6**	**75**	**67**	**-10.7**	**9**	**9**	**0.0**	**95**	**85**	**-10.5**

* Source: Statistics of road accidents in Ukraine for the period from 01.01.2018 to 31.12.2018. URL: http://patrol.police.gov.ua/wp-content/uploads/2019/01/DTP-12-2018.xls

Table 2.39

Road accidents for the period from 01.01.2019 to 31.03.2019 *

Region	Total accident			Road accident with victims								
				total			died			injured		
	m.p.	p.p.	%	m.p.	p.p.	%	m.p.	p.p.	%	m.p.	p.p.	%
Crimea	0	0		0	0		0	0		0	0	
Vinnytsia	669	658	-1.6	132	119	-9.8	26	30	15.4	195	139	-28.7
Volyn	600	612	2.0	137	142	3.6	23	24	4.3	170	168	-1.2
Dnepropetrovsk	2418	2472	2.2	358	373	4.2	34	25	-26.5	439	440	0.2
Donetsk	792	843	6.4	157	176	12.1	23	24	4.3	219	221	0.9

Region	Total accident			Road accident with victims								
				total			died			injured		
	m.p.	p.p.	%	m.p.	p.p.	%	m.p.	p.p.	%	m.p.	p.p.	%
Zhytomyr	860	855	-0.6	165	175	6.1	19	25	31.6	203	220	8.4
Transcarpathian	555	671	20.9	106	70	-34.0	21	8	-61.9	135	91	-32.6
Zaporozhye	1202	1221	1.6	198	205	3.5	19	23	21.1	265	252	-4.9
Ivano-Frankivsk	624	753	20.7	125	155	24.0	24	33	37.5	148	207	39.9
Kyiv	2663	2659	-0.2	277	292	5.4	43	65	51.2	393	369	-6.1
m. Kyiv	9076	9390	3.5	407	462	13.5	27	32	18.5	506	527	4.2
Kirovograd	314	382	21.7	54	63	16.7	5	9	80.0	63	80	27.0
Luhansk	209	159	-23.9	38	40	5.3	4	5	25.0	43	46	7.0
Lviv	2467	2399	-2.8	366	373	1.9	47	40	-14.9	481	514	6.9
Mykolayivska	848	777	-8.4	186	178	-4.3	25	26	4.0	247	218	-11.7
Odessa	2902	3196	10.1	324	406	25.3	41	54	31.7	407	477	17.2
Poltava	855	837	-2.1	148	164	10.8	20	33	65.0	174	203	16.7
Rivne	491	536	9.2	92	131	42.4	14	30	114.3	122	156	27.9
Sumy	391	376	-3.8	76	68	-10.5	5	8	60.0	97	78	-19.6
Ternopil	486	482	-0.8	87	88	1.1	14	12	-14.3	111	126	13.5
Kharkiv	2877	2842	-1.2	225	281	24.9	10	30	200.0	276	330	19.6
Kherson	673	647	-3.9	121	115	-5.0	thirteen	10	-23.1	166	141	-15.1
Khmelnytsky	718	655	-8.8	144	109	-24.3	16	thirteen	-18.8	204	142	-30.4
Cherkasy	857	800	-6.7	115	113	-1.7	26	17	-34.6	141	142	0.7
Chernihiv	511	498	-2.5	103	91	-11.7	17	12	-29.4	161	126	-21.7
Chernivtsi	547	491	-10.2	66	87	31.8	thirteen	16	23.1	79	125	58.2
Sevastopol	0	0		0	0		0	0		0	0	
In general	**34605**	**35211**	**1.8**	**4207**	**4476**	**6.4**	**529**	**604**	**14.2**	**5445**	**5538**	**1.7**
For a day	**385**	**391**	**1.6**	**47**	**50**	**6.4**	**6**	**7**	**16.7**	**61**	**62**	**1.6**

* Source: Accident statistics in Ukraine for the period from 01.01.2019 to 31.03.2019. URL: http://patrol.police.gov.ua/wp-content/uploads/2019/04/DTP-03-2019-.rar

2.7. Energy efficiency

In order to implement paragraph 80 of the Action Plan for the implementation of the stage "Reforming the energy sector (until 2020)" of the Energy Strategy of Ukraine for the period up to 2035 "Security, energy efficiency, competitiveness", approved by the Cabinet of Ministers of June 6, 2018 № 497-p. Accordingly, the State Agency for Energy Efficiency of Ukraine has defined energy efficiency indicators , and energy efficiency indicators in transport are calculated for two types of road transport [32] : passenger and freight transport (Table 2.40). Regarding trends in energy efficiency in transport th sector and experts of the International Energy Agency Celebrate ayut significant positive prospects and that WMS ut an example for other countries.

Table 2.40

Energy intensity of industry , thousand toe / million UAH *

Branch	2010	2011	2012	2013	2014	2015	2016
Industry	0.088	0.087	0.055	0.054	0.042	0.032	0.022 th most common
Ferrous metallurgy							
Chemical and petrochemical			0.165 th most common	0.086	0.044 th most common	0.029 th most common	0.044 th most common
Non-ferrous metallurgy							
Non-metallic mineral products			0.150	0.144 th most common	0.107	0.087	0.056
Transport equipment			0.014	0.013 th most common	0.009	0.007	0.005
Engineering			0.022 th most common	0.018	0.013 th most common	0.011	0.008
Mining (excluding fuel)			0.046	0.041	0.036 th most common	0.044 th most common	0.023
Food and tobacco			0.028	0.040	0.020	0.015	0.012

Branch	2010	2011	2012	2013	2014	2015	2016
Pulp and paper and printing			0.044 th most common	0.041	0.024	0.019 th most common	0.014
Woodworking and wood products			0.063	0.076	0.040	0.034	0.022 th most common
Construction	0.014	0.015	0.013 th most common	0.014	0.012	0.014	0.006
Textile and leather			0.016	0.013 th most common	0.008	0.006	0.005
Other industries			0.007	0.003	0.003	0.003	0.001
Metallurgy			0.519 th most common	0.600	0.254 th most common	0.202	0.187 th most common

* Source: [32] .

Table 2.41

CO_2 emission intensity by sectors, kg CO_2 / UAH *

Branch	2010	2011	2012	2013	2014	2015	2016
Industry	0.278 th most common	0.275 th most common	0.177 th most common	0.176 th most common	0.142 th most common	0.107	0.075 th most common
Ferrous metallurgy							
Chemical and petrochemical			0.446	0.233	0.122	0.082	0.120
Non-ferrous metallurgy							
Non-metallic mineral products			0.477 th most common	0.470	0.345 th most common	0.283	0.190 th most common

Branch	2010	2011	2012	2013	2014	2015	2016
Transport equipment			0.041	0.040	0.029 th most common	0.022 th most common	0.015
Engineering			0.069	0.055	0.041	0.036 th most common	0.025
Mining (excluding fuel)			0.148	0.132	0.117	0.141 th most common	0.079
Food and tobacco			0.076	0.110	0.053	0.040	0.035 th most common
Pulp and paper and printing			0.126	0.119	0.070 th most common	0.056	0.042
Woodworking and wood products			0.166 th most common	0.199 th most common	0.102	0.075 th most common	0.055
Construction	0.037 th most common	0.038	0.034	0.036 th most common	0.033 th most common	0.039 th most common	0.020
Textile and leather			0.048	0.042	0.026	0.019 th most common	0.016
Other industries			0.027	0.012	0.012	0.011	0.004
Metallurgy			1,759 th most common	2,064 th most common	0.942	0.738	0.666

* Source: [32] .

Table 2.42

Energy intensity, CO_2 emission intensity , and total energy consumption by road *

Indicator	2001	2005	2010	2011	2012	2013	2014	2015
Estimated data on specific energy consumption, grams of oil equivalent per unit of transport								

Indicator	2001	2005	2010	2011	2012	2013	2014	2015
Specific energy consumption per unit of transport, freight traffic, gOE / tkm	87.51	51.86	31.48	32.21	32.32	31.03	27.35	26.42
Specific energy consumption per unit of transport, passenger traffic, gOE / tkm	14.85	9.51	8.06	9.00	9.81	9.41	7.84	8.79
Estimated data on specific emissions of CO_2 per unit of road transport								
Specific emissions of CO_2 per unit of freight traffic, g CO_2 / tkm	264.78	154.39	92.95	95.30	95.96	92.42	81.65	79.05
Specific emissions of CO_2 per unit of passenger work , g CO_2 / tkm	43.04	25.89	21.88	24.83	27.37	26.40	22.26	24.86
Total energy consumption by road								
Petrol, kt	4424.0	4756.0	4706.0	4398.0	4240.0	3957.0	3143.0	2396.0
Diesel fuel, kt	1625.6	2212.4	2924.6	3645.9	3907.5	3787.0	3334.4	2997.5
LPG (liquefied petroleum gas), kt	240.0	352.4	695.6	853.0	828.0	896.0	967.0	1116.0
CNG (compressed natural gas), million m^3	249.8	616.7	541.3	377.0	383.1	313.0	250.0	190.0
Petrol, PJ	191.7	205.7	203.1	189.5	182.5	169.9	135.3	103.1
Diesel fuel, PJ	70.0	95.4	126.0	157.0	168.3	163.1	143.6	129.1
LPG (liquefied petroleum gas), PJ	10.9	16.0	31.5	38.7	37.5	40.6	43.9	50.6
CNG (compressed natural gas), PJ	8.5	20.9	16.8	12.8	13.1	10.7	8.5	6.4
Gasoline, thousand tons AD	4578.4	4913.9	4776.5	4526.0	4359.9	4057.3	3231.0	2463.1
Diesel fuel, thousand tons AD	1672.9	2277.5	3433.5	3750.3	4019.0	3894.6	3428.8	3082.3
LPG (liquefied petroleum gas), thousand tons AD	260.0	381.7	751.8	923.9	896.8	970.5	1047.4	
CNG (compressed natural gas), thousand tons AD	202.6	500.1	402.3	305.8	312.1	255.2	202.6	154.0
The amount of petroleum products (gasoline, diesel and LPG), thousand tons AD	6511.3	7573.1	8961.8	9200.2	9275.8	8922.3	7707.2	5545.4

* Source: [32].

Data on final energy consumption are defined in the energy balance of Ukraine (Table 2.43).

Table 2.43

Energy balance of Ukraine for 2017 , thousand tons AD *

SUPPLY AND CONSUMPTION	Coal and peat	Crude oil	Petroleum products	Natural gas	Atomic energy	Hydroelectric energy	Wind, solar energy	Biofuels and waste	Electricity	Heat energy	Total
Production	13637	2208	-	15472	22453	769	149	3618	-	546	58851
Imports	12993	1331	9671	11262	-	-	-	-	4	-	35261
Export	-567	-139	-246	-	-	-	-	-542	-449	-	-1944
International bunkering	-	-	-251	-	-	-	-	-	-	-	-251
Change in inventories	-366	-49	334	-2180	-	-	-	-30	-	-	-2291
General supply of primary energy	**25696**	**3351**	**9507**	**24554**	**22453**	**769**	**149**	**3046**	**-445**	**546**	**89625**
Interfoods	-	334	-298	-	-	-	-	-	-	-	36
Statistical differences	-	-	-1561	-194	-	-	-	-	-	74	-1681
Power plants	-11803	-	-64	-138	-22302	-769	-149	-2	12251	-150	-23125
Thermal power plants (CHP)	-2137	-	-473	-3000	-151	-	-	-275	1032	3418	-1586
Thermal power plants	-869	-	-46	-4789	-	-	-	-553	-	5703	-554
Coke plants (blast furnaces)	-2926	-	-	-	-	-	-	-	-	-	-2926
Gas companies	-35	-	-	-	-	-	-	-	-	-	-35
Enterprises for the production of briquettes	-1627	-	-	-	-	-	-	-	-	-	-1627
Oil refineries	-	-3666	3048	-	-	-	-	-	-	-	-618
Petrochemical enterprises	-	-	-	-	-	-	-	-	-	-	-
Other transformation enterprises	-109	-	-	-	-	-	-	-324	-	-	-433
Own consumption by the energy sector	-490	-6	-51	-959	-	-	-	-	-1301	-1032	-3841
Losses during transportation and distribution	-475	-7	-1	-502	-	-	-	-	-1444	-721	-3150
Final consumption	**5226**	**6**	**10060**	**14971**	**-**	**-**	**-**	**1892**	**10093**	**7838**	**50086**
Industry	**4368**	**-**	**380**	**2627**	**-**	**-**	**-**	**53**	**4320**	**3354**	**15103**
Ferrous metallurgy	3743	-	63	1398	-	-	-	15	1514	1218	7951
Chemical and petrochemical	2	-	9	141	-	-	-	-	248	454	855
Non-ferrous metallurgy	92	-	6	144	-	-	-	-	131	259	631

SUPPLY AND CONSUMPTION	Coal and peat	Crude oil	Petroleum products	Natural gas	Atomic energy	Hydroelectric energy	Wind, solar energy	Biofuels and waste	Electricity	Heat energy	Total
Non-metallic mineral products	499	-	5	338	-	-	-	2	193	71	1109

* Source: [17] .

Table 2.44

Ukraine's energy balance for 2017 by industry, thousand tons AD *

SUPPLY AND CONSUMPTION	Coal and peat	Crude oil	Petroleum products	Natural gas	Atomic energy	Hydroelectric energy	Wind, solar energy	Biofuels and waste	Electricity	Heat energy	Total
Transport equipment	-	-	thirteen	21	-	-	-	-	71	48	152
Engineering	2	-	4	122	-	-	-	2	342	91	563
Mining (excluding fuel)	5	-	169	266	-	-	-	-	811	84	1335
Food and tobacco	24	-	27	151	-	-	-	5	351	819	1377
Pulp and paper and printing	-	-	1	18	-	-	-	-	85	139	243
Woodworking and wood products	-	-	5	3	-	-	-	26	60	96	190
Construction	1	-	72	9	-	-	-	1	77	27	186
Textile and leather	-	-	1	6	-	-	-	-	30	18	56
Other industries	-	-	5	12	-	-	-	1	408	32	457
Transport	**5**	**-**	**7500**	**1612**	**-**	**-**	**-**	**45**	**606**	**-**	**9768**
Domestic air transportation	-	-	-	-	-	-	-	-	-	-	-
Automobile	-	-	7327	28	-	-	-	45	-	-	7401
Railway	4	-	134	-	-	-	-	-	518	-	656
Pipeline	-	-	5	1582	-	-	-	-	57	-	1643
Inland navigation	-	-	33	-	-	-	-	-	-	-	33
Other modes of transport	1	-	-	2	-	-	-	-	31	-	34

SUPPLY AND CONSUMPTION	Coal and peat	Crude oil	Petroleum products	Natural gas	Atomic energy	Hydroelectric energy	Wind, solar energy	Biofuels and waste	Electricity	Heat energy	Total
Others	**324**	**-**	**1368**	**9564**	**-**	**-**	**-**	**1794**	**5167**	**4484**	**22701**
Household sector	214	-	56	8830	-	-	-	1678	3014	2643	16435
Trade and services	103	-	139	602	-	-	-	91	1838	1623	4396
Agriculture	7	-	1172	131	-	-	-	25	313	218	1867
Fishing	-	-	1	-	-	-	-	-	2	-	3
Other consumers	-	-	-	-	-	-	-	-	-	-	-
Non-energy use	**528**	**6**	**813**	**1168**	**-**	**-**	**-**	**-**	**-**	**-**	**2515**
Industrial and energy sector, transformation sector	528	6	682	1168	-	-	-	-	-	-	2384
of which: raw materials for industry	-	-	119	1083	-	-	-	-	-	-	1202
On the transport	-	-	11	-	-	-	-	-	-	-	11
In other sectors	-	-	120	-	-	-	-	-	-	-	120

* Source: [17] .

2.8. Noise

According to experts from the Dnieper State Academy of Civil Engineering and Architecture, every second inhabitant of Ukraine lives in a zone of acoustic discomfort. The population of Donetsk, Zaporizhia, Kharkiv and Luhansk oblasts is the most affected by noise pollution. In 72 settlements the maximum permissible noise levels are exceeded [16 , p. 65].

The total area of the territories subject to constant noise action of motor transport makes about 50% of all territory of the city . Recently, the average noise level produced by transport has increased by 12–14 dBA [5] .

The values of the intensity of noise that occurs when moving vehicles and affects drivers and passengers, as well as people near moving vehicles, are given below [22]: a car creates noise with an intensity of 70-80 dBA, a bus - 80-85 dBA, truck - 80 - 90 dBA. The intensity of traffic noise is influenced by a number of factors [22]: intensity, speed of traffic flow; engine type; type and quality of road surface; faulty road surface of any type with potholes, open seams and inconsistencies of the surface, etc.

Permissible noise levels that enter the premises of residential and public buildings from external and internal sources, and permissible noise levels in residential areas are set by the State Sanitary Standards of permissible noise levels in

residential and public buildings and residential areas, approved by order of the Ministry of Health of Ukraine on February 22, 2019 № 463.

2.9. Waste

In 2017, the situation in the field of waste management shows a tendency to a slight increase in their generation, compared to the previous year, when the declining trend, which began in 2012. The volume of waste of I-III hazard classes is reduced. The dynamics of waste generation and management in Ukraine in recent years are given in table. 2.45. Compared to the previous year, the volumes of waste utilization and disposal increased, but their value, compared to 2013, remains low.

Of the total amount of waste generated, in particular, in 2017, 98.4 % (360.2 million tons) accounted for waste generated as a result of economic activity of enterprises and organizations, and 1.6 % (5.9 million tons) - in households (Table 2.46).

The largest amount of waste is generated in the mining industry and quarrying (Table 2.47), and in 2017 there is an increase in waste generation compared to the previous year.

In terms of territory, the most technogenic load is experienced by industrialized regions. In 2017, the total amount of waste generated in Dnipropetrovsk, Kirovohrad, Poltava and Donetsk regions amounted to 631.7 million tons (including 30929.1 thousand tons of waste generated during mining operations in the process of creating mines and quarries 'yeriv of "Yerystivskyy GOK") 66.4, 10.3, 9.6 and 6.1 %, respectively (Table. 2.48) .

Analyzing the indicators of waste accumulation, it should be borne in mind that almost 85% of the total accumulation is waste from the primary mining and beneficiation cycle - overburden and mine rocks, sludge and other mineral products, which in the form of heaps, dumps, sludge were accumulated in previous years. . They are characterized by a high territorial concentration in the mining regions. Also, the Ministry of Ecology and Natural Resources of Ukraine notes that the insufficient number of landfills for hazardous industrial waste and the lack of plants for their disposal and processing, the lack of a sufficient number of centralized collection, disposal, disposal and disposal by type of waste (including toxic) , which are formed at almost all enterprises, leads to such a negative phenomenon as the placement and accumulation of waste in their own territories of enterprises [24].

Table 2.45

Dynamics of waste generation and management in Ukraine, thousand tons *

Years[32]	Formed	Disposed of	Burned	Deleted to special places or objects	Total amount of waste accumulated during operation in specially designated places or facilities (waste disposal sites)
1995	3562.9	1915.7	...	1232.3	54841.0
1996	3150.9	1570.6	...	1262.9	46014.0
1997	3161.4	1794.9	...	1392.7	71551.2
1998	2454.1	1660.2	...	668.9	34337.5
1999	2820.4	1138.2	...	885.4	37098.9
2000	2613.2	1376.2	...	760.6	26244.1
2001	2543.3	2292.0	...	640.0	23002.0
2002	1728.8	1701.2	...	726.9	18728.5
2003	2436.8	1184.2	...	931.7	31304.0
2004	2420.3	840.1	...	1102.8	28349.0
2005	2411.8	863.4	71.4	948.5	21674.0
2006	2370.9	847.9	62.1	1057.0	20121.5
2007	2585.2	1031.2	39.6	990.6	20131.8
2008	2301.2	918.9	32.2	1066.3	21017.2
2009	1230.3	825.9	15.8	333.2	20852.3
2010	425914.2	145710.7	1058.6	336952.2	13267455.0
including wastes of I-III hazard classes	1659.9	642.4	16.5	306.3	16236.3
2011	447641.2	153687.4	1054.5	277106.8	14422372.1
including wastes of I-III hazard classes	1434.5	597.5	15.6	138.5	15157.9
2012	450726.8	143453.5	1215.9	289627.4	14910104.7
including wastes of I-III hazard classes	1368.1	541.4	14.0	146.7	14324.8

Years[32]	Formed	Disposed of	Burned	Deleted to special places or objects	Total amount of waste accumulated during operation in specially designated places or facilities (waste disposal sites)
2013	448117.6	147177.9	918.7	288121.1	15167368.9
including wastes of I-III hazard classes	919.1	439.0	15.1	103.0	12641.6
2014[33]	355000.4	109280.1	944.7	203698.0	12205388.8
including wastes of I-III hazard classes	739.7	327.1	8.2	81.6	11996.0
2015	312267.6	92463.7	1134.7	152295.0	12505915.8
including wastes of I-III hazard classes	587.3	314.5	5.8	78.6	12055.0
2016	295870.1	84630.3	1106.1	157379.3	12393923.1
including wastes of I-III hazard classes	621.0	337.9	6.2	111.7	12102.4
2017	366054.0	100056.3	1064.3	169801.6	12442168.6
including wastes of I-III hazard classes	605.3	305.5	8.7	107.1	12197.6

* Source: [39].

Table 2.46

Waste generation from economic activities and in households, thousand tons *

Activities	2010	2014	2015	2016	2017
Total	**425914.2**	**355000.4**	**312267.6**	**295870.1**	**366054.0**
From economic activity	***419191.8***	***348686.1***	***306214.3***	***289523.6***	***360196.0***
Agriculture, forestry and fisheries	8568.2	8451.4	8736.8	8715.5	6188.2
Mining and quarrying	347688.1	297290.0	257861.9	237461.4	313738.2
coal and lignite mining	37071.3	13032.5	12084.7	10495.8	12916.4
mining of metal ores	267544.9	281519.2	238156.6	222476.6	293710.4
extraction of other minerals and development of quarries	16819.0	2685.8	1921.6	4378.1	6956.4
Processing industry	50011.7	34796.7	31000.5	34093.0	32176.7
including					
food production	7245.4	5016.1	4222.2	5089.8	6446.5
beverage production	1522.2	815.9	939.2	646.4	394.2
production of chemicals and chemical products	2679.0	1062.5	703.3	840.0	1242.9
production of basic pharmaceutical products and pharmaceuticals	615.4	7.5	10.8	12.0	12.5
metallurgical production	32844.2	23386.6	20725.6	22264.5	21980.0
Supply of electricity, gas, steam and air conditioning	8641.0	5972.7	6597.5	7511.5	6191.7
Water supply; sewerage, waste management	1698.7	612.5	594.2	457.4	408.7
waste collection, treatment and disposal; restoration of materials	842.8	94.1	180.0	136.2	110.2
Construction	329.4	306.4	376.2	300.2	493.8
Other types of economic activity	2254.7	1256.4	1047.2	984.6	998.7
From households	***6722.4***	***6314.3***	***6053.3***	***6346.5***	***5858.0***

* Source: [11].

Table 2.47

Waste generation by categories of materials, thousand tons *

Categories of materials[34]	2014	2015	2016	2017
Total	**355000.4**	**312267.6**	**295870.1**	**366054.0**
Used solvents	1.4	31.6	1.1	1.0
Waste acids, alkalis or salts	428.3	384.9	278.6	213.1
Waste oils	20.2	15.5	14.0	17.1
Chemical waste	1006.0	913.4	940.7	834.2
Sediment of industrial effluents	3567.3	3209.9	3919.8	3648.7
Sludges and liquid waste from sewage treatment plants	791.2	249.8	838.3	971.7
Medical waste and biological	1.1	0.9	0.7	0.6
Ferrous metal waste	4245.6	3396.7	3706.0	3556.0
Non-ferrous metal waste	31.3	30.1	23.5	28.3
Mixed waste of non-ferrous and ferrous metals	27.1	9.6	10.4	7.4
Glass waste	23.5	22.3	25.8	34.3
Paper and cardboard waste	234.2	111.0	184.5	183.5
Rubber waste	25.3	22.9	20.3	26.4
Plastic waste	43.7	42.9	51.9	48.6
Wood waste	813.9	683.1	933.8	779.9
Textile waste	10.0	8.0	18.8	20.8
Wastes containing polychlorodiphenyls	0.4	0.5	0.1	0.2
Unsuitable equipment	12.2	14.4	10.8	15.9
Unsuitable vehicles	4.6	3.1	2.0	1.2
Waste batteries and batteries	6.4	7.2	4.0	4.1
Animal wastes and mixed food wastes	954.2	897.0	990.6	587.6
Wastes of plant origin	9061.4	7742.3	8606.0	8782.3
Animal excrement, urine and manure	4037.2	4938.0	4288.7	3653.4
Household and similar waste	7021.3	6789.2	6946.2	6183.2
Mixed and undifferentiated materials	7632.7	7380.9	9429.1	9699.0

Categories of materials[34]	2014	2015	2016	2017
Sorting remnants	116.4	35.6	81.9	63.2
Ordinary sediment	567.4	397.6	693.6	515.1
Mineral wastes of construction and demolition of objects	1407.2	897.5	822.5	974.1
Other mineral wastes	212719.9	235700.2	225883.5	265602.0
Combustion waste	14094.2	13896.0	13829.9	14157.0
Soil waste	397.8	788.2	501.7	367.2
Empty rock from dredging	55828.8	23125.1	12500.1	45028.0
Solidified, stabilized or glazed waste; mineral waste generated after processing	29868.2	522.2	311.2	48.9

* Source: [11].

Table 2.48

Dynamics of waste generation by regions, thousand tons *

Regions[35]	2010	2014	2015	2016	2017
Ukraine	**425914.2**	**355000.4**	**312267.6**	**295870.1**	**366054.0**
Autonomous Republic of Crimea	3161.3	…	…	…	…
Vinnytsia	1860.9	2423.8	1950.3	1927.5	2341.7
Volyn	2718.0	583.4	638.9	684.0	733.1
Dnepropetrovsk	282799.4	259353.9	227076.8	205850.1	243114.7
Donetsk	56544.4	17982.4	16877.5	20205.7	22434.6
Zhytomyr	757.6	671.9	518.3	550.4	550.3
Transcarpathian	188.7	96.0	133.7	155.6	173.4
Zaporozhye	5758.1	5155.6	5463.3	5040.8	5129.4

Regions[35]	2010	2014	2015	2016	2017
Ivano-Frankivsk	1278.5	1815.0	2124.8	1935.4	1948.8
Kyiv	3529.0	1272.1	1660.5	1561.3	1265.6
Kirovograd	29177.1	39748.6	33344.7	34408.1	37623.3
Luhansk	16107.5	3536.9	2548.4	2456.4	644.0
Lviv	2599.9	3323.0	2953.3	2773.8	2483.1
Mykolayivska	3268.8	2328.6	2306.1	2366.4	2327.9
Odessa	748.8	809.5	602.6	647.5	739.9
Poltava	4581.7	5013.7	4431.7	5421.2	35121.8 [1]
Rivne	747.9	1356.0	843.3	713.2	457.7
Sumy	1031.2	938.2	840.0	672.6	580.4
Ternopil	1121.8	858.9	808.9	862.2	1905.8
Kharkiv	2856.8	2172.5	1711.4	1952.6	1803.4
Kherson	472.2	467.8	417.3	388.7	399.8
Khmelnytsky	1435.3	1266.2	960.9	1299.6	928.2
Cherkasy	1568.9	1041.2	1179.2	1219.2	1295.1
Chernivtsi	251.1	388.9	398.1	388.5	369.0
Chernihiv	410.2	848.3	867.3	720.6	732.7
m. Kyiv	736.1	1548,0	1610.3	1668.7	950.3
Sevastopol	203.0	…	…	…	…

* Source: [11].

Table 2.49

Waste management for disposal operations, thousand tons *

Disposal operations	2010	2014	2015	2016	2017
Total recycled	**145710.7**	**109280.1**	**92463.7**	**84630.3**	**100056.3**
Utilization / regeneration of solvents	330.6	89.0	65.3	91.4	82.1
Recycling / disposal of organic substances that are not used as solvents	1407.5	1394.6	443.2	842.9	4357.9
Composting of organic waste	147.4	689.3	651.1	692.0	755.2

Disposal operations	2010	2014	2015	2016	2017
Fermentation of organic waste	295.8	123.9	86.7	115.2	68.1
Recycling of paper and cardboard	…	2.7	24.0	9.9	31.6
Recycling / utilization of metals and their compounds	5921.2	5995.8	6515.8	5119.9	5445.2
Recycling / disposal of other inorganic materials	109629.8	75184.4	58958.1	55544.1	46294.3
Regeneration of acids and bases	33.6	0.4	0.4	1.6	2.8
Recovery of components used to reduce pollution	6125.2	14491.7	13718.7	10287.2	29228.1
Recovery of catalyst components	0.0	0.0	0.0	0.0	3.1
Re-distillation of used petroleum products or other reuse	99.3	36.1	29.0	21.2	16.5
Tillage that has a positive impact on agriculture or improves the environmental situation	9244.5	10754.7	10763.3	9914.5	12480.0
Use of wastes from any of the above operations	6438.5	517.5	1208.1	1990.4	1291.4
Total prepared for disposal	**6037.3**	**2903.9**	**1940.5**	**2920.5**	**3357.8**
Waste exchange for further disposal or disposal	2394.1	10.6	34.9	9.1	18.7
Waste sorting	…	109.3	163.1	49.2	25.4
Mechanical and biological processing of waste at IBE facilities	…	40.9	57.6	83.8	69.8
Disassembly of unusable vehicles	…	0.0	0.0	0.1	0.1
Collection and pre-treatment of scrap metal and waste containing metals	3643.2	2743.1	1684.9	2778.3	3243.8

* Source: [11].

Table 2.50

Dynamics of waste utilization by regions, thousand tons *

Regions	2010	2014	2015	2016	2017
Ukraine	**145710.7**	**109280.1**	**92463.7**	**84630.3**	**100056.3**
Autonomous Republic of Crimea	199.2	…	…	…	…
Vinnytsia	460.4	239.6	368.2	343.4	350.5
Volyn	10.0	96.7	105.5	118.7	112.2
Dnepropetrovsk	94274.9	83937.3	71495.7	66745.7	83802.1
Donetsk	17097.6	3142.9	2715.2	3758.0	5395.5
Zhytomyr	159.9	92.3	79.6	76.5	82.8
Transcarpathian	13.0	55.6	0.9	0.3	0.2
Zaporozhye	1673.2	1623.0	2623.1	2887.8	2705.5
Ivano-Frankivsk	605.1	426.0	575.4	681.8	651.6
Kyiv	1296.9	94.4	127.3	53.9	20.2
Kirovograd	20814.5	11335.7	8591.0	3049.9	1471.4
Luhansk	3769.5	2078.7	265.7	562.2	90.3
Lviv	48.2	533.6	325.8	482.7	603.0
Mykolayivska	118.8	77.7	76.3	81.0	61.3
Odessa	376.8	11.3	10.2	10.3	10.5
Poltava	2177.4	3441.5	3063.2	3615.2	2780.5
Rivne	119.7	97.4	94.0	65.2	23.6
Sumy	338.8	245.4	187.9	194.0	228.4
Ternopil	149.4	278.0	140.5	83.1	98.7
Kharkiv	525.3	203.3	283.9	422.0	121.5
Kherson	77.2	90.0	66.0	23.5	31.1
Khmelnytsky	260.1	305.1	346.0	450.1	397.0
Cherkasy	980.8	698.6	719.5	697.7	766.9
Chernivtsi	32.9	55.6	69.1	121.1	111.8
Chernihiv	83.2	107.3	133.5	104.3	130.6
m. Kyiv	15.4	13.1	0.2	1.9	9.1
Sevastopol	32.5	…	…	…	…

* Source: [11].

Table 2.51

List of regions that are the largest polluters of the environment in terms of waste generation in 2017 *

Region[36]	thousand tons	as a percentage of the total
Dnepropetrovsk	243 114.7	66.4
Kirovograd	37 623.3	10.3
Poltava	35 121.8	9.6
Donetsk	22 434.6	6.1
Zaporozhye	5 129.4	1.4
Lviv	2 483.1	0.7
Vinnytsia	2 341.7	0.6
Mykolayivska	2 327.9	0.6
Ivano-Frankivsk	1 948.8	0.5
Ternopil	1 905.8	0.5
Kharkiv	1 803.4	0.5
Cherkasy	1 295.1	0.4
Kyiv	1 265.6	0.3
m. Kyiv	950.3	0.3
Khmelnytsky	928.2	0.3
Odessa	739.9	0.2
Volyn	733.1	0.2
Chernihiv	732.7	0.2
Luhansk	644.0	0.2
Sumy	580.4	0.2
Zhytomyr	550.3	0.15
Rivne	457.7	0.1
Kherson	399.8	0.1
Chernivtsi	369.0	0.1
Transcarpathian	173.4	0.05
Total	**366054.0**	**100.0**

* Source: [26].

In general, the root causes of Ukraine's environmental problems are recognized [30]:

–subordination of ecological priorities to economic expediency; failure to take into account the consequences for the environment in legislative and regulatory acts, in particular in the decisions of the Cabinet of Ministers of Ukraine and other executive bodies;

–predominance of resource- and energy-intensive industries in the structure of the economy with mostly negative impact on the environment, which is significantly exacerbated by unregulated legislation in the transition to market conditions;

–physical and moral depreciation of fixed assets in all sectors of the national economy;

–inefficient system of public administration in the field of environmental protection and regulation of the use of natural resources, in particular the inconsistency of actions of central and local executive bodies and local governments, unsatisfactory state of the system of state environmental monitoring;

–low level of understanding in society of the priorities of environmental protection and the benefits of balanced (sustainable) development , imperfection of the system of environmental education and training;

–unsatisfactory level of compliance with environmental legislation and environmental rights and responsibilities of citizens;

–unsatisfactory control over compliance with environmental legislation and failure to ensure the inevitability of liability for its violation;

–Insufficient funding from state and local budgets for environmental measures, funding for such measures on a residual basis.

2.1 0 . Cumulative impact

The cumulative effects on Strategic Action Plan and Subsector Action Plans refer to air quality, climate change, land use, water, sea, habitats, flora, fauna, landscape and noise. The cumulative effect of the Strategic Action Plan and Subsector Action Plans measures on air quality and climate change is positive, since the Strategic Action Plan and Subsector Action Plans promotes the use of public transport against private transport, as well as modes such as rail and inland waterway transport against road transport. The impacts on land use, water, sea, biodiversity and landscape should be carefully examined in combination with other potential plans and programs in Ukraine (such as sectoral development plans or local and regional spatial plans). Concerning noise, the effects mainly concern construction phase and are reversible but it should be remembered that in urban areas transport noise is a major issue. Additionally, cumulative effects may arise from construction

infrastructure in the framework of some other plans, so an integrated approach must be adopted to avoid the phenomenon of excess of the carrying capacity of the regions under development.

In 2018, the state of environmental pollution on the territory of Ukraine according to the monitoring network of hydrometeorological organizations has not changed significantly and remained high enough.

In recent years, the unfavorable quality of the natural environment, especially atmospheric air and surface water, is usually observed in the places of residence of most of the country's population (urban area and industrial zones).

Of the 39 cities of Ukraine where hydrometeorological organizations conducted regular observations, in two cities the atmospheric air was characterized by a very high indicator (as in the previous year), and in 14 cities - a high level of pollution. This list includes cities with powerful enterprises of metallurgy, chemistry and petrochemistry, fuel and energy complex, as well as those with a large fleet of mobile sources. In almost all cities on this list, high levels of air pollution are associated with significant concentrations of formaldehyde, nitrogen dioxide, phenol, suspended solids, hydrogen fluoride, and carbon monoxide.

Concentrations of radioactive elements in the air on the territory of Ukraine were stable and several orders of magnitude lower than the permissible norms (except for the exclusion zone in the area of the Chornobyl NPP location).

According to the generalized data of the Central Geophysical Observatory . Borys Sreznevsky in 2018 [40], as in previous years, water quality in terms of hydrochemical parameters did not meet the standards for the most common substances such as heavy metal compounds, ammonium nitrogen, nitrite nitrogen, dissolved oxygen, sulfates. The main sources of pollutants are wastewater of various types of production, agricultural and communal services, surface runoff.

According to the results of hydrobiological monitoring of freshwater objects, no significant improvement in water quality and the state of aquatic ecosystems compared to the previous year was observed. In general, the state of ecosystems remains stable, no radical changes in the axonometric composition and structure of groups have been identified.

According to the radiation control of water bodies of Ukraine during 2018, no exceedances of permissible levels of radionuclides in water were registered.

The waters of the Black and Azov Seas and estuaries were the most polluted with oil products and phenols, in some areas of the seas - compounds of ammonium nitrogen and nitrite nitrogen, of heavy metals - hexavalent chromium.

In the soils on the territory of cities due to long-term emissions of pollutants into the atmosphere from various enterprises, on highways - from transport, formed zones of high content of heavy metals around them of industrial and transport origin.

Thus, in the event that the draft Action Plan is not adopted, given the existing high level of environmental pollution, it should be expected to continue, and for some components of the deterioration of the negative trend.

3. The characteristics and environmental conditions of the population and the state of his health at the area 's that are likely to be affected

The measures envisaged by the draft Action Plan for 2019–2021 for the implementation of the National Transport Strategy of Ukraine for the period up to 2030, as already noted, are justified in the following areas:

competitive and efficient transport system;

innovative development of the transport industry and global investment projects;

safe for society, environmentally friendly and energy efficient transport;

unhindered mobility and interregional integration.

These directions and content of measures indicate that they are aimed at minimizing the impact on the environment, including the health of the population , both transport infrastructure and transport in general . Given that the state planning document is of national importance, its measures are closely related not only to the implementation of the National Transport Strategy of Ukraine until 2030, but also aimed at overcoming environmental problems of Ukraine, which are directly or indirectly related to the transport sector or its subsectors.

Thus, the root causes of environmental problems in Ukraine are [30]:

– subordination of ecological priorities to economic expediency; failure to take into account the consequences for the environment in legislative and regulatory acts, in particular in the decisions of the Cabinet of Ministers of Ukraine and other executive bodies;

– the predominance of resource- and energy-intensive industries in the structure of the economy with mostly negative impact on the environment, which is significantly exacerbated by the unregulated legislation in the transition to market conditions;

– physical and moral depreciation of fixed assets in all sectors of the national economy;

– inefficient system of public administration in the field of environmental protection and regulation of the use of natural resources, in particular inconsistency of actions of central and local executive bodies and local governments, unsatisfactory state of the state environmental monitoring system;

– low level of understanding in the society of the priorities of environmental protection and the advantages of balanced (sustainable) development, imperfection of the system of ecological education and enlightenment;

– unsatisfactory level of compliance with environmental legislation and environmental rights and responsibilities of citizens;

– unsatisfactory control over compliance with environmental legislation and failure to ensure the inevitability of liability for its violation;

– insufficient funding from state and local budgets for environmental measures, funding for such measures on a residual basis.

The aforementioned areas and content management of a plan justified in the light of the introduction of secure society, energy efficient and environmentally friendly transport, the report con Nemo only possible potential negative impact of building s Rob IT as part of the planned measures on site.

On average, such an impact is possible during the implementation of the following tasks of the draft Action Plan, in particular :

Competitive and efficient transport system

Task 6. Improving the efficiency of internal logistics operations of freight transport by removing existing barriers and improving the relevant infrastructure, as well as its combination with the international and trans-European transport network (TEN-T):

1) restoration of the European track of 1435 mm of the Ukrainian segment of pan-European railway connections from the Polish to the Romanian border through Lviv - Ivano-Frankivsk - Chernivtsi, to connect the main TEN-T corridors of the EU bypassing the Carpathians;

2) reconstruction of the 1435 mm railway track on the Kovel-Yagodyn-State Border section with subsequent electrification (Volyn region);

3) electrification of the section Kovel-Volodymyr-Volynskyi - Izov - State Border;

4) equipment of traction substations located on III and IX pan-European transport corridors ("Cretan"), with means of reactive power compensation

5) experimental resumption of railway traffic on track 1520 in the direction Romania - Ukraine - Slovakia on the section Vikshan - Vadul-Siret - Chernivtsi - Kolomyia - Rakhiv - Valya-Vysheului, as part of investment measure 315 "Restoration of through rail traffic on the existing track 1520 mm between all borders regions of Ukraine and bordering regions of Romania, Hungary, Slovakia and Moldova, which are part of the EU Strategy for the Danube Region ”Chernivtsi region;

6) introduction of the passenger connection Mukachevo-Chop-Záhony (Hungary) / Čierne nad Tisza Slovakia (Lviv Railway regional branch);

7) restoration of the Ukrainian part of the international cross-border railway connection Przemyśl (Poland) - Nyżankowice (Ukraine) - Khyriv (Ukraine) - Zaguzh (Poland);

8) project "Electrification of the railway direction Dolynska - Mykolayiv - Kolosivka" Odessa region;

9) new construction of railway transport infrastructure facilities with electrification of the State Border - Ovruch - Korosten - Zhytomyr - Berdychiv section (first stage);

10) construction of a combined track of 1435 mm and 1520 mm: Eurorail "Dry Port" (Mostyska - Rodatichi) Lviv region;

11) construction of a combined track of 1435 mm and 1520 mm: "Eurorail Lviv-Rava-Ruska - Warsaw" Lviv region;

12) construction of a new runway and passenger terminal complex of Odessa International Airport;

13) reconstruction of the aerodrome complex of the municipal enterprise "Odessa International Airport";

14) completion of the reconstruction of the aerodrome complex of Kharkiv Airport, provided for in the program of preparation for Euro-2012;

15) construction, reconstruction and overhaul of the highway M-03 Kyiv-Kharkiv-Dovzhansky (in the city of Rostov - on the Don) in the area from Poltava region to Donetsk region, Kharkiv region. Sections of the highway M-03 Kyiv-Kharkiv-Dovzhansky on the bypasses of settlements from Poltava to the border with Kharkiv region (2nd stage);

16) construction and overhaul of six transport interchanges at different levels on the highway M-05 Kyiv-Odessa km 87 + 000 - km 128 + 028, km 15 + 390, km 21 + 847, km 35 + 290;

17) construction of the highway M-09 Ternopil - Lviv - Rava Ruska on the section km 135 - km 143 (bypassing the town of Kulykiv), Lviv region;

18) performance of repair and construction works in the direction Lviv-Odessa (Gdansk-Odessa):

1. M-10 Lviv - Krakovets;
2. M-06 Kyiv - Chop (Northern bypass of Lviv);
3. H-02 Lviv - Ternopil;
4. M-12 Stryy - Ternopil - Kirovograd - Znamyanka (on the section Ternopil - Uman);
5. M-05 Kyiv - Odessa (on the section (Uman-Odessa).
6. Construction of the Ternopil bypass within the framework of the project Transport Transport of Ukraine - Phase 1;

19) reconstruction and overhaul of the public highway of state importance M-14 Odessa - Melitopol - Novoazovsk (on Taganrog) on the section Odessa - Nikolaev - Kherson (border of the Kherson region - bypass of Kherson);

20) construction of the highway M-22 Poltava - Alexandria on the bypass section of Kremenchuk with a bridge over the Dnieper River, Poltava region. 1. Construction of the road section km 0 + 000 - km 6 + 550; construction of the road

section km 6 + 550 - km 13 + 100; construction of the road section km 13 + 100 - km 14 + 500; construction of the road section km 14 + 500 - km 19 + 600;

21) overhaul of the highway M-01 Kyiv-Chernihiv - Novi Yarilovichi (to Gomel) (Kyiv - Kipti);

22) construction of a bypass of the town of Berehove and the village of Astei to the international car checkpoint "Luzhanka";

23) construction of the highway M-06 Kyiv-Chop (bypass of Dubno), km 371 + 570 - km 395 + 550 Rivne region;

24) H-11 Reconstruction of the highway Dnipropetrovsk - Mykolayiv on the section Dnipropetrovsk - Kryvyi Rih. Dnipropetrovsk and Mykolayiv regions;

25) construction of a bridge crossing over the Southern Bug river in the city of Nikolaev. Mykolaiv region;

26) restoration of the depths of the Ukrainian part of the river route E40 (freight traffic), which connects the Black and Baltic Seas through the corridor "Vistula-Dnieper", dredging of inland waterways E40.

Task 7. Ensuring a comprehensive solution to the issues, in particular the preparation and implementation of the relevant concept or implementation of the program (plans) for the development of multimodal transportation and logistics technologies, which includes, in particular:

ensuring the development of multimodal transport technologies and infrastructure complexes to ensure the interaction of different modes of transport, in particular:

- providing guaranteed depths in the waters of seaports and on the Dnieper River (3.65 m) in order to develop shipping, including inland waterways, and the possibility of reorienting part of the freight flow from road and rail to water;

- conducting an environmental impact assessment and obtaining a decision on the implementation of planned activities of dredging works on the Pripyat River;

creation of a network of multimodal transport and logistics clusters and basic logistics centers, "dry ports", terminals, specialized transshipment complexes, etc., in particular:

- construction of a logistics terminal at the Kovel railway station;

harmonization of the development of port infrastructure (railways, highways) and port capacity, in particular:

- approval of the Comprehensive Plan for the Development of Seaports of Ukraine;

- implementation of infrastructure projects for the development of seaports and access roads to seaports;

ensuring uniform technological compatibility in the main directions of transport and junctions between modes of transport (Measures are envisaged under Task 6 "Improving the efficiency of internal logistics operations of freight transport by removing existing barriers and improving infrastructure, as well as its combination with the international and trans-European transport network (TEN-T) »).

Task 8. Ensuring the development of a priority network of roads, in particular:

increase in the share of paved public roads:

- construction of paved roads at the entrances to settlements in rural areas; development of a network of road service points and to ensure compliance with the requirements of work and rest of drivers in accordance with the European Agreement concerning the Work of Crews of Vehicles engaged in International Road Transport (EUTR) (Law of Ukraine of September 7, 2005 № 2819-IV), and regulations:

- arrangement of places of rest of drivers;

increasing the number of mobile dimensional and weight complexes and ensuring effective control over the excess of dimensional and weight parameters of vehicles, in particular:

- introduction of a pilot project of weighing in motion (WIM) within the Kyiv region and the main access roads (M-01 Kyiv-Chernihiv-Novi Yarilovichi; M-03 Kyiv-Kharkiv-Dovzhansky; M-05 Kyiv-Odessa; M- 06 Kyiv-Chop; M-07 Kyiv-Kovel-Yagodyn);

- design, supply and installation of six automatic weighing points in motion on the roads around Kyiv and an auxiliary office (pilot project for the implementation of a weighing system in motion (WIM);

Task 14. Ensuring the development of air transport and creating conditions for sustainable development of air transport, in particular:

technical improvement of the air navigation system through the creation of communication, navigation and surveillance infrastructure for the organization of air traffic, in particular:

- replacement of instrument landing systems (ILS) at Kyiv Airport (Zhulyany);
- introduction of new air traffic control radars;
- introduction of radio transmitting and receiving centers with VoIP function on remote objects;

development of terminal passenger and cargo complexes with multimodal technologies at the expense of their owners and public-private partnership with ensuring international standards of quality of passenger service, including persons with reduced mobility and persons with disabilities, as well as cargo and mail:

- development of Bila Tserkva International Airport with a multimodal infrastructure for cargo and passenger air transportation, as well as the development of a modern aircraft maintenance and repair center in the Kyiv region;
- development of a multimodal hub on the basis of Gostomel airfield;

increasing the competitiveness of Boryspil International Airport as a leading hub airport in Eastern Europe, in particular by expanding the network of air connections, attracting more air carriers:

- development of the infrastructure of Boryspil airport;
- reconstruction of Flight Zone № 2 of the state enterprise Boryspil International Airport;

- reconstruction of passenger terminal D of the state enterprise Boryspil International Airport;

Reconstruction of runways and comprehensive modernization of equipment at regional airports for the possibility of operating medium-haul aircraft, and, if appropriate, wide-body aircraft in accordance with EU legislation, in particular:

- implementation of the state program of reconstruction and modernization of regional airports;
- construction of a passenger terminal and service facilities of the Zaporizhia International Airport utility company of the Zaporizhia City Council;
- reconstruction of the aerodrome of KP "Vinnytsia Airport". Vinnytsia region;
- reconstruction of the runway at Kherson Airport;
- ensuring the development of Kyiv International Airport (Zhulyany).

Innovative development of the transport industry and global investment projects

Task 16. Introduction of a mechanism to stimulate the gradual modernization and development of transport infrastructure, upgrade vehicles for the needs of the industry, in particular improving the management system of transport infrastructure development and implementation of the transport network development plan based on the national transport model, in particular:

- construction of a new metal railway bridge (under the second track) on 109 km of the Kryvyi Rih-Kryvyi Rih-West section;
- increasing the capacity of the direction to the Mariupol node;
- electrification of the railway line Popasna - Kupyansk. Luhansk region;
- construction of the Bilokurakine-Svatove railway. Luhansk region;
- design and construction of a stationary traction substation Art. Separate Odessa region;
- reconstruction of track development of Pidbirtsi station;
- increasing the capacity of the direction Hrebinka - Poltava, Poltava region;
- development of the Black Sea seaport;
- development of the Nikolaev seaport;
- development of the Sea Commercial Port "South";
- development of the port of Mariupol. Construction of a grain terminal on the territory of the state enterprise "Mariupol Sea Commercial Port";
- development of the Odessa sea trade port;
- development of the Rhine sea trade port;

- reconstruction and overhaul of the highway H-08 Boryspil-Dnipro-Zaporizhzhya (via Kremenchuk) - Mariupol on the sections km 169 + 277 - km 246 + 619, km 259 + 279- km 273 + 649. Poltava region;

- overhaul of the highway T-04-03 Marianske - Berislav - "R-47";

Task 17. Introduction of an effective tax mechanism for attracting private capital in development, in particular:

aviation transport, in particular the implementation of strategic projects in aviation, modernization and development of airport infrastructure and air navigation service provider of Ukraine, including the introduction of the latest technologies of remote aerodrome control services (remote control tower) of regional airports with low traffic:

- introduction of performance-based navigation (PBN);

use of global satellite systems (GNSS) as the main means of navigation;

application of stepless recruitment and reduction techniques (CCO / CDO);

introduction of advanced flexible use of airspace (A-FUA);

harmonization of general and operational air traffic;

development of communication, navigation and surveillance (SNS) infrastructure in accordance with the European ATM Master Plan, in particular:

introduction of Data Processing Centers (DTCs) for centralization of air navigation services (ANS);

development of telecommunication infrastructure, ensuring its integration into the European network service (PENS);

introduction and development of air traffic services (AMHS);

creation of ground-to-air communication infrastructure for introduction of frequency distribution of 8.33 kHz channels;

introduction of modern cooperative air traffic control systems (Mode S, ADS-B, WAM);

support for non-cooperative surveillance systems;

creation and maintenance of navigation infrastructure to provide performance-based zonal navigation (PBN);

providing technical support for the automation of air traffic management and civil-military coordination;

introduction of technologies for centralized collection, processing and dissemination of data related to air navigation; introduction of remote aerodrome control services (Remote Tower); introduction of systems of remote control, management and monitoring of ZNS objects;

- creation of an aviation cluster with a cargo airport, a cargo carrier, a maintenance center, a flight school and the Lviv Jagellon Industrial Park;

Task 30. Creation of a modern infrastructure of communication, navigation and surveillance of Ukraine for the organization of air traffic taking into account the tasks of Ukraine as a member of Eurocontrol:

- introduction of radio transmitting and receiving centers with VoIP function on remote objects within the framework of the target task of the National Single Sky Implementation Plan (LSSIP) COM11 - "Implementation of Voice over Internet Protocol (VoIP) in ATM";

- introduction of gateways for the implementation of the VoIP function in the existing voice communication systems (Kyiv, Lviv) in the framework of the target of the National Plan for the implementation of the Single European Sky (LSSIP) COM11 - "Implementation of Voice over Internet Protocol (VoIP) in ATM »;

- introduction of 5 DME;

Task 34. Ensuring integrated innovative development of transport, in particular through the implementation of the state strategy (target approach) of innovation and development and investment projects in the transport sector, providing for the possible creation of the Transport Innovation Fund, and the relationship of goals and resources through appropriate plans and programs of activity and development, in particular:

road transport

- preparation of proposals for the establishment on the basis of the state enterprise "State Motor Transport Research and Design Institute" of the National Research and Testing Center of promising technologies for safe, environmentally friendly and energy efficient road transport in accordance with international technical regulations and EU directives;

general aviation airports

- resumption of operation of general aviation aerodromes (reconstruction of aerodromes including runways);

renewal of rolling stock of railway, automobile, aviation, sea and river transport;

renewal of public transport with a predominant transition to electric transport

- implementation of the Financial Agreement (Urban Public Transport of Ukraine Project between Ukraine and the European Investment Bank);

electric transport

- creation of a national network of high-speed car charging stations for electric vehicles;

Task 35. Creating conditions for the implementation of integrated information systems for passengers and cargo owners, namely:

simplification of formalities and improvement of cargo handling technologies in logistics terminals, airports and ports of Ukraine

- technical support of sustainable operation of the river information system;

- providing continuous radio coverage in the frequency range of the maritime mobile communication service in the area of the river information system from Kherson to the border with the Republic of Belarus;

increasing the capacity of the road network through the introduction of intelligent transport systems

- construction of the telecommunication cable sewerage infrastructure on the roads of the road infrastructure, as a reference for the construction of the infrastructure of optical communication lines, taking into account their repair and restoration and construction works;

Safe for society, environmentally friendly and energy efficient transport

Task 42. Improving road safety, namely:

improving pedestrian infrastructure, parking areas, speeding vehicles and developing infrastructure for bicycles

- arrangement of overground pedestrian crossings (updating of road signs, markings, pedestrian fences, alternative lighting, installation of traffic lights, including sounded for the needs of the blind and equipped for the needs of visually impaired people, safety islands, means of forced speed reduction, anti-pockets before pedestrian crossings and increased barrier-free land crossings); arrangement (design and construction) in cities and on suburban roads of separate bicycle paths and bicycle lanes; allocation of lanes for route vehicles and creation of appropriate conditions for unimpeded passage and compliance with the traffic schedule;

Task 45. Improving the level of shipping safety, namely:

ensuring the development of the onshore infrastructure of the Global Maritime Distress and Safety Communication System (GMMS)

- implementation of projects for the development of the coastal infrastructure of the Global Maritime Communication System in case of disaster and for security (GMZLB) KP "MPRS": construction of new facilities of the coastal segment of GMZLB - base stations of the coastal radio station A1 GMZLB Odessa construction of new objects of the coastal segment of GMZLB - base stations of the Coastal radio station of the sea area A1 GMZLB of Berdyansk; Construction of new objects of the coastal segment of GMZLB - Coastal radio station of the sea area A2 GMZLB of Berdyansk;

acquisition of marine and aviation search and rescue equipment and creation of base infrastructure

- construction of KP "MPRS" shore bases for search and rescue boats and storage base for search and rescue boats (non-self-propelled craft of the project POSS-907);

Task 46. Improving the level of environmental safety in transport, namely:

creation (construction, reconstruction) of a sufficient number of receiving port facilities for ship waste and polluted waters, as well as cargo residues in order to ensure compliance with the relevant international conventions to which Ukraine has acceded or plans to accede

Unhindered mobility and interregional integration

Task 58. Ensuring the development of a network of air transportation routes between the regions of the country, in particular through the modernization of regional airports and airfields with the involvement of international credit programs and grants to reduce the cost and increase the availability of air services:

- development and adjustment of the work of KP "Cherkasy Airport of Cherkasy Regional Council";
- reconstruction of the aerodrome and construction of the passenger terminal of Sumy International Airport;
- development and support of Poltava regional utility company "Airport-Poltava";
- development of Ternopil airport;
- development of Rivne International Airport;
- development and support of Ivano-Frankivsk International Airport (Scorzonera LLC);
- development and support of Uzhhorod International Airport;
- Reconstruction of the old terminal "1" for passenger service of VIP category (business terminal) of SE "Lviv International Airport" named after Danylo Halytsky;
- reconstruction of the runway of the aerodrome KP "Airport-Khmelnitsky";
- restoration and launch of Mykolayiv International Airport;

Task 61. Allocation of separate lanes in cities for passenger transportation

bringing urban development plans in line with state building codes;

Task 64. Ensuring the development of socially and environmentally oriented mobility over short distances in accordance with the models of "City of short roads" and the implementation of the principles of intermodality and ensuring optimal interaction of cycling with other modes of transport

arrangement of safe pedestrian infrastructure, creation of safe infrastructure for bicycle traffic;

Task 67. Ensuring with the participation of local state administrations the gradual replacement of road transport by electric transport, in particular by attracting loans on favorable terms, improving legislation, etc.

creation of a national network of car charging stations for electric cars along roads of international importance;

Task 72. Gradual renewal of rolling stock for passenger transport, replacement of modes of transport with carbon emissions, promotion of "green" modes of transport, ensuring the development of bicycle traffic in cities, replacing the concept of using minibuses with more flexible and environmentally friendly systems equipped for passenger transport with disabilities and other low mobility groups

deployment of a network of bicycle paths in cities with the appropriate level of quality and safety;

Task 73. Promoting urban mobility and developing a network of parking areas and passenger terminals for switching from individual transport to urban transport

identification within the construction of the transport model of large cities, parking areas and driveways, which will allow parking of individual vehicles near the nodes of basic public transport services.

Therefore, in the regions where the implementation of these tasks is planned, the consequences for the environment, including for public health (consequences for flora, fauna, biodiversity, soil, subsoil, climate, air, water, landscape, natural areas and areas) are likely. objects, safety of life and health, tangible assets, cultural heritage sites and the interaction of these factors).

Given the localization of measures envisaged by the draft Action Plan, when conducting environmental measures it is advisable to take into account the parameters of the largest polluting enterprises for 2017, formed by the Ministry of Ecology and Natural Resources of Ukraine on the basis of official statistics, based on reports of discharges. , emissions and waste generation. The main pollutants are systematized into three categories [26]: wastewater discharges (33 enterprises), air emissions (33 enterprises) and waste generation (34 enterprises). Two thirds of enterprises are located in 4 oblasts: Dnipropetrovsk - 30; Donetsk - 22; Zaporizhzhya - 9; Luhansk - 6.

In particular, out of 33 enterprises - the largest polluters in Ukraine, which were included in the rating of polluted wastewater discharges, 9 are in Dnipropetrovsk region, 8 in Donetsk region, 4 - in Luhansk and Sumy regions, 3 enterprises in Zaporizhia region and 1 enterprise in Lviv region, Mykolayiv region, Rivne region, Chernihiv region, as well as in Kyiv.

Regarding the enterprises that generate the largest amount of waste, out of 34 enterprises in Ukraine that generate the largest amount of waste, 14 are located in Dnipropetrovsk region, 8 - in Donetsk, 3 - in Zaporizhia, 2 enterprises in Kirovohrad and Poltava, and 1 enterprise in Vinnytsia, Ivano-Frankivsk, Mykolaiv, Ternopil and Lviv regions.

Of the 33 facilities from all over Ukraine that emit the most pollutants into the atmosphere, 7 - are located in Dnipropetrovsk region, 6 - in Donetsk, 3 - in Zaporozhye, 2 companies in Ivano-Frankivsk, Kyiv, Luhansk, Lviv, Kharkiv and 1 enterprise each in Vinnytsia, Kirovohrad, Cherkasy, Chernihiv and Poltava, Khmelnytsky regions and Kyiv.

4. Environmental problems, including risks to the health of the population, related to the state planning document, in particular in relation to areas with environmental status

As noted in Section 2 of this report, in particular paragraphs. 2.4, with the results of accounting data of territories and objects of the nature reserve fund submitted by the executive authorities at the local level, ensuring the implementation of state policy in the field of environmental protection, as of 01.01.2018 the nature reserve fund of Ukraine has in its

consisting of 8,296 territories and facilities with a total area of 4.318 million hectares within the territory of Ukraine (actual area 3.985 million hectares) and 402500.0 hectares within the Black Sea (Table 4.1 -4.2) [15].

Ensuring the preservation of natural habitats and natural fauna and flora on the territory of Ukraine is done by defining the territories of the Emerald Network within Ukraine and their preservation. The process of defining and conserving the Emerald Network in Ukraine only acquires an institutional basis in accordance with the requirements of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and the Directive № 2009/147 / EC on the Conservation of Wild Birds and the Directive № 92/43 / EC on the conservation of natural habitats and of species of natural fauna and flora.

Directive № 2009/147 / EC on the conservation of wild birds and Directive № 92/43 / EC on the conservation of natural habitats and of species of natural fauna and flora provide for the establishment and operation of the EU NATURA 2000 network of protected areas.

At the same time, today there is no scientific approach to ensuring the conservation of populations of species of flora and fauna, natural habitats at the biogeographical level, which is used in the formation of the NATURA 2000 network in the EU. This leads to a further reduction in the level of biodiversity in Ukraine. The principle of biodiversity conservation at the level of natural habitats (biotopes) is currently not implemented in national legislation, ie one of the key mechanisms of nature protection in the EU in Ukraine does not function . Whereas the formation of a network of protected areas on the basis of the settlement principle creates conditions not only for the conservation of species, but also for the reproduction of their populations. Therefore, monitoring of the conservation status of species of wild flora and fauna and natural habitats is not carried out systematically [33].

Table 4.1

Distribution of the number and area of objects of the nature reserve fund of Ukraine by categories and categories and administrative-territorial units *

Administrative-	Nature reserves	Biosphere reserves	National nature parks	Regional landscape parks	Reserves		Sights of nature		Botanical gardens	
					nationwide value	of local significance	nationwide value	of local significance	general value	of local significance

territorial unit																				
	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha
Vinnytsia	0	0	0	0	1	20203.4	4	18468.38	21	13563.7	125	11397,8574	10	322	185	653,48	0	0	0	0
Volyn	1	2975.7	0	0	3	121767.84	0	0	15	7731.8	206	90782,55	4	122.9	120	454.7	1	10	0	0
Dnepropetrovsk	1	3766.2	0	0	0	0	4	14000.07	24	29036,6631	81	47959,39	3	148	50	356.95	2	108	1	27
Donetsk	1	3033.2	0	0	2	61326.5	6	28927.31	7	4628.6	47	10141.42	10	236	30	469,34	1	203	0	0
Zhytomyr	2	50976.8	0	0	0	0	0	0	10	6757	145	78304,66	2	51	35	93.69	1	35.4	0	0
Transcarpathian	0	0	1	58035.8	3	87964.3	2	14961,96	19	12368	55	7742.62	9	464	329	478,68	1	86.41	0	0
Zaporozhye	0	100	0	0	2	94882,92	1	1025	12	38998.1	224	16560.7824	7	412	77	580,415	0	0	0	0
Ivano-Frankivsk	1	5344.2	0	0	5	120339.7	3	38417	10	5415.8	59	42964.94	14	440.4	200	910.6	0	0	0	0
Kyiv	0	0	1	226964.7	2	17206.72	2	5156.2	16	63276.9	85	26393,435	2	92	67	363,325	0	0	0	0
Kirovograd	0	0	0	0	0	0	2	77850.7	21	5728	84	12818.92	2	9.1	50	525,48	0	0	0	0
Crimea	6	63855.07	0	0	1	10900	14	41358	14	73957.7	25	23998.8	thirteen	639	81	2580,18	1	876.6	1	33.16
Luhansk	1	5403.02	0	0	1	7007	1	14011	5	1416,46	90	57154.17	3	165.24	68	5234.0913	0	0	0	0
Lviv	1	2084.5	0	0	3	58350.5	5	56288.9	9	3303	35	27771.34	2	592.8	186	2241,15	2	41.2	1	1.5
Mykolayivska	1	3010,65	0	2741	2	41361.28	5	39345.2	1	1782	54	10657.92	1	11	43	285.96	0	0	0	0
Odessa	0	0	1	51547.9	2	49176.1	2	15320	8	11913	31	16440,35	2	10.17	47	11.19	1	16	0	0
Poltava	0	0	0	0	2	22792,62	5	53056.45	20	41226.9	156	38154,88	1	145	134	1733,21	1	18	0	0
Rivne	1	47046.8	0	0	1	5448.3	3	58708	thirteen	16720	112	53887.3	8	420.2	59	394,42	0	0	0	0
Sumy	1	882.9	0	0	2	39575.2	1	98857.9	10	17780.3	93	29664.24	3	62.1	98	170.72	0	0	3	17.04
Ternopil	1	9516.7	0	0	2	17780.38	3	42997	18	11937.58	113	50032.19	12	126.2	452	1256,4032	1	200	2	32.86
Kharkiv	0	0	0	0	3	22690	7	20544.33	3	1038	166	36921,56	0	0	44	645.9	1	41.9	1	13.25
Kherson	0	0	2	139821.4	4	150780,9041	0	0	8	34607	thirteen	26892.8	0	0	30	26.1	0	0	0	0

Khmelnytsky	0	0	0	0	2	270078.7	1	16915.3	25	9660.8	133	27902,89	5	173.2	292	1520,78	1	17.5	1	2.21
Cherkasy	1	8634.88	0	0	2	11227.23	0	5562.5	5	14013.71	217	28474.0653	6	1166	186	721,315	0	0	0	0
Chernivtsi	0	0	0	0	3	27801.6	2	36473.3	10	1261.8	47	42875.1	9	176.4	175	606.75	1	3.5	0	0
Chernihiv	0	0	0	0	3	41988.5	3	85045,3491	11	9326	436	105355.5	7	297	130	562,01	0	0	0	0
m. Kyiv	0	0	0	0	1	10988.14	4	2651.6	1	1110.2	15	4176.2	1	30	131	131.85	3	205.7	0	0
Sevastopol	0	0	0	0	0	0	1	83.9	4	25689.9	0	0	0	0	6	448,78	0	0	0	0
Total:	**19**	**206630,62**	**5**	**4791108**	**49**	**1311637,834**	**81**	**786025,3491**	**320**	**464248,9131**	**2847**	**925425,8801**	**136**	**6311.71**	**3305**	**23457.4695**	**18**	**1863,21**	**10**	**127.02**
Black Sea									1	402500										

* Source: according to the State Cadastre of Territories and Objects of the Nature Reserve Fund of Ukraine as of 01.01.2017. In RL: http://old.menr.gov.ua/images/blog/news/27_04_2015/Forma_4DKPZF_2018.xlsx

Continuation of the table. 4.1

Administrative-territorial unit	Zoological parks				Dendrological parks				Parks-sights s-p-m				Protected tracts		Total		NPF objects that are part of the territories of other NPF objects		Actual area of PZF ATO	% of PZF areas from ATO areas	ATO area, thousand hectares
	general value		of local significance		nationwide values		of local significance		nationwide values		of local significance										
	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha	Number	Area, ha			
Vinnytsia	0	0	0	0	0	0	1	10	11	401	26	396.1	30	734.4	414	66150.3174	27	6527.5	59622,8174	2.25	2649,29
Volyn	0	0	0	0	0	0	0	0	3	28.6	8	80.33	27	15060.12	388	239014,54	48	15165.76	223848.78	11.11	2014,47
Dnepropetrovsk	0	0	0	0	0	0	1	2.8	1	45	7	417.5	3	466.4	178	96333,9731	4	325.6	96008,3731	3	3192.3
Donetsk	0	0	0	0	0	0	0	0	0	0	3	30	12	800.7	119	109796.07	25	16694.16	93101.91	3.51	2651.7
Zhytomyr	0	0	0	0	0	0	3	14.9	5	119.8	18	228.67	0	0	221	136581,92	0	0	136581,92	4.58	2982.7
Transcarpathian	0	0	0	0	0	0	2	34.9	1	38	34	138.28	9	1183.3	465	183496.25	68	4655,03	178841.22	14.02	1275.3
Zaporozhye	0	0	1	290	0	0	1	7.5	1	31	16	167.7259	2	95	344	153150,4433	24	28180	124970,4433	4.6	2718.3
Ivano-Frankivsk	0	0	0	0	3	142	6	16.36	1	7	8	83.4	207	7521.7	517	221603.1	44	2785,92	218817.18	15.71	1392.7

Kyiv	0	0	0	0	1	405.8	0	0	3	488.5	11	185.87 47	17	1571.7	207	342105,1 547	16	51870.22	290234,9 347	10. 3	2812. 1
Kirovograd	0	0	0	0	1	109	0	0	2	63.7	5	104.47	55	3192,7 6	222	100402.1 3	31	993,92	99408.21	4.0 4	2458. 8
Crimea	0	0	2	34.9	0	0	1	3.2	10	276.2	21	291.25	7	1205.3	197	220009.3 6	26	690	219319,3 6	8.4 1	2608. 1
Luhansk	0	0	0	0	0	0	0	0	2	136	7	107.07	20	3159.5	198	93793.55 13	7	1169	92624,55 13	3.4 6	2668. 3
Lviv	0	0	1	5.9	2	64	0	0	6	115.3	56	793.07 39	48	6502.4	357	158155,5 639	16	2256.9	155898,6 639	7.1 4	2183. 1
Mykolayiv ska	1	18.4 8	0	0	0	0	0	0	1	28	18	186.3	thirte en	3656.7	140	103084.4 9	23	27596.75	75487.74	3.0 7	2458. 5
Odessa	1	6.5	0	0	0	0	0	0	1	49	23	1604,9 39	4	13879	123	159974,1 49	12	9133.25	150840,8 99	4.5 3	3331. 3
Poltava	0	0	0	0	2	20.9	1	7.64	4	442.5	thirte en	179.64	48	7116.2	387	164893.9 4	48	22447.42	142446,5 2	4.9 5	2875
Rivne	1	11.6	0	0	1	29.5	0	0	2	39	thirte en	140,19 62	97	3454.9	311	186300,2 162	39	8837.7	177462,5 162	8.8 5	2005. 1
Sumy	0	0	0	0	1	21	3	5.04	2	311.6 6	20	341,31	26	369.6	263	188059.0 1	36	11359,44 05	176699,5 695	7.4	2383. 2
Ternopil	0	0	1	10	2	74	7	35.7	4	65	11	55.64	5	492.2	634	134611,8 532	152	11392.65	123219,2 032	8.9 1	1382. 4
Kharkiv	1	22	0	0	1	22.8	1	51.5	4	169.9	1	10.8	9	2537.2	242	84709.14	11	10557.8	74151.34	2.3 6	3141. 8
Kherson	0	0	0	0	1	167.3	0	0	0	0	thirte en	175	10	942	81	353412,5 041	6	50629.2	302783,3 041	10. 6	2846. 1
Khmelnyts ky	0	0	1	1.57	0	0	5	57.5 5	9	204.4 5	27	389.55	20	1538.5	522	328463	176	15980.97	312482,0 3	15. 15	2062, 9
Cherkasy	1	4.37	0	0	1	179.1 8	0	0	6	688,8 9	53	689,17 01	52	3743,0 9	530	75104.40 04	9	11197.26	63907.14 04	3.0 5	2091. 6
Chernivtsi	0	0	0	0	2	22.3	4	41.2	0	0	40	243.9	38	1072.5	331	110578.3 5	64	6979.9	103598.4 5	12. 8	809.6
Chernihiv	1	9	0	0	1	204.7	1	11.9	1	40	18	332.9	52	17546.2 608	664	260719,1 199	56	11428.89	249290,2 299	7.8 1	3190. 3
m. Kyiv	1	39.5	0	0	1	6.5	1	13.7	9	1931, 73	thirte en	195,44	0	0	181	21480,56	18	3769.6	17710.96	21	83.6
Sevastopol	0	0	0	0	0	0	0	0	0	0	0	0	1	18.44	12	26241.02			26241.02	30. 27	86.4
Total:	**7**	**111. 45**	**6**	**342, 37**	**20**	**1468, 98**	**38**	**313, 89**	**89**	**5720. 23**	**483**	**7568.5 298**	**812**	**97859.8 708**	**8245**	4318224, 12	**986**	332624,8 405	3985599, 286	**6.6**	**60354 .96**
Black Sea																			402500		

Table 4.2

The composition of land that belongs to the components of the national ecological network *

Components of an ecological network	Area (thous. Ha) state ohm on 01.09.2000	Area (thousand hectares) as of 01.01.2015	Area (thousand hectares) as of 01.01.2016	Projected area (thousand hectares) for 2015
Hayfields and pastures	7772.9	7848.3	7840.5	9536.6
Forests and wooded areas	10380.2	10630.3	10633.1	10955.7
Open wetlands	940.4	982.6	982.3	940.4
Radioactively contaminated land that is not used on the farm	136.0	123.8	123.7	136
Open lands without vegetation or with little vegetation	1180.8	1015.8	1020.6	1180.8
Water	2415	2426.4	2426.4	2415
Total area (thousand hectares), a percentage of the total area of Ukraine	***22825.3 37.8%***	***23027.2 38,16%***	***23026.6 38,16%***	***25164.5 41,68%***

* Source: [18].

Measures claim roekt in the Action Plan as a whole system in rahovuyut probably second impact on the nature reserve fund - plots of land and water space, natural complexes and objects which have a special nature, scientific, aesthetic, recreational and other value, allocated for the purpose preservation of natural diversity of landscapes, the gene pool of flora and fauna, maintaining the overall ecological balance, provide background environmental monitoring and is part of the global system of natural areas and sites under special protection, areas and sites of ecological network (Table 4. 3) .

Table 4.3

SWOT -analysis is kolohichn s problems, including risks impact on public health related to ektu Action Plan for 2019-2021 years of the National Transport Strategy of Ukraine till 2030

Strengths	Weak sides
The draft Action Plan was developed in pursuance of the order of the Cabinet of	The draft Action Plan contains no data on the exact location of infrastructure, their parameters, in

Strengths	Weak sides
Ministers of Ukraine dated May 30, 2018 № 430 "On approval of the National Transport Strategy of Ukraine until 2030." The tasks and activities of the Action Plan covering mainly and areas that are also relevant from the environmental point of view and ensure safety of life and public health : - competitive and efficient transport system; - innovative development of the transport industry and global investment projects; - safe for society, environmentally friendly and energy efficient transport; - unhindered mobility and interregional integration. The measures are aimed at meeting the needs of the population in transportation and improving the business environment to ensure the competitiveness and efficiency of the national economy, the implementation of the European integration course and the implementation of the Association Agreement between Ukraine and the European Union, the European Atomic Energy Community and their countries. members, on the other hand	relation to what information to quantify the impact , in particular on public health , Areas her with protection status is not enough. This necessitates such an assessment directly during the development of specific infrastructure projects by mode of transport .
Opportunities	**Threats**
Adoption of the draft Action Plan will ensure innovative development of the transport sector of Ukraine , safe for society, environmentally friendly and energy efficient transport	Absence in the draft Action Plan of an internal mechanism for monitoring the achievement of the established results

The measures envisaged by this document of state planning for rail, air, road transport are mainly in the restoration and modernization of existing infrastructure. Therefore, no significant additional direct impacts are expected in the protected

area . However, given that the planned activities include possible new construction works, the main potential impact expected from land transport (road and rail) is habitat fragmentation. When carrying out the reconstruction / construction of waterways or ports, a negative impact on flora and fauna is inevitable, as such activities lead to a reduction in the areas covered with vegetation, which are the habitat of animal species. Negative impact on the flora and fauna of inland waterway measures is likely due to noise generation (especially during bird nesting or fish migration) or in case of accidents (rupture of fuel tanks on transport equipment, flooding, damage to the riverbed). With regard to inland waterway transport, there is a possibility of some loss of biodiversity during construction works in ports due to land allotment and / or dredging. The main consequences caused by maritime transport are closely related to the impact on water quality. With regard to air transport, it should be borne in mind that birds pose a danger to aircraft flights, as collisions between aircraft and birds have become more frequent and serious.

5. Obligations in the field of environmental protection, including those related to the prevention of negative impact on public health, established at the international, state and other levels related to the state planning document, as well as ways to take into account such obligations under time of preparation of the state planning document

The draft Action Plan is designed to fit with obliged b Ukraine in the field of environmental protection, including those related to the prevention negative impact on public health , including:

Law of Ukraine " On Strategic Environmental Assessment " of 20.03.2018 2354-VIII , which regulates relations in the field of environmental impact assessment, including public health, the implementation of state planning documents and applies to state planning documents relating to , in addition to another, transport ;

Minutes of on Strategic Environmental Assessment to the Convention on the assessment of the environmental impact in a transboundary context, ratified by Ukraine of 01.07.2015 number 562-VIII;

Article 363 Chapter 6 "Environment" and Appendix xxx of the Association Agreement between Ukraine, on the one hand, and the European Union, the European Atomic Energy Community and their derzhavamy- members, on the other hand , ratified by Ukraine on 16 September 2014 , the . № 1678-VII, incl. Directive 2001/42 / EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programs on the environment ;

Of the Law of Ukraine On Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the period up to 2030 dated 28.02.2019 2697-VIII , in particular, ensuring the goal of the state environmental policy - achieving good environmental status by introducing an ecosystem approach to all areas of socio-economic development of Ukraine ensure

the constitutional right of every citizen of Ukraine a clean and safe environment, implementing sustainable environmental management and conservation and restoration of natural ecosystems and on AIN 's principles of state environmental policy :

maintaining a state of the climate system that will make it impossible to increase the risks to human health and well-being and the environment;

Ukraine's achievement of the Sustainable Development Goals, which were approved at the United Nations Summit on Sustainable Development in 2015;

promoting balanced (sustainable) development by achieving balanced components of development (economic, environmental, social), focusing on the priorities of balanced (sustainable) development;

integration of environmental requirements during the development and approval of documents of state planning, sectoral (regional), regional and local development and in the decision-making process on the planned activities of facilities that may have a significant impact on the environment;

intersectoral partnership and stakeholder involvement;

prevention of emergencies of natural and man-made nature, which involves the analysis and forecasting of environmental risks, based on the results of strategic environmental assessment, environmental impact assessment, as well as comprehensive monitoring of the environment;

ensuring environmental safety and maintaining ecological balance on the territory of Ukraine, increasing the level of environmental safety in the exclusion zone;

ensuring the inevitability of liability for violations of environmental legislation;

application of the principles of caution, prevention (prevention), priority of elimination of sources of environmental damage, " polluter pays " ;

responsibility of executive bodies and local self-government bodies for availability, timeliness and reliability of ecological information;

stimulation by the state of domestic economic entities that reduce greenhouse gas emissions, reduce energy and resource consumption, modernization of production aimed at reducing the negative impact on the environment, including improving the environmental tax system for pollution and payments for the use of natural resources resources;

introduction of the latest means and forms of communication and effective information policy in the field of environmental protection.

Thus, Goal 2 "Ensuring sustainable development of natural resource potential of Ukraine" of the Basic Principles (strategy) of the state environmental policy of Ukraine for the period up to 2030 provides the task of reducing the loss of biological and landscape diversity, in particular , by improving the principles of ecological network formation, its expansion and inexhaustible use, as well as the preservation of unique natural landscapes; conservation and restoration of the number

of species of natural flora and fauna, including migratory species, their habitats, rare and endangered species, species of fauna and flora and typical natural plant communities subject to protection; reducing the negative impact of urbanization on the environment, stopping the destruction of the environment within cities, in particular, preventing unjustified destruction of greenery within cities during construction or other works, illegal allocation of land occupied by greenery for construction; ensuring sustainable use and protection of land, improving the condition of affected ecosystems and promoting the achievement of a neutral level of land degradation, raising awareness of the population, landowners and land users on the problems of land degradation; stimulating the renewal of worn-out fixed assets of industrial and transport infrastructure and housing and communal services through direct government subsidies, cheaper loans, partial compensation of interest rates on loans, etc .;

Objective and 3 "Ensuring the integration of environmental policy in the decision-making process for socio-economic development of Ukraine",whose tasks are, in particular:

development of sectoral strategies for:

improving air quality;

improving water quality and managing water resources, including the marine environment. Complete gradual cessation of discharge of untreated and insufficiently treated wastewater into water bodies and ensuring compliance of the degree of wastewater treatment with the established norms and standards, as well as prevention of groundwater pollution;

preservation of the ozone layer;

climate change prevention and adaptation;

ensuring the protection and preservation of nature;

conservation of biodiversity and landscapes;

handling of hazardous chemicals.

Goal and 4 "Reduction of environmental risks in order to minimize their impact on ecosystems, socio-economic development and public health", in particular tasks in part:

reduction of air and water pollution;

reduction of anthropogenic impact on the ecosystems of the Black and Azov Seas;

introduction of environmental risk management based on its modeling in real time with the involvement of the latest information technologies to protect natural ecosystems, health and well-being of the population;

prevention of the spread of invasive species and control of the emergence and spread of such species in natural ecosystems, including marine ones;

reducing the amount of removal of radionuclides outside the exclusion zone and the zone of unconditional (compulsory) resettlement;

solving environmental problems, restoring and preserving the environment of Donbass;

Sustainable Development Strategy "Ukraine - 2020", approved by the Decree of the President of Ukraine of January 12, 2015 № 5/2015, in particular, on the vector of development - the reform of transport infrastructure;

Agreement on Certain Aspects of Air Services of 0 December 1, 2005 and the initialed draft Agreement between the EU and its Member States on Common Aviation Area;

UN Framework Convention on Climate Change, ratified by the Law of Ukraine of October 29, 1996 № 435/9 6-VR;

Paris Agreement, ratified by the Law of Ukraine of July 14, 2016 № 1469-VIII,

UN General Assembly Resolution September 25, 2015 № 70/1 "Transforming our world: The 2030 Agenda for Sustainable Development "

C medium-term plan of priority actions of the Government until 2020, approved by the order of the Cabinet of Ministers of Ukraine dated April 3, 2017 № 275 ;

Strategies th low-carbon development of Ukraine for 2050 and pursuant to orders of the Cabinet of Ministers of Ukraine of 7 December 2016, the. Number 932-p " On approval of the concept of public policy in the field of climate change for the period up to 2030 " in part of apobihannya Climate Change by reducing anthropogenic emissions and increasing the absorption of greenhouse gases and ensuring a gradual transition to low- carbon development of the state;

Law of Ukraine “On Ukraine's Accession to the United Nations Convention to Combat Desertification in Countries Suffering from Serious Drought and / or Desertification, Especially in Africa” of 4 July 2002 № 61-IV ;

Law of Ukraine "On Ukraine's participation in the Convention on Wetlands of International Importance, Mainly as a Habitat for Waterfowl" of October 29, 1996 № 437/96-VR;

Strategy for the development of the public financial management system, approved by the order of the Cabinet of Ministers of Ukraine dated August 1, 2013 № 774-r , because such a system is the basis for ensuring sustainable development of the country and guaranteed fulfillment of social obligations to citizens, andPublic finances are of strategic importance for the regulation, in particular, of the real sector of the economy and the financial sector, ensuring the development of regions, supporting business activities, and their potential is the basis of economic and social development of Ukraine. The effectiveness of the public financial management system is important to ensure the stability of the budget system, as well as overall financial security and sustainable economic growth;

State Strategy for Regional Development until 2020, approved by the Cabinet of Ministers of Ukraine dated August 6, 2014 № 385 , and the Action Plan for 2018-2020 for the implementation of the State Strategy for Regional Development until 2020, approved by the Cabinet of Ministers of Ukraine from September 12, 2018 № 733, in part, in particular, settlement at the legislative level of the issue of concession activities, in particular regarding the mechanism of selection of the

concessionaire and preparation for the implementation of quality projects on concession terms that will comply with international practice ;

Action plan for deregulation of economic activity, approved by the order of the Cabinet of Ministers of Ukraine dated August 23, 2016 № 615-r , in part with the abolition of pre-trip and post-trip medical examinations of drivers, as well as the introduction of liability for release of vehicles that have not passed shift inspection ; c simplification of the procedure of organization and control over the training, retraining and advanced training of drivers of vehicles ; c simplification of the issuance of one-time permits to the west to the river ports of Ukraine of vessels under foreign flags ; with the abolition of fees for the construction and / / lifting of bridge trusses ; with the abolition of the fee for locksmithing for ships, the obligation of hydropower plants to maintain lock facilities ; on reduction of tariffs for services of river pilots on pilotage of the vessel by river inland waterways ; d monopolization of the market of services for pilotage of vessels by river inland waterways, further liberalization of such market, determination of sections (districts) of mandatory pilotage on river inland waterways ; to ensure the provision of business entities and state supervision (control) to the information system of the port community in electronic form of information in the form approved in accordance with the legislation used in the processing of cargo in seaports, instead of documents in paper form ;

The plan of action for the implementation of best practices in efficient and effective regulation reflected the World Bank Group in the methodology of the ranking " Doing Business ", approved by the Cabinet of Ministers of Ukraine of 16 December 2015 r. Number 1406 (as amended by the Cabinet of Ministers Ukraine from November 23, 2016 № 926-r) .

Thus, the BBC Action Plan measures do not conflict with obliged yum Ukraine in the field of environmental protection, including those related to the prevention of negative effects on human health .

6. Description of the consequences for the environment, including for the health of the population, including secondary, cumulative, synergistic, short-, medium- and long-term (1, 3-5 and 10-15 years, respectively, and, if necessary, 50 -100 years), permanent and temporary, positive and negative consequences

The draft state planning document does not contain quantitative and qualitative characteristics of infrastructure facilities, the construction of which is planned in the draft Action Plan. In this regard, the description of secondary cumulative, synergistic, short-, medium- and long-term (1, 3-5 and 10-15 years, respectively, and if necessary - 50-100 years), permanent and temporary, positive and negative consequences , can be implemented at the stage of implementation of specific infrastructure projects by mode of transport.

IMPACTS TO AIR

SEA OBJECTIVE: Minimize the risk of potential effect on the air quality

Road transport

During the construction works (rehabilitation of existing network or new roads), the negative impact on the air quality is primarily due to the necessary activities required during the construction. The biggest reasons for the reduction of air quality during the construction are:

- dust emissions because of manipulation of loose materials (excavation, filling, ...)
- dust emissions from the surfaces on which the machinery necessary for the construction is moving
- fossil fuel combustion products from the machinery engines, engines of the vehicles used to transport workers, engines of vehicles used to transport the materials and other fossil fuel engines (eg, diesel generators).

The exhaust gas and dust emissions are not so large as to make bigger long-term impairment of the surrounding area air quality. If a short-term deterioration of air quality occurs, the impact will stop as soon as the construction works finish, so these impacts are short-term and reversible.

During the operation phase, depending on the implementation of the measures, the overall impacts present important uncertainty. Improvement of the road network quality, elimination of congestions and increase of the speed usually lead to lower emissions. However, improvement of the existing network (as well as creation of new road networks) if it is follow-up by the removal of traffic congestion issues, often creates increased new traffic, which results to increase emissions in areas that had no such problem. before the named intervention. Positive impacts are expected by the implementation of environmental protection measures and improvement of traffic safety and security.

Rail transport

As for road transport, most of the negative impacts are expected during the construction works of the infrastructure (upgrade of existing infrastructure or creation of a new one), when exhaust emissions of construction equipment and dust emissions by excavations are foreseen. These impacts are however short-term (during construction period) and reversible.

Infrastructure development in the rail sector has rather positive impacts, since one of the targets of the Strategic Action Plan and Subsector Action Plans is implementation of the state policy of support modal shift to non-motorized, electric transport (railways, light rail, water) . Positive impacts are also expected by measures such as renewal of rolling stock with new low energy consuming engines and upgrading of fleet and transport technologies of all modes of transport. Rapid technological development and the increasing share of electric trains will also help reduce exhaust gas pollution of railway vehicles propelled by diesel engines. Although, the overall impact depends on the electricity generation could result in increasing local air pollution in the power plants which usually uses fossil fuels for electricity generation.

Inland waterway and maritime transport

Impact on air quality during the construction works on ports will have floating particles (dust) and exhausted gases generated during earthworks necessary for the construction of the port (or waterway). During operation of the machinery necessary for the construction of the planned project and access roads, as well as during the delivery and / or shipment of materials, machinery most commonly uses fossil fuels as fuel, by whose combustion the gases which appear contain: sulfur dioxide (SO2), nitrogen oxides (NO_x), carbon oxides (CO, CO_2), volatile organic compounds (VOCs), polycyclic hydrocarbons (PAH) and particulate matter (PM).

During operation emissions, such as CO, NO_x, SO_2, PM, VOC are expected by port operations (lifts (cranes) and accompanying machinery manipulation, road, railway and inland waterway traffic, transhipment of cargo, use of boiler rooms etc.). The impact of the port on the air quality near populated areas generally depends on the type and scale of operations in the harbor and the distance of built-up areas from the port. Increasing the amount of goods will cause an increase in emissions of pollutants such as NO_x, SO_2 and particulate matters (dust), in accordance with the increased transport and transhipment of goods, not considering the progress in terms of increased energy efficiency of mechanization and reduced pollutant emissions. The transhipment of bulk cargo is identified as a potential source of pollution, all measures for protection should be taken (eg discharged from less height, use of funnels,) that during loading of that cargo type, dust emissions are less. For other types of transhipment cargo (general, liquid, chemicals) a significant impact on air quality is not expected. In terms of

sustainable transport development, the development of railways and inland waterways is in line with the strategy of promoting multimodal transport and generation of traffic diversion effects from the road, as higher-pollutant, to energy more efficient rail and river transport. Additional positive impacts are expected by applying asset management and infrastructure life cycle (upgrading of fleet and transport technologies of all modes of transport), enhancement of energy efficiency at transport (support modal shift to non-motorized, electric transport, railways, light rail , water)) and implementation of integrated environmental policies at transport (control air and noise emissions at transport)).

Air transport

During the construction project, air quality is affected primarily due to the necessary activities required in the construction. That impact is primarily negative, but short-term and reversible.

The impact of airports on the quality of air in populated areas near airports generally depends on the type and scale of operations at the airport and the distance of the populated areas from the airport. Greatest emissions of pollutants typically occur as a product of combustion of fuel during aircraft operation. The main sources of emissions airport area are the following:

- gases produced by fuel combustion in the aircraft engines
- gases released into the atmosphere during refuelling
- gases produced by the combustion of fuel needed for the functioning of necessary ground equipment, servicing and serving of aircraft on the ground
- emissions from motor vehicles for the transport of passengers, employees and visitors to the airport
- emissions from the chimney of the central boiler room
- emission from fuel combustion from vehicles on roads in vicinity, a certain percentage of which is related to the operation of the airport.

Main aircraft emissions include carbon dioxide (CO_2) and steam (H_2O), common products of burning hydrocarbon-based fuel. Other emissions include nitrogen oxides (NO_x), sulfur compounds (SO_x and H_2SO_4), carbon monoxide (CO),

volatile organic compounds (VOC) and soot (particulate matter, PM10). By-products are also other gas compounds, charged molecular clusters, including nitric acids (HNO_3 and HNO_2). The formation of individual compounds is a direct consequence of the composition of fuel, the conditions of chemical reactions required to form certain compounds, the conditions of mixing gases with air, the cooling rate of the plume and the composition of aerosols already present in the ambient air, etc.

Chemical compounds that are an integral part of aircraft emissions are usually divided into those that directly affect the climate, such as CO2, and those that affect it indirectly through chemical reactions, such as NOx, which affects the balance of ozone and other gases (eg methane) in the atmosphere. Advances in the aircraft engine industry have reduced the amount of pollutants emitted during the operation of aircraft engines, and ICAO, primarily through CAEP, insists on the policy of further reduction and limitation of emissions of aircraft engines that affect the environment. Consequently, in case the expansion and improvement of the airports is accompanied by an important increase in air traffic (which is rather probable), so negative impacts concerning air quality in the surrounding area are expected. Positive impacts are expected by the implementation of integrated environmental policies at transport (control air and noise emissions at transport)) and the implementation of international and European standards and plans, such as ICAO / CAEP, one of the main targets of which is the reduction of air emissions by aviation.

Urban and regional transport

Small negative effects (emissions to air from construction works for improving of urban mobility and regional integration) are expected during construction period, but of short-term and reversible character.

Positive impacts are expected by the implementation of environmental protection measures and improvement of traffic safety and security.

The measures of the Strategic Action Plan and Subsector Action Plans concerning the urban mobility and regional integration (such as promotion of the delivery of regular public transport services in urban settlements, promotion of non-motorized transport) are in general in the spirit of improvement of public transport services. This results to positive effects

on air quality, due to the increase of the attractiveness of the public transport and the modal shift from private cars to public transport.

Conclusion

Air emissions (mainly PM10 and exhaust emissions) are expected during the construction phase of the infrastructure. The impact of airports on the quality of air in populated areas near airports generally depends on the type and scale of operations at the airport and the distance of the populated areas from the airport. In general, the overall impacts of the Strategic Action Plan and Subsector Action Plans on air quality are positive, considering the spirit of promotion public transport, rail, inland waterway and maritime transport.

IMPACTS TO CLIMATE CHANGE

SEA OBJECTIVES: Adapt transport infrastructure to climate change

Decrease greenhouse gases

The impact on climate change is reflected in damage suffered due to extreme weather and climate conditions, and grows each year. Another consequence of higher global temperatures is a change in patterns of average climate phenomena and more frequent occurrences of extreme weather conditions (drought, floods, erosions, storms with hail, heat waves, low temperatures with frost, etc.). These risks will be reduced to a minimum by using certain assumptions, input data, procedures and processes through which the effects of climate change will be included in the design phase, all in accordance with the valid legal and technical regulations, standards and ordinances.

Road transport

Impacts by road sector and their interventions on GHG emissions present important uncertainty. There is a strong possibility that the reconstruction / construction of new roads will create additional journeys and will lead to an increase in GHG emissions by the road sector, which now represents 74.4% of GHG transport emissions in Ukraine. In general, the transport sector is responsible for roughly 24% of global greenhouse gas emissions from fuel combustion and is the fastest growing sector among all emissions sources in Ukraine. However, the evolution of emissions depends on various factors

(transport development that will result from the combination of all measures foreseen in the Strategic Action Plan and Subsector Action Plans , evolution of road transport technology, improvement of economic conditions etc.).

Rail transport

As for the road transport, most of the negative impacts from the GHG emissions are expected during the construction works.

The measures of Strategic Action Plan and Subsector Action Plans related to rail transport have in general positive or neutral impact on climate change. Positive impacts are also expected by measures such as renewal of rolling stock with new low energy consuming engines and upgrading of fleet and transport technologies of all modes of transport. Also, the modernization of the rolling stock (passenger and freight) will have positive impacts, as the new stock is more energy efficient and has lower GHG emissions. The electrification of the railway usually leads to a reduction of GHG emissions, although the result strongly depends on the fuel used for the electricity generation.

Inland waterway and maritime transport

The most of the negative impacts from the GHG emissions are expected during the construction works on inland waterways or ports.

The overall promotion of transport by inland waters will have positive impacts concerning climate change, considering the potential shift from road to inland waterway and maritime transport.

Air transport

The most of the negative impacts from the GHG emissions are expected during the construction works on airports.

As for the road transport, there is uncertainty on the impacts during operation phase. In case the expansion and amelioration of the airports is accompanied by an important increase in air traffic, negative impacts concerning climate change are anticipated. However, considering that the share of aviation in the GHG emissions (mostly CO_2) of the country is low (around 23.1% of the transport emissions together with rail, water transport and production equipment and 3.8% of the total emissions of the country according to State Statistical Service of Ukraine; excluding the temporarily occupied

territories of the Autonomous Republic of Crimea, the city of Sevastopol and part of the anti-terrorist operation zone), the negative impacts could be considered as small relatively to other sectors contributing to GHG effect in Ukraine. One of the goals for improving fuel efficiency is to increase efficiency by 2% annually. This improvement is of course accompanied by measures to improve the technology, operational processes, alternative fuels and the accompanying economic instruments. On the other hand, the number of kilometers flown by aircraft is increasing, and it is estimated that this improvement of 2% per year, with current efforts, would be attainable over the next ten years, and after that new and even greater commitments will be required, and thus the costs, to maintain a constant trend of reducing emissions.). ICAO as the umbrella organization of international air transport takes the issue of aircraft (and related activities) impact on the environment very seriously. The Commission for Environmental Protection in Air Transport (ICAO - CAEP - Committee on Aviation Environmental Protection) only deals with technical and operational aspects of noise mitigation and emissions from aircraft. Commission resolutions are revised every three years, so the last available versions are those from 2010 - Resolution A37-18 and Resolution A37-19. It can be concluded that sustainability which includes reducing emissions from aircraft is of utmost importance for further development of the aviation industry.

Positive impacts are expected by the implementation of integrated environmental policies at transport (control air and noise emissions at transport)) and the implementation of international and European standards and plans, such as ICAO / CAEP, one of the main targets of which is the reduction of air emissions by aviation.

Urban and regional transport

As for the other types of transports, the most of the negative impacts from the GHG emissions are expected during the construction works, but they are negligible comparing to the positive results expected by the successful implementation of the proposed measures.

The measures of the Strategic Action Plan and Subsector Action Plans concerning the urban mobility and regional integration (such as promotion of the delivery of regular public transport services in urban settlements, promotion of non-motorized transport) are in general in the spirit of improvement of public transport services. This results to positive effects

on climate change, due to the increase of the attractiveness of the public transport and the modal shift from private cars to public transport.

Conclusion

GHG emissions are expected during the construction phase of the infrastructure. As for the air quality, in general, the overall impacts of the Strategic Action Plan and Subsector Action Plans on climate change are positive, considering the spirit of promotion public transport, rail, inland waterway and maritime transport.

IMPACTS TO SOIL AND LAND USE CHANGE

SEA OBJECTIVE: Avoid or minimize adverse effects upon soils

Road, rail, air, urban and regional transport

The most negative effects of the Strategic Action Plan and Subsector Action Plans , on the land use is land take for the development of new transport infrastructure. Considering that most of the infrastructure already exists and the Strategic Action Plan and Subsector Action Plans, foresees its upgrade, rehabilitation and modernization, the additional effects are not considered to be very significant. The design of the specific projects (especially for road transport and planned expansion and development of ports), should consider the land take and avoid land take of the most valuable agricultural land. However, the effects on land use should be examined in combination with other development policies such as spatial development policy

Furthermore, permanent and direct effects of the various transport types on plant production in the surroundings are as follows:

- contamination by chemical pollutants from emissions of automotive and aircraft engines, which to some degree can be absorbed and enter the food chain,

- slowdown in growth and development of crops due to dust deposition on plants, which reduces penetration of light and photosynthesis,

- limited and / or disabled organic production of agricultural food products.

Soil erosion is not expected to be significant by land transport, since the Strategic Action Plan and Subsector Action Plans, mainly forces adaptation of existing infrastructure.

Inland waterway and maritime transport

The significant effects on soil are expected by the inland waterway transport and maritime transport and strongly depend on the extent of the interventions and are site specific. In general, it can be determined that the construction of the port will have a significant negative impact on changes in the physical, chemical and hydropedological properties of the surrounding land. It is assumed that along the border encompass of the port, a zone will be left / belt land for landscaping of the area (planting of woody and other vegetation), which will in some way separate the port from other agricultural land. Since the constructed facilities for storage and material handling (coal, cement, fertilizer, ore, steel, petroleum and liquefied natural gas) must be waterproof, negative impact of these substances on changing the features of the surrounding soil are not expected, except in the case of accidents. Adverse effects on soil are expected due to sedimentation of contaminated sediments. River / sea bank erosion is also one possible impact. The flow induced by the passage of the vessels generates erosive forces that may damage harbor basins, navigable channels, beaches and seaside properties.

Conclusion

The most negative effects of the Strategic Action Plan and Subsector Action Plans, on the land use is land take for the development of new transport infrastructure. Considering that most of the infrastructure already exists and the Strategic Action Plan and Subsector Action Plans foresees its upgrade, rehabilitation and modernization, the additional effects are not considered to be very significant. The significant effects on soil are expected by the inland waterway transport and maritime transport and strongly depend on the extent of the interventions and are site specific. Adverse effects on soil are expected due to sedimentation of contaminated sediments. River / sea bank erosion is also one possible impact.

IMPACTS TO WATER AND SEA

SEA OBJECTIVE: Avoid adverse effects upon water and sea resources

Road, rail, air, urban and regional transport

For rail, road, air, urban and regional transport, the impacts on water resources (either positive or negative) are limited. Construction works represent a potential contamination of surface and groundwater, particularly due to possible leakage of fuel and lubricants from machinery used for performance of earth works. Additionally, for road and air transport, negative impacts may arise using salt for de-icing the road. Also, during the operation of the airport in winter, the chemicals for de-icing of the maneuvering area and de-icing of the aircraft are used.

Inland waterway transportation

Inland waterway transport has significant impacts on water bodies, related both to construction and operation phase.

Development / upgrading of inland waterways and river ports consequently request engineering works in river. The biggest negative impact on waters is expected during dredging works. Dredging poses a threat to the aquatic environment through not only the disposal of dredged material but also the dispersal of pollutants into surface waters during dredging. Additionally, it may create faster flowing water affecting the natural characteristics of the water body. At these locations, there will be a temporary deterioration of water quality downstream. Deterioration of water quality will ensue due to the increased value of suspended solids and enrichment of water with nutrients and precipitated substances, particularly heavy metals. The consequence of raising the sludge in the water column will be increased sedimentation of particles at the bottom of the area downstream from the location of the project where works are carried out.

In general, during the operation phase, the vessels that will navigate through the waterway will represent a source of multiple types of pollution and will be a permanent and active source of phenol, heavy metal and other exhaust gas pollution. The increased river traffic will furthermore increase the demand for use of antifouling agents, ship paint, agents for cleaning (eg detergents) etc. which expose the environment to an increased risk of pollution. The above-mentioned impacts have secondary effects on the biodiversity of water bodies as well as in the aquaculture activities.

Maritime transport

Maritime transport is expected to have negative impacts on the sea. The most significant impact is dispersal of pollutants into surface waters during dredging activities, operations on ports / harbors / terminals, washing of equipment and

tanks, dumping of black (sewage) and gray (shower, sink, and galley) waters, pollution from ballast water and illegal waste and waste water dumping. The increased sea traffic will furthermore increase the demand for use of antifouling agents, ship paint, agents for cleaning (eg detergents) etc. which expose the environment to an increased risk of pollution. As for the inland waterway transport, pollution of the maritime environment has additionally secondary effects on the biodiversity. On the other hand, positive impacts are expected by the implementation of integrated environmental policies at transport and the implementation of international and European regulations and standards which will have positive impacts on water quality.

Conclusion

For rail, road, air, urban and regional transport, the impacts on water resources (either positive or negative) are limited. Construction works represent a potential contamination of surface and groundwater, particularly due to possible leakage of fuel and lubricants from machinery used for performance of earth works. Inland waterway transport has significant impacts on water bodies, related both to construction and operation phase. Development / upgrading of inland waterways and river ports consequently request engineering works in river. The biggest negative impact on waters is expected during dredging works. Maritime transport is expected to have negative impacts on the sea. The most significant impact is dispersal of pollutants into surface waters during dredging activities, operations on ports / harbors / terminals, washing of equipment and tanks, dumping of black (sewage) and gray (shower, sink, and galley) waters, pollution from ballast water and illegal waste and waste water dumping.

IMPACTS TO HABITATS, FLORA, FAUNA, PROTECTED AREAS AND LANDSCAPE

SEA OBJECTIVES: Avoid adverse effects upon internationally and naturally designated nature conservation sites.

Avoid or minimize adverse effects upon important habitats, species and landscape

Road, rail, urban and regional transport

The measures of Strategic Action Plan and Subsector Action Plans for rail, road, air, urban and regional transport, mainly consider on the rehabilitation and upgrading of existing infrastructure. Consequently, no major additional direct

impacts to habitats, flora, fauna, protected areas and landscape are expected. Nevertheless, considering that the planned interventions include possible new construction works the main potential impact during construction expected by land transport (road, rail, urban) is habitat fragmentation. These effects can be significant for some groups of small species such as amphibians and reptiles but also for large carnivores. There are also some potential impacts on forests. Additional impact during construction is the disturbance of birds and wildlife due to increased lighting during construction and operation of transport infrastructure.

Inland waterway transportation

During construction, negative impact on terrestrial and aquatic habitats of the subject area will occur unavoidably:

- devastation of all habitats in areas where hydrotechnical objects will be built, ie the riverbed is widened,
- temporary devastation of terrestrial habitats due to the construction of access paths for adequate access to the construction site,
- devastation of underwater habitats in areas where excavation will be done,
- disposal of construction and other waste created during construction on the surface of surrounding terrestrial or aquatic habitats,
- pouring out of dangerous liquids such as oils or grease onto surrounding surfaces which represent terrestrial habitats for flora and fauna as well as into waterways (aquatic habitats).

By performing the intervention in nature, the integrity and stability of natural habitats is disrupted, which has a negative effect on plant and animal life. By reconstructing / constructing the waterway or port, a negative impact on flora and fauna is unavoidable. It results in a decrease of plant covered surfaces which also represent habitats for animal species. Negative impacts on flora and fauna of inland waterways are possible with noise (especially during the nesting season of beards or fish migration) or in the case of accidents (rupture of fuel reservoirs on transport equipment, inundation zone and bed river damage). Temporal dredging also causes suspension of sediment. The resuspension of sediment may expose the water environment to substances that may have a detrimental effect on wildlife. A potential effect is the increased oxygen

consumption resulting from the resuspension of organic matter and reduced components. Another potential effect may be the mobilization of harmful components (heavy metals, organic compounds etc.) that are presently buried in the riverbed. The removal of sandbars in the middle of the river and / or along the riverbank may have an impact on certain species and their habitats, amongst others on fish spawning sites. River training work may include the construction of groynes, submerged groynes, guiding bunds, closure bunds. River training through the construction of groynes will permanently reduce the flow of velocity and increases the sedimentation of fine particles between the groynes. This may result in a change in the conditions for benthic vegetation and fauna and of survival for fish eggs / larval.

Negative Impacts on biodiversity and habitats also include potential barriers to migration and dispersal of species (dams, canals), straightening river courses which can accelerate water velocity causing severe erosion of the riverbed and the shoreline and introduction of non-native or invasive species.

To conclude, new infrastructure measures on the inland waterway network are likely to have impacts on biodiversity and the network of protected sites, so each project preparation must be carefully and properly planned and addressed from the early phases.

Maritime transport

Development / upgrading of sea ports consequently request engineering works in sea, so negative impacts are expected during both construction and operation phase.

As for the inland waterway transport, during construction works in ports due to land take and / or dredging there is the possibility of certain loss of biodiversity. The main impacts caused by maritime transport are in close connection with the impacts on water quality.

During the operation phase, the anticipated impacts may be disturbance of species due to noise, human presence, eutrophication and sedimentation, which is important especially for vulnerable species. Additionally, in case of pollution from ballast water, introduction of non-native or invasive species may occur.

Air transport

Birds have become a serious threat to the safety of aircraft as their strikes have become more frequent and more serious. Collisions with birds have less severe consequences on piston engine aircraft, and least severe consequences on smaller aircraft. Birds flying in the intake of the jet engine and striking the wing occur mainly when landing, but this is also possible during the take-off which can lead to an abrupt interruption of the take-off, braking and skidding off the runway. Collisions between birds and aircraft occur worldwide. Most bird species are active by day, but many are active at dawn, at dusk or even at night. Most strikes occur at low altitudes.

Conclusion

The measures of Strategic Action Plan and Subsector Action Plans for rail, road, air, urban and regional transport, mainly consider on the rehabilitation and upgrading of existing infrastructure. Consequently, no major additional direct impacts to habitats, flora, fauna, protected areas and landscape are expected. Nevertheless, considering that the planned interventions include possible new construction works the main potential impact during construction expected by land transport (road, rail, urban) is habitat fragmentation. By reconstructing / constructing the waterway or port, a negative impact on flora and fauna is unavoidable. It results in a decrease of plant covered surfaces which also represent habitats for animal species. Negative impacts on flora and fauna of inland waterways are possible with noise (especially during the nesting season of beards or fish migration) or in the case of accidents (rupture of fuel reservoirs on transport equipment, inundation zone and bed river damage). As for the inland waterway transport, during construction works in ports due to land take and / or dredging there is the possibility of certain loss of biodiversity. The main impacts caused by maritime transport are in close connection with the impacts on water quality. Birds have become a serious threat to the safety of aircraft as their strikes have become more frequent and more serious.

IMPACTS TO CULTURAL HERITAGE AND MATERIAL ASSETS

SEA OBJECTIVES: Avoid adverse effects upon Ukrainian and World Cultural Heritage sites

Minimize adverse effects on unknown and intangible cultural heritage sites, material assets and other infrastructure

Road, rail, inland waterway, maritime, air, urban and regional transport

The measures of Strategic Action Plan and Subsector Action Plans for rail, road, air, urban and regional transport, mainly consider on the rehabilitation and upgrading of existing infrastructure. Consequently, no major additional direct impacts on cultural heritage are expected). However, negative Impacts may in the construction phase of the infrastructure, should be carefully assessed during the environmental permitting phase of the works. In case of an archaeological findings, action will be taken as laid down by the law and conventions on the protection of cultural heritage accepted by the Republic of Ukraine. Additionally, the impacts on material assets might be negative, since the necessity of construction materials will result in an increase in the demand for construction primary materials (such as sand, limestone etc.), that may downgrade certain areas (quarrying areas). However, improvement of the existing network (as well as creation of new road networks to eg some cultural and historical areas) can results in increasing of visitors and consequently to secondary impacts, such as waste generation, noise, etc.

Conclusion

The measures of Strategic Action Plan and Subsector Action Plans for rail, road, air, urban and regional transport, mainly consider on the rehabilitation and upgrading of existing infrastructure. Consequently, no major additional direct impacts on cultural heritage are expected). However, negative Impacts may in the construction phase of the infrastructure, should be carefully assessed during the environmental permitting phase of the works.

IMPACTS TO POPULATION

SEA OBJECTIVES: Contribute towards direct or indirect to employment

Improve social cohesion and sustainable mobility

Road, rail, inland waterway, maritime, air, urban and regional transport

In general, the Strategic Action Plan and Subsector Action Plans measures are in the spirit of development of sustainable transport, compliant to the European relevant policy and promote the use of public transport. However, the interventions on the road sector might increase the traffic and transport needs for private transport.

Conclusion

In general, the Strategic Action Plan and Subsector Action Plans measures are in the spirit of development of sustainable transport, compliant to the European relevant policy and promote the use of public transport and their impacts are expected to be positive.

IMPACTS TO ENERGY

SEA OBJECTIVE: Contribute and increase the energy efficiency in the transport

Road, rail, inland waterway, maritime, air, urban and regional transport

The Strategic Action Plan and Subsector Action Plans is expected to have positive impacts on energy efficiency, since it promotes the implementation of integrated Transport Planning (asset management and infrastructure life cycle), enhancement of energy efficiency at transport and promotion of the delivery of regular public transport services in urban settlements. Consequently, it may result in a significant modal shift from road transport both for passengers and freight to more energy efficient transport modes (rail, inland waterway and maritime transport). Furthermore, implementation of integrated environmental policies at transport. eg energy safety, air and noise emissions at transport, and reducing environmental impact or implementation of (EURO-4, EURO-5, EURO-6 standards and of support of modal shift to non-motorized, electric transport (railways, light rail, water) in transport planning and modernization of fleets will have significant additional positive effects on energy efficiency of the transport sector in Ukraine.

Conclusion

The Strategic Action Plan and Subsector Action Plans is expected to have positive impacts on energy efficiency, as it promotes the implementation of integrated Transport Planning, enhancement of energy efficiency at transport and promotion of the delivery of regular public transport services in urban settlements. implementation of integrated environmental policies at transport and modernization of fleets will have significant additional positive effects on energy efficiency of the transport sector in Ukraine.

NOISE IMPACTS

SEA OBJECTIVE: Avoid or minimize adverse effects of transport noise upon health and wellbeing of human communities

For all type of transport, during the reconstruction and construction works, there will be noise in the environment made by construction machinery, equipment and vehicles associated with the activities on the construction site. These impacts are short term and reversible.

Road transport

Noise has been identified as the biggest problem on roadways where the transit traffic of heavy trucks takes place, although the rest of the traffic activities have been recognized as a source of noise as well. Negative effects on noise are expected in the areas neighboring the road axis.

Rail transport

Increased noise levels and vibration levels are expected in the areas neighboring the rail lines. However, this depends on the time of day and the frequency of trains. During the use, along the settlement areas in which the expected noise levels are higher than allowed, it is necessary to undertake the noise protection measures. The condition of the tracks and the trains has the biggest impact on the noise emission and therefore special attention should be paid to routine maintenance. The barriers provided for noise protection will serve their purpose only if the tracks and vehicles are in a good condition. Due to the increased train speed and the expected traffic volume increase, there may be vibrations that will still be felt by the population living in the immediate vicinity of the railway track. On the other hand, modernization will significantly improve the current situation and reduce the vibrations caused by poor rail connections and worn-out track structures. Vibrations cause annoyance to residential areas.

Inland waterway and maritime transport

Vessels on the waterway / sea do not present a source of noise, except at ports for transhipment of goods, where the noise of the vessel is combined with the existing noise originating from traffic and working machines because of passenger

car and heavy vehicle (trucks) road traffic, goods movement, deriving from machinery such as quay crane, pumps, rail traffic noise etc.

Air transport

It can be concluded that the increased air traffic will surely lead to a significant increase in noise burden, prominent in the neighboring areas of airports.

Furthermore, implementation of integrated environmental policies at transport. eg energy safety, air and noise emissions at transport, and reducing environmental impact or implementation of (EURO-4, EURO-5, EURO-6 standards and of support of modal shift to non-motorized, electric transport (railways, light rail, water) in transport planning and modernization of fleets will have significant additional positive effects on noise control of the transport sector in Ukraine.

Urban and regional transport

In urban areas transport noise is a major issue.

Conclusion

For all type of transport, during the reconstruction and construction works, there will be noise in the environment made by construction machinery, equipment and vehicles associated with the activities on the construction site. Noise has been identified as the biggest problem on roadways where the transit traffic of heavy trucks takes place, although the rest of the traffic activities have been recognized as a source of noise as well. Increased noise levels and vibration levels are expected in the areas neighboring the rail lines. However, this depends on the time of day and the frequency of trains. Vessels on the waterway / sea do not present a source of noise, except at ports for transhipment of goods, where the noise of the vessel is combined with the existing noise originating from traffic and working machines. It can be concluded that the increased air traffic will surely lead to a significant increase in noise burden, prominent in the neighboring areas of airports. In urban areas transport noise is a major issue.

WASTE MANAGEMENT

SEA OBJECTIVES: Avoid or minimize adverse effects of waste generation

During construction of all transport infrastructure, the main impacts on waste production are large quantities of construction / demolition waste which will be produced. Inadequate waste collection and disposal could result in potentially impact on soil and water. Collection and disposal of all kinds of waste generated on the site, in line with all currently valid regulations and best practices, help prevent environmental pollution. Transport of all generated waste from the location and its disposal in accordance with the regulations and good practice will prevent negative environmental impact.

Road transport

Waste production is connected to resting and maintenance areas, but they are not considered significant.

Rail transport

The waste produced by rail sector are waste railway sleepers and stone aggregate, municipal wastes in stations and rails, equipment waste from rail elements, lubricants etc. Furthermore, the transport fleet renewal will also result with important quantities of waste that will need special management. Maintenance activities are and will also be another source of waste.

Inland waterway and maritime transport

During the use, because of port activities (maintenance and servicing of equipment which port use to carry out their activities and for the process of cargo handling) different type of wastes occurred (this includes sludge from fuels deposits, waste generated on-board, wastewater by vessels, etc.). Additionally, other main sources of waste identified in the port and in its neighborhood are oil terminals and fuel deposits. Waste is also expected by ship maintenance activities in the ports. Finally, during ship operations, important quantities of waste are also anticipated. These include glass, tin, plastic, paper, cardboard, steel cans, kitchen grease, kitchen waste and food waste. Ships are also a source of wastewater. An increased number of ship traffic on the river / sea may result in an increase in the disposal of waste and wastewater, including bilge water into the river / sea.

Air transport

Due to an increase in the number of passengers, an increase in the amount of waste can be expected. Urban and regional transport

The Strategic Action Plan and Subsector Action Plans are expected not to have a significant significant impact on waste production with the exception of the (rail) transport fleet renewal will result with important quantities of waste that will need special management. In this respect, the measures of the Strategic Action Plan and Subsector Action Plans should include the management of these wastes in line with EU waste legislation. Also, waste is expected in public transport maintenance areas.

Conclusion

During construction of all transport infrastructure, the main impacts on waste production are large quantities of construction / demolition waste which will be produced. Inadequate waste collection and disposal could result in potentially impact on soil and water. The waste produced by rail sector are waste railway sleepers and stone aggregate, municipal wastes in stations and rails, equipment waste from rail elements, lubricants etc. During the use, because of port activities (maintenance and servicing of equipment which port use to carry out their activities and for the process of cargo handling) different type of wastes occurred (this includes sludge from fuels deposits, waste generated on-board, wastewater by vessels, etc.). Due to an increase in the number of passengers, an increase in the amount of waste can be expected.

IMPACTS TO HUMAN HEALTH AND SAFETY

SEA OBJECTIVES: Minimize the number of fatalities in transport

Road, rail, inland waterway, maritime, air, urban and regional transport

Negative health impact is expected during construction near the construction site.

Positive impacts to health issues are expected from the almost whole measures During operation, negative impact on health issue can occur near roads, inland and maritime ports and airports. The Strategic Action Plan and Subsector Action Plans are in the spirit of EU policy promoting modes such as rail, inland waterway transport, which are considered more

environmentally friendly, especially as far as the air pollution is concerned. Finally, the anticipated overall impacts on health issues are expected to be positive.

Road , rail, inlad waterway and maritime and air transport

Positive impacts are expected from the whole Strategic Action Plan and Subsector Action Plans .

Urban and regional transport

In general, the promotion of public transport has positive effects on citizen safety. Positive impacts from the Strategic Action Plan and Subsector Action Plans are expected by measures related to reduce fatality rate due to traffic accidents in urban settlements but also with other measures and actions such as elimination of bottlenecks and prioritization of public transport, modernization of public transport fleet, traffic management etc.

Additionally, the development of modern transport infrastructure may have positive impacts in terms of security of the population towards crime. This can be achieved by the adequate design of the infrastructure (proper lighting, surveillance systems etc.) and is of great importance especially in places where criminal acts occur (such as railway and bus stations etc.). This issue should be addressed in the design phase of the infrastructure.

Conclusion

Negative health impact is expected during construction near the construction site. In general, the implementation of the Strategic Action Plan and Subsector Action Plans will increase the safety of the transport sector in Ukraine.

The following paragraphs summarize the results of the assessment procedure per SEA objectives.

TRANSPORT SEGMENT	AIR	CLIMATE CHANGE	SOIL AND LAND USE CHANGE	WATER	SEA	HABITATS. FLORA AND FAUNA	PROTECTED AREAS	LANDSCAPE	CULTURAL HERITAGE AND MATERIAL ASSETS	POPULATION	ENERGY	NOISE	WASTE	HEALTH AND SAFETY
ROAD TRANSPORT														
Construction phase	- DI LT LO CU	- DI LT LO CU	- DI LT LO CU	- DI LT LO CU	0	0	0	0	(?)	0	0	-DI OC LO CU TR	- IN OC LO	0
Utilization phase	- - DI ST LO CU TR	- DI LT LO CU	- DI LT LO CU	- DI LT LO CU	0	- DI LT LO CU	0	- DI LT LO CU	0	(?)	- DI LT LO CU	--DI OC LO CU TR	- DI LT LO CU	- DI LT LO CU
RAILWAY TRANSPORT														
Construction phase	- DI LT LO CU	- DI LT LO CU	- - DI LT LO CU	- DI LT LO CU	0	0	0	0	(?)	0	0	--DI OC LO CU TR	--DI OC LO CU TR	0
Utilization phase	++ DI IN MT ST LO RE CU	++ DI IN MT ST LO RE CU	- DI LT LO CU	0	0	- DI LT LO CU	0	- DI LT LO CU	0	++ DI IN MT ST LO RE CU	++ DI IN MT ST LO RE CU	--DI OC LO CU TR	- DI LT LO CU	++ DI IN MT ST LO RE CU
INLAND WATERWAY TRANSPORT														
Construction phase	- DI LT LO CU	- DI LT LO CU	-	DI ST LO RE CU TR AC		- DI ST LO RE CU TR AC	- DI ST LO RE CU TR AC	- DI ST LO RE CU TR AC	(?)	0		DI ST LO RE CU TR AC	DI ST LO RE CU TR AC	

TRANSPORT SEGMENT	AIR	CLIMATE CHANGE	SOIL AND LAND USE CHANGE	WATER	SEA	HABITATS. FLORA AND FAUNA	PROTECTED AREAS	LANDSCAPE	CULTURAL HERITAGE AND MATERIAL ASSETS	POPULATION	ENERGY	NOISE	WASTE	HEALTH AND SAFETY
Utilization phase	- DI IN MT ST LO RE CU	++ DI IN MT ST LO RE CU		DI ST LO RE CU TR AC		- DI ST LO RE CU TR AC	- DI ST LO RE CU TR AC	- DI ST LO RE CU TR AC	0	+ + DI IN MT ST LO RE CU	+ DI IN MT ST LO RE CU	DI LT LO CU	DI ST LO RE CU	+ DI IN MT ST LO RE CU
MARITIME TRANSPORT														
Construction phase	- OF LT LO CU -	- DI LT LO CU	-	DI ST LO RE CU TR AC		- DI LT LO CU	- DI LT LO CU	- DI LT LO CU	(?)	0		DI ST LO RE CU TR AC	DI ST LO RE CU TR AC	
Utilization phase	- DI ST LO RE	- DI ST LO RE	-	DI ST LO RE CU TR AC		- DI LT LO CU	- DI LT LO CU	- DI LT LO CU	0	+ + DI IN MT ST LO RE CU	+ DI IN MT ST LO RE CU	- DI LT LO CU	DI ST LO RE CU	I IN MT ST LO RE CU
AIR TRANSPORT														
Construction phase	- OF LT LO CU -	- OF LT LO CU -	?)	OF LT LO CU -		0	0	0	(?)	0		DI ST LO RE CU TR AC	DI ST LO RE CU	

TRANSPORT SEGMENT	AIR	CLIMATE CHANGE	SOIL AND LAND USE CHANGE	WATER	SEA	HABITATS. FLORA AND FAUNA	PROTECTED AREAS	LANDSCAPE	CULTURAL HERITAGE AND MATERIAL ASSETS	POPULATION	ENERGY	NOISE	WASTE	HEALTH AND SAFETY
													TR AC	
Utilization phase	- DI ST LO CU TR	- OF LT LO CU -		(OF LT LO CU -		- OF LT LO CU -	0	- OF LT LO CU -	0	(?)	OF LT LO CU -	DI ST LO RE CU TR AC	DI ST LO RE CU	OF LT LO CU -
URBAN TRANSPORT														
Construction phase	- OF LT LO CU -	- OF LT LO CU -	- OF LT LO CU -			0	0	0	?	0		DI ST LO RE CU TR AC	DI ST LO RE CU TR AC	
Utilization phase	+ + DI IN MT ST LO RE CU	- + DI IN MT ST LO RE CU		(		0	0	0	0	+ + DI IN MT ST LO RE CU	+ DI IN MT ST LO RE CU	+ DI IN MT ST LO RE CU	- DI ST LO RE CU	+ DI IN MT ST LO RE CU

LEGEND:

Grades of possible preliminary positive and negative impacts

MARK	EXPLANATION

-	Significant adverse impact. Significant adverse impact should be minimized with the application of mitigation measures to become insignificant.
-	Moderate adverse impact. This impact is acceptable.
0	No impact or neutral. Intervention has no effect that could be proven, or such impact is negligible.
+	Moderate positive impact
++	Significant positive impact
(?)	The significance of the impact cannot be assessed with certainty due to the lack of data on environmental components, planned activities or for some other reasons.
DI / IN	Direct / Indirect
LT / MT / ST / O	Term-Long (p ermanent , 50-100 years) / Medium-term (10-15 years) / Short-term (3-5 years) / Occasional (t emporary , 1 year)
LO / RE	Local / Regional
CU / SI / TR	Cumulative / Synergic / Transboundary
AC	Accidental event

The assessment includes the magnitude and significance, in qualitative and quantitative terms, of the potential impacts (direct and indirect, temporary or permanent, positive and negative, short and long-term, transboundary and cumulative) of the Strategic Action Plan and Subsector Action Plans .

7. Measures to be taken to prevent, reduce and mitigate the negative consequences of the implementation of the state planning document

The measures proposed are based on the impacts assessed in the previous chapter and the international experience in similar conditions. However, the measures proposed provide general guidance for addressing the adverse impacts, while detailed measures must be examined case by case during the development of specific projects and incorporated during the environmental permitting process.

SEA SEGMENT	SEA OBJECTIVES	PROPOSED ENVIRONMENTAL MITIGATION MEASURES
GENERAL	All of them bellow	The Strategic Action Plan and Subsector Action Plans and their implementation should be in coordination with other development strategies of the country such as Spatial Development strategy. Carefully design all planned infrastructure. The provisions of the Strategic Action Plan and Subsector Action Plans for studies / programs / plans assessing the necessity and feasibility of infrastructure should be prioritized. Adopt European and international environmental standards and know-how on the prevention and mitigation of adverse environmental impacts. Introduce and implement the Strategic Environmental Assessment (SEA) for each transport program / plan developed and introduced. Prepare Environmental Impact Assessment (EIA) and other necessary environmental documentation for each transport project that should include mitigation measures and monitoring plan in line with EU environmental legislation and environmental performance documents (EBRD Environmental and Social Policy, IFC EHS guidelines). Detailed mitigation measures should be presented at the environmental permitting phase of each intervention resulting from the Strategic Action Plan and Subsector Action Plans implementation.

		Adopt good engineering construction management practices, norms and standards for all construction works, to prevent / minimize environmental impacts to all parts of the environment. Prepare a Site Construction Management Plan to define: local transport, storage of materials, wastewater management, construction waste management and other waste, measures for occupational health and safety, fire protection system. Apply appropriate technical solution to prevent negative impacts to water and sea in case of extraordinary events (eg spillages of hazardous substances).
AIR AND CLIMATE CHANGE	Minimize the risk of potential effect on the air quality Adapt transport infrastructure to climate change Decrease greenhouse gases	Ensure that new infrastructure projects include operational strategies for managing extreme weather events and changes in climatic conditions such as winds, rainfalls and temperatures. Sustainable design and construction techniques should include climate change adaptation techniques. **Road transport** Considerate design options for the reduction of traffic congestion. **Inland waterway and maritime transport** Develop air quality management procedures applicable to ship operators and land based activities. Dry bulk materials storage and handling facilities on ports, harbors and terminals should be designed to minimize or control dust emissions. Where practicable, design new facilities on ports, harbors and terminals to minimize travel distance from ships off-loading and on-loading facilities to storage areas. **Air transport** Optimize ground service infrastructure on airports to reduce aircraft and ground vehicle movements on taxiways and idling at the gate. Improve ground service vehicle fleets.

		Minimize fugitive air emissions from jet kerosene and other fuel storage and handling activities. Supply electrical power and preconditioned air through ground based equipment to minimize the use of aircraft APUs.
SOIL AND LAND USE CHANGE	Avoid or minimize adverse effects upon soils	Constrain conversion of most valuable agricultural land of agricultural land, or if it is not possible, limit redevelopment for transport infrastructure interventions. Develop Erosion and Sediment Control Plans for the inland and maritime port construction activities.
WATER AND SEA	Avoid or minimize adverse effects upon water and sea resources	**Road transport** Avoid the use of salt for de-icing of the road transport network. **Inland waterway and maritime transport** Prior to initiation of dredging activities, materials should be evaluated for their physical, chemical, biological, and engineering properties to inform the evaluation of dredge materials reuse or disposal options. Conduct dredging only if necessary, and based on an assessment of the need for new infrastructure components or port navigation access to create or maintain safe navigation channels, or, for environmental reasons, to remove contaminated materials to reduce risks to human health and the environment. Excavation and dredging methods should be selected to minimize suspension of sediments, minimize destruction of benthic habitat, increase the accuracy of the operation, and maintain the density of the dredge material, especially if the dredge material includes contaminated areas. Apply commonly used dredging methods depending on the depth of the sediments and environmental concerns such as the need to minimize sediment suspension and increase dredging accuracy. Areas sensitive for marine life such as feeding, breeding, calving, and spawning areas should be identified. Where sensitive species are present, dredging (and blasting) should be conducted in a manner to avoid fish migration or spawning seasons, routes, and grounds. Conduct inspection and monitoring of dredging activities to

		evaluate the effectiveness of impact prevention strategies, and re-adjusted where necessary. Analyze dredged material to select appropriate disposal options (eg land reclamation, open water discharge, or contained disposal). Consider beneficial reuse of uncontaminated, dredged material (eg for wetland creation or enhancements, habitat restoration, or creation of public access / recreational facilities). Use techniques (eg silt curtains), to minimize adverse impacts on aquatic life from the re-suspension of sediments. Avoid installation of storm drainage catch basins that discharge directly into surface waters, but using containment basins in areas with a high risk of accidental releases of oil or hazardous materials (eg fuelling or fuel transfer locations), and oil / grit or oil / water separators in all runoff collection areas. Maintain oil / water separators and trapping catch basins regularly to keep them operational. Install filter mechanisms (eg draining swabs, filter berms, drainage inlet protection, sediment traps and sediment basins) to prevent sediment and particulates from reaching the surface water. Port operators should provide collection, storage, and transfer and / or treatment services, and facilities of sufficient capacity and type for all wastewater generated by vessels at the port in accordance with MARPOL and national regulations. Equip smaller vessels used for harbor services with recycling or chemical toilets, or holding tanks, that can be discharged to shore facilities. **Air transport** Primary use mechanical de-icing methods such as sweepers and plows complemented by chemical means. Pre-treate pavement surfaces with such means prior to the onset of ice to allow for easy removal. Substitute urea or glycol de-icers with less toxic, more biodegradable, and lower biochemical oxygen demand (BOD) alternatives.

		Provide a stormwater management system to collect and treat surface run-off containing aircraft and airfield anti-icing and de-icing fluids, including water originating from heaps of snow cleared from aprons and runways.
HABITATS, FLORA AND FAUNA, PROTECTED AREAS AND LANDSCAPE	Avoid adverse effects upon internationally and naturally designated nature conservation sites Avoid or minimize adverse effects upon important habitats, species and landscape	New development should avoid internationally and naturally designated nature conservation sites and other designated and sensitive sites. Avoid excessive lighting to minimize bird disturbance. **Road transport** Sit roads and support facilities to avoid critical terrestrial and aquatic habitat (eg old-growth forests, wetlands, and fish spawning habitat) utilizing existing transport corridors whenever possible. Design and construct wildlife access to avoid or minimize habitat fragmentation, considering motorist safety and the behavior and prevalence of existing species. Possible techniques for terrestrial species may include wildlife underpasses, overpasses, bridge extensions, viaducts, enlarged culverts, and fencing. Possible techniques for aquatic species include bridges, fords, openbottom or arch culverts, box and pipe culverts. Avoid or modified construction activities during the breeding season and other sensitive seasons or times of day to account for potentially negative effects. Prevent short and long term impacts to the quality of aquatic habitats by minimizing clearing and disruption of riparian vegetation, provide adequate protection against scour and erosion and consider the onset of the rainy season with respect to construction schedules. Minimize removal of native plant species, and replanting of native plant species in disturbed areas. Explore opportunities for habitat enhancement through such practices as the placement of nesting boxes in rights-of-way, bat boxes underneath bridges, and reduced mowing to conserve or restore native species.

		Implement Integrated Vegetation Management (IVM). **Rail transport** Avoid fragmentation or destruction of critical terrestrial and aquatic habitats by siting railways, rail yards, support facilities, and maintenance roads to avoid such locations or by utilizing existing transport corridors whenever possible. Where fragmentation of critical habitats cannot be avoided, maximize the availability of animal crossings (eg bridges, culverts, and over-crossings) and provide jointing chambers to allow small animals a means of escape from the railway. When rail crossings of watercourses are unavoidable, maintain water flow and fish access by utilizing clear-span bridges, open-bottom culverts, or other appropriate methods. Where sensitive habitats cannot be avoided by rail alignment, construction of bridges should be considered to span at-risk areas (eg wetlands). Avoid construction activities during the breeding season and other sensitive seasons or times of day, especially where critically endangered or endangered species are concerned. Avoid the introduction of invasive species during reinstatement activities, preferably use native plant species and, when feasible, clear invasive species during routine vegetation maintenance. Regular maintenance vegetation within road / railroad rights-of-way to avoid interference with vehicle travel and road maintenance or with train operations and track maintenance. **Inland waterway and maritime transport** Potential impacts to shoreline vegetation, wetlands, fisheries, bird life, and other sensitive aquatic and near-shore habitat habitats during port construction and operation should be fully assessed with special consideration for areas of high biodiversity value or those required for the survival of critically endangered or endangered flora and fauna. The depth of the port should be considered at the design phase in terms of habitat destruction and the amount and nature of dredging

		required. Additionally, specific prevention and mitigation measures should be adopted for blasting activities which can cause considerable impacts to marine organisms and their habitats during construction. Port facilities that conduct cleaning or repair of ballast tanks should be equipped with adequate reception facilities able to prevent the introduction of invasive species. Treatment technologies may include those applied to other effluents accepted in port reception facilities or more specific methods such as filtration, sterilization (eg using ozone or ultraviolet light), or chemical treatment (eg biocides). Ports should provide ship operators with details on the port, state, or port authority ballast water management requirements, including the availability, location, and capacities of reception facilities, as well as with information on local areas and situations where ballast water uptake should be avoided .
CULTURAL HERITAGE AND MATERIAL ASSETS	Avoid adverse effects upon Ukrainian and World Cultural Heritage sites Minimize adverse effects on unknown and intangible cultural heritage sites, material assets and other infrastructure	New development should avoid Ukrainian and World Cultural Heritage sites and other designated and sensitive sites. In case of archaeological finds, suspend the works and inform the competent authorities, which will take further action per its legal authority. Quarry rehabilitation plans should be elaborated for the quarrying areas.
POPULATION	Contribute towards direct or indirect to employment Improve social cohesion and sustainable mobility	Through various forms of media inform the public on the local and regional levels of the implemented strategy / plans. Strategically plan works on existing infrastructure in a way that as little as possible disrupt traffic flows.

ENERGY	Contribute and increase the energy efficiency in the transport	Promote use of renewable energy (eg photovoltaic) for street lighting, or lighting of stations, airports and ports.
NOISE	Avoid or minimize adverse effects of transport noise upon health and wellbeing of human communities	**Road transport** Considerate noise impacts during road design to prevent adverse impacts at nearby properties through the placement of the road right-of-way and / or through the design and implementation of noise control measures. Design and implement noise control measures: - Construction of the road below the level of the surrounding land - Noise barriers along the border of the right-of way (eg earthen mounds, walls, and vegetation) - Insulation of nearby building structures (typically consisting of window replacements) - Use of road surfaces that generate less pavement / tire noise such as stone-matrix asphalt Reduce project traffic routing through community areas wherever possible. **Rail transport** Implement noise reduction or prevention measures at the source: - Use of modern non-metallic disc brakes (non-metallic disc brakes also reduce wearing of wheels and rails) - Reduce the roughness of running surfaces through regular maintenance of wheels and tracks, and consideration for replacing traditional jointed track with continuously welded rail Install noise controls at the source for improved sound-proofing, and other noise reducing features (eg engine enclosures and exhaust muffling for diesel engines, and shielding of wheels with vehicle-mounted shrouds).

		Depending on the location of noise-sensitive areas, noise and vibrations should be considered in the design, construction, and operation of railways (eg through alignment choice, relocation of nearby buildings, and soundproofing, such as noise barriers, along railways or next to buildings). Ensure reducing noise levels of passing trains in populated areas, especially at night (consider the possibility of reducing the speed of trains in urban areas, installation of noise barrier, etc.). **Inland waterway and maritime transport** Noise reduction options on ports that should be considered include: - Selecting equipment with lower sound power levels - Installing silencers for fans - Installing suitable mufflers on engine exhausts and compressor components - Improving the acoustic performance of constructed buildings, apply sound insulation - Installing acoustic barriers without gaps to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective - Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas - Re-locating noise sources to less sensitive areas to take advantage of distance and shielding - Siting permanent facilities away from community areas if possible - Taking advantage of the natural topography as a noise buffer during facility design - Developing a mechanism to record and respond to complaints

		Air transport Plan site for airport location (new developments and expansion of existing facilities), and orientation of routes for arriving and departing aircraft relative to actual and projected residential development and other noise sensitive receptors in the surrounding area. This may include coordination with local authorities with influence over land-use planning and overall transportation planning activities. Plan flight routes, timing and altitude for aircraft (airplane and helicopter) flying over community areas. In areas where significant impacts are anticipated, implement preferred procedures and routes for landing and take-off (LTO) to minimize potential noise from approaching and departing aircraft for noise-sensitive areas. These procedures may include instructions on the use of descent profiles or "noise preferential" routes (NPRs), such as the "continuous descent approach" to avoid noise-sensitive areas, the use of "Low Power / Low Drag" (LPLD) procedure to fly the aircraft in a 'clean' condition (eg no flap or wheels deployed) if possible to minimize airframe noise and instructions on minimizing reverse thrust on landing. An alternative approach may include the dispersion of noise through equal use of multiple flight tracks as opposed to a preferential flight track. Use night-time or other operating restrictions. If necessary, work with local authorities to identify and implement noise prevention and control strategies in noise abatement zones (eg sound insulation of buildings that are exposed to aircraft noise above levels stipulated by local authorities or limitations on night-time operation of certain landing routes) . Ensure power supply to the aircraft to reduce or eliminate the need for use of APUs.
WASTE	Avoid or minimize adverse	Implement Waste Management Plans that should include waste prevention / generation / minimization, segregation, reuse, recycle,

	effects of waste generation	transport, disposal and monitoring activities for hazardous and non-hazardous waste in line with EU waste legislation. Establish a solid waste recycling program, depending on the existence of local facilities, involving the placement of labeled waste containers in passenger terminals for metals, glass, paper, and plastics. Food establishments should segregate compostable and other food waste for recycling as agricultural fertilizer and animal feed. Passenger operators and cleaning contractors should be encouraged to segregate waste in the vehicles by separating the collection of newspapers / papers, plastic, and metallic containers and used pillows. Used pillows should be recycled in furniture manufacturing or as insulation. Compost vegetation waste for reuse as a landscaping fertilizer. Manage with sediment and sludge removed from storm drainage systems maintenance activities as a hazardous or non-hazardous waste based on an assessment of its characteristics. Collect animal carcasses in a timely manner and dispose of it through prompt burial or other environmentally safe methods. **Road transport** Maximize the rate of recycling of road resurfacing waste either in the aggregate (eg reclaimed asphalt pavement or reclaimed concrete material) or as a base. Incorporate recyclable materials (eg glass, scrap tires, certain types of slag and ashes) to reduce the volume and cost of new asphalt and concrete mixes. Manage with of all removed paint materials suspected or confirmed of containing lead as a hazardous waste. **Rail transport** Where feasible, avoid use of sleepers treated with chromated copper arsenate and consider use of copper azote for wood treatment as a substitute, or using concrete sleepers. Recycling of sleepers may involve crushing for recovery of the steel rebar and use of the crushed

		material in road construction. Wood sleepers may be chipped for reuse, burnt, or disposed of in landfills. Landfill facilities should be capable of handling wastes that may have chemical leaching properties. Disposal of wood sleepers by incineration or recycling should consider associated air emissions and secondary product residues of preservative chemicals.

8. Justification for the choice of justified alternatives considered, description of the way in which the strategic environmental assessment was carried out, including any complications (lack of information and technical means during such an assessment)

The order of the Cabinet of Ministers of Ukraine of May 30, 2018 № 430-r approved the National Transport Strategy of Ukraine for the period up to 2030, the implementation of which will contribute to Ukraine's rapprochement with the EU, as it concerns the implementation of the Association Agreement and creating conditions for Ukraine's gradual integration. EU internal market; improving the quality of transport services, effective implementation of administrative reform, fight against corruption, transparency of decision-making, clear delineation of functions and division of powers between the executive and business entities, ensuring a level playing field for the provision of transport services.

Action Plan for 2019 - 2021 years of the National Transport Strategy of Ukraine till 2030 contributes to the implementation of the Strategy in the near future, which will help strengthen the institutional capacity of organizations involved in the harmonization of Ukraine with the EU and create grounds for strengthening the mechanism for monitoring for its implementation to obtain an efficient transport complex of Ukraine.

The proposed draft Action Plan for 2019-2021 for the implementation of the National Transport Strategy of Ukraine for the period up to 2030 contains a list of tasks, relevant measures and responsible for the implementation of government, deadlines, expected results, as well as identified sources of funding, calculations / need for financing.

The most favorable option will be the approval of the proposed Action Plan for 2019-2021 for the implementation of the National Transport Strategy of Ukraine for the period up to 2030 , determined by the results of the strategic environmental assessment .

In the process of strategic environmental assessment, the following alternatives are considered:

Alternative 1:

"Zero scenario", ie description, forecasting and assessment of the situation in case of non-approval of the specified state planning document;

Alternative 2:

"Action plan for 2019-2021 for the implementation of the National Transport Strategy of Ukraine for the period up to 2030 with a reduction in the priority of innovative development of the transport sector and global investment projects."

If *Alternative 1 is* chosen *, the* situation will remain unchanged. When leaving the existing situation at the moment same problem still exists, that does not ensure the achievement of this goal and do not overcome the inconsistencies of the industry transport requirements of effective implementation is vrointehratsiynoho integration course of Ukraine and national transport networks in the trans-European transport network, meet only the basic needs of the population and the economy in terms of volume with low quality of services, imperfect system of compensation for concessional transportation and lack of mechanism for implementation and financing of socially important transportation, as required by European legislation, systemic underfunding, insufficient maintenance of infrastructure and rolling stock, and technical backwardness, which threatens not only the performance of its socio-economic functions, but also national security. The current state does not meet the strategic o pits and objectives of the basic principles (strategy) of the State Environmental Policy of Ukraine till 2030, approved by the Law of Ukraine on February 28, 2019 number 2697- VIII , deepening and snuyuchi problems and worsening the current state of the environment in Ukraine , preventing the achievement of the expected results of the implementation of this document.

In addition, Alternative 1 does not ensure the implementation of the tasks of the National Transport Strategy of Ukraine for the period up to 2030 in all major areas:

–□competitive and efficient transport system;

–□innovative development of the transport industry and global investment projects;

–□safe for society, environmentally friendly and energy efficient transport;

–□unhindered mobility and interregional integration.

The choice of *Alternative 2 would have* no significant impact on the content of the Action Plan for 2019–2021 for the implementation of the National Transport Strategy of Ukraine until 2030.

However, choosing an alternative Action Plan to reduce the priority of innovative development of the transport sector and global investment projects in terms of introducing an effective tax mechanism to attract private capital in the development of rail transport (stimulating the renewal of traction and other rolling stock), inland water transport (stimulating fleet renewal and support for long-term investments in the renewal and construction of river vessels), air transport (implementation of strategic projects in aviation, modernization and development of airport infrastructure and air navigation service provider of

Ukraine, including the introduction of new technologies for remote aerodrome and dispatching services of regional airports with small volumes) would reduce the priority and make it difficult to implement such important measures as:

1) development of proposals on methods of stimulation and economic mechanisms to promote the localization of the best innovative technologies for transport infrastructure, production and renewal of rolling stock (taking into account the needs of people with disabilities and other low mobility groups) on the basis of domestic enterprises, including stimulating their foreign economic activity;

2) implementation of measures for state support of the shipbuilding industry in Ukraine;

3) introduction of a mechanism for targeted financing of inland water transport development;

4) settlement of the issue of taxation of port dues in the legislative plane;

5) introduction of performance-based navigation (PBN), use of global satellite systems (GNSS) as the main means of navigation; application of stepless recruitment and reduction techniques (CCO / CDO); introduction of advanced flexible use of airspace (A-FUA); harmonization of general and operational air traffic; development of communication, navigation and surveillance (SNS) infrastructure in accordance with the European ATM Master Plan, in particular: introduction of Data Processing Centers (DACs) for centralization of air navigation services (AIE); development of telecommunication infrastructure, ensuring its integration into the European network service (PENS); introduction and development of the air traffic service messaging service (AMHS); creation of ground-to-air communication infrastructure for the introduction of frequency distribution of 8.33 kHz channels; introduction of modern cooperative air traffic control systems (Mode S, ADS-B, WAM); support for non-cooperative surveillance systems; creation and maintenance of navigation infrastructure to provide performance-based zonal navigation (PBN); providing technical support for the automation of the processes of air traffic organization and civil-military coordination; introduction of technologies for centralized collection, processing and dissemination of data related to air navigation; introduction of remote aerodrome control services (Remote Tower); introduction of systems of remote control, management and monitoring of ZNS objects;

6) creation of an aviation cluster with a cargo airport, a cargo carrier, a maintenance center, a flight school and the Lviv Jagellon Industrial Park.

Alternative 2 with lowering the priority of innovative development of the transport sector and global investment projects in terms of implementing an effective tax mechanism to attract private capital in the development of rail, inland waterway and air transport in general would be contrary to the National Transport Strategy of Ukraine until 2030.

The methodological basis of the strategic environmental assessment of the draft Action Plan to identify all important impacts and risks, assess their magnitude and significance, prevent, reduce and mitigate adverse effects on the environment, is a systematic approach, which in this assessment process is a combination of such research methods. in particular: general

- analysis, synthesis, formalization, comparison, historical, logical, idealization, expert assessments, etc .; graphic; regulatory regulation, content analysis; economic and mathematical, modeling; information; prognostication; socio-ecological.

It is the system of tools and techniques provided by each of these methods for use in strategic environmental assessment, made it possible to propose measures to prevent, reduce and mitigate the impact on the environment in terms of environmental protection, safety of life and health. i on atmospheric air and climate change; lands and changes in land use; waters and seas; habitats, flora and fauna, areas subject to special protection, and landscape; cultural heritage and tangible assets; protection of the population; energy efficiency; noise; waste management.

In the process of strategic environmental assessment at the state level, as well as by region, information and data on the state of the environment, living conditions and health, environmental issues related to the state planning document, in particular on areas with environmental status: statistical information , reports on the state of the environment, information included in other acts of legislation relevant to the draft Action Plan, data on monitoring the state of the environment, expert assessments, other available information on environmental indicators that reflect the main trends of causes and consequences of the environmental situation statistical observations using administrative data.

During the evaluation found a lack of statistical information on the release along with air pollutants from mobile sources after 2015 , the e nerhoyemn of Art and intensively about art and CO_2, and the total energy consumption for all modes of transport in, acoustic (noise) pollution and no most relevant at the time of the report data (for 2018-2019 years.) on all components of the environment and public health - segments of strategic environmental assessment . However, deep analysis of available information regarding the above made it possible oh araktery zuvaty cur second environment, including health, and projected changes in this state, if the state planning document is approved , environmental conditions and life of the population and its status health in areas that are likely to be affected , and to identify environmental problems, including risks to public health, related to the draft Action Plan , in particular for areas with conservation status .

9. Measures envisaged for monitoring the consequences of the implementation of the state planning document for the environment, including for public health

Monitoring the impact on the environment, security of life and health of the population of a plan is the key in the strategic environmental assessment . Information obtained as a result of monitoring will allow the Ministries of Infrastructure of Ukraine monitor the impact of the document state planning on the natural environment and

human health , to assess the effectiveness of measures to prevent and mitigate , detect unforeseen report effects and manage any uncertainties arising in the evaluated process, in particular, to prevent adverse effects.

To determine the monitoring procedure, the following were considered:

– environmental goals and monitoring indicators ;

– probable significant impacts identified in the process of strategic environmental assessment ;

– measures.

Monitoring of the consequences of the implementation of the state planning document for the environment, including for the health of the population , proposed in this report, takes into account the procedures already established in the country within other policy areas , in particular, the state environmental policy of Ukraine and legislation on monitoring, forecasting record in and information in the field of environmental protection (tab. 9.1) . In addition, the measures foreseen in the draft Action Plan to improve data collection , provide the ability to monitor the implementation and effects of this strategic document .

Table 9.1

Monitoring the consequences of the implementation of the state planning document for the environment, including for public health

Segments of strategic environmental assessment	Objectives of strategic environmental assessment	Monitoring indicators
Atmospheric air and climate change	Reduction of emissions of pollutants and greenhouse gases into the atmosphere. Adaptation of transport infrastructure to climate change	Emissions of pollutants and greenhouse gases from mobile and stationary sources of pollution (t) Dynamics of climate change
Soils and change and land use	Prevention or minimization of negative impact on soils , minimization of fragmentation and consolidation of lands	The area was oslynn th cover in the ecological balance and land use (ha) Withdrawal of land for transport infrastructure (ha)
Water resources and seas	Prevention or minimization of negative impact on water and marine resources	Water / sea quality / status / class Number of cases of pollution of water sources / sea
Habitats, flora and fauna, areas subject to special protection and landscape	Prevention or minimization of negative impact on places defined by international agreements and protected areas	Habitat fragmentation Number of cases of collision of the population with wild animals

Segments of strategic environmental assessment	Objectives of strategic environmental assessment	Monitoring indicators
	Prevention or minimization of negative impacts on important habitats, species of flora and fauna, landscape	
Cultural heritage and tangible assets	Prevention of negative impacts on Ukrainian and world cultural heritage sites Minimizing the negative impact on unidentified objects of cultural heritage assets and infrastructure	Proximity and accessibility of transport infrastructure
People	Direct or indirect impact on employment Improving social cohesion and sustainable mobility	Investing in transport infrastructure The scope and structure of passenger and freight traffic The population that uses public and Iron chnym transport (s)
Public health and safety	Minimization Exposure negative impacts on health 'I and welfare Minimization of the number of road accidents	Number of fatal accidents and people injured in road accidents
Energy efficiency	Promoting and improving energy efficiency in transport	Total energy consumption by transport and infrastructure
Noise	Prevent or minimize the negative impact of traffic noise on human health and well-being	Noise level from transport and infrastructure
Waste	Prevention or minimization of waste generation and optimization of waste management	The amount of waste generated in the field of transport and infrastructure

Monitoring the effects of State Implementation planning for the environment, including health performance indicators based on project implementation plan for the document specified at chikuvany we result s. Due to the fact that such results are characterized by institutional and organizational and economic content, their monitoring can also be carried out on the indicators of overall project implementation and use of financial instruments , implementation of transport sector reform , modernization of the transport sector, in particular :

–□implementation of investment projects (total amount of public expenditures for preparation and construction, programmed on the date of calculation);

–□involvement of the private sector (capital expenditures should be supported by private / public funding on the settlement date);

–□percentage of resources provided for short-term action plans (distributed public resources, loans signed by international financial institutions and public-private partnership entities for the next 3 years for short-term projects of the indicative list of projects);

–□implementation of public policy initiatives (average% of public policy implementation / soft measures defined in the draft Action Plan);

–□Directives and Regulations of the Association Agreement transposed into Ukrainian law (number of Directives and Regulations - or their updated equivalents - in the annexes to the Association Agreement adopted by the Ukrainian Parliament in the relevant national laws on the date of calculation).

–□resources spent on road safety (effective costs, in figures, compared to cost forecasts);

–□number of new enterprises operating on railway networks (compared to the planned indicators);

– τηε□number of concession contracts concluded for the management of seaport terminals (compared to the planned indicators).

The above list of indicators for monitoring the consequences of the implementation of the state planning document for the environment, including for public health is not exclusive and will be detailed in the framework of the project M monitoring

10. Description of the likely transboundary effects on the environment, including public health

The draft Action Plan for 2019–2021 on the implementation of the National Transport Strategy of Ukraine for the period up to 2030 does not contain data on the exact location of infrastructure facilities, therefore information on determining the cross-border implications of the state planning document and their quantitative assessment is insufficient .

And movirnyy transboundary negative impact of all types of transport on air quality and noise generation n and the border of Ukraine with other countries (Poland, Slovakia, Hungary, Romania, Moldova, Russian Federation, Republic of Belarus).

Declining water quality of waterways may affect neighboring countries (Romania, the Republic of Moldova). The main transboundary negative impact is expected to be the possible pollution of the Black Sea due to navigation and port operations. At the same time, Romania and the Russian Federation may become affected states.

The issue of quantitative assessment of transboundary s consequence s environment, including health, recommended con chickpeas and in the development of specific infrastructure projects by mode.

11. Summary There is no technical nature of the information

11. 1. The content and main objectives of the state planning document, its connection with other state planning documents

According to paragraph 3 of the first part of Article 1 of the Law of Ukraine "On Strategic Environmental Assessment", state planning documents - strategies, plans, schemes, urban planning documentation, national programs, state target programs and other programs and program documents, including amendments to them and / or subject to approval by a public authority, local government.

According to Article 2 of the Law of Ukraine "On Strategic Environmental Assessment", this Law applies to state planning documents relating to, in particular, transport, and the implementation of which will provide for the implementation of activities (or containing activities and facilities) implementation of the environmental impact assessment procedure, or which require assessment, taking into account the probable consequences for the territories and objects of the nature reserve fund and the ecological network.

The Ministry of Infrastructure of Ukraine has developed a draft Action Plan for 2019-2021 for the implementation of the National Transport Strategy of Ukraine for the period up to 2030 (hereinafter - the Action Plan), which is proposed for approval by order of the Cabinet of Ministers of Ukraine.

The draft Action Plan was developed by the Ministry of Infrastructure of Ukraine in pursuance of paragraph 3 of the order of the Cabinet of Ministers of Ukraine of May 30 , 2018 № 430 "On approval of the National Transport Strategy of Ukraine for the period up to 2030".

Tasks and activities of the Action Plan will be performed in the following main areas:

competitive and efficient transport system;

innovative development of the transport industry and global investment projects;

safe for society, environmentally friendly and energy efficient transport;

unhindered mobility and interregional integration.

Thus, the draft Action Plan defines the mechanisms for implementing the strategy for all subsectors of the transport sector, as well as cross-cutting and special measures to be implemented in all transport sectors during 2019-2021 to create a safe and efficient transport complex integrated into the world transport network. meeting the needs of the population in

transportation and improving the conditions for doing business to ensure the competitiveness and efficiency of the national economy.

The draft Action Plan also provides a comprehensive solution to existing problems in the transport sector and contains priorities for its development, in particular in the context of implementing the European integration course and implementing the Association Agreement between Ukraine, on the one hand, and the European Union, the European Atomic Energy Community and their states. -members, on the other hand, ratified by the Law of Ukraine of September 16, 2014 № 1678-VII, as well as changes in the geopolitical environment in the region; Agreement on Certain Aspects of Air Services of 1 December 2005 and the initialed draft Agreement between the EU and its Member States on the Common Aviation Area, Sustainable Development Strategy "Ukraine - 2020", approved by the Decree of the President of Ukraine of 12 January 2015 № 5, UN Framework Convention on Climate Change, ratified by the Law of Ukraine of October 29, 1996 № 435/96-VR, Paris Agreement, ratified by the Law of Ukraine of July 14, 2016 № 1469-VIII, UN General Assembly Resolution of September 25, 2015 № 70/1 "Transformation of our world: Agenda for sustainable development until 2030", the medium-term plan of priority actions of the Government until 2020 , approved by the order of the Cabinet of Ministers of Ukraine dated April 3 , 2017 від 275, as well as strategic goals and tasks of the Basic principles (strategy) of the state ecological policy of Ukraine for the period till 2030, approved by the Law of Ukraine from February 28, 2019 № 2697-VIII.

11. 2. Characteristics of the current state of the environment, including public health, and forecast changes in this state, if the state planning document is not approved

Emissions of pollutants into the atmosphere

According to the Air Pollution Index (EAI), which takes into account the degree of air pollution in the five priority pollutants, a very high level of pollution, as in the previous year, was observed in Mariupol and Dnieper, high - in Odessa, Kamyansk, Kiev, Kryvyi Rih, Lutsk, Mykolayiv, Slovyansk, Kramatorsk, Rubizhne, Lviv, Zaporizhia, Lysychansk, Kherson, Kremenchug. The high level of air pollution in these cities was mainly due to the high content of specific harmful substances - formaldehyde, phenol, hydrogen fluoride, ammonia, the main impurities - suspended solids, nitrogen dioxide, carbon monoxide .

Soils and changes in land use

According to observations, the soils of the cities of Zaporizhia, Mariupol, Uzhhorod and the village of Pobuzke were the most polluted. In some cities, single concentrations of metals were recorded at a sufficiently high level (Table 2.17).

In general, soils in Ukraine are the most contaminated with lead, zinc, copper, less - manganese, cadmium and nickel.

In industrial settlements due to long-term emissions of pollutants into the atmosphere around the enterprises formed zones of increased soil contamination with heavy metals.

Aquatic resources

According to the International Bank for Reconstruction and Development / World Bank, the main causes of surface water pollution are the discharge of polluted urban and industrial wastewater into reservoirs directly or through a sewerage system, discharge of contaminated effluents from built-up areas and farmland and soil erosion in groundwater supply areas. Donetsk, Dnipropetrovsk, Luhansk and Odesa oblasts account for approximately 75% of all surface water discharges. The main sources of discharged contaminated water are industrial enterprises (894 million m3), housing and communal services (538 million m3) and agricultural sector (71 million m3). Due to the low quality of wastewater treatment, the volume of discharged polluted wastewater into the surface water of reservoirs is not reduced.

As in previous years, water bodies in Ukraine were polluted mainly with heavy metal compounds, nitrogen compounds, phenols, sulfates, and petroleum products.

By regions, the largest polluters of discharged polluted wastewater into water bodies in 2017 were Kyiv (28.6% of the total), Dnipropetrovsk (23.0%) and Donetsk regions (19.9%) .

Habitats, flora and fauna, specially protected areas and landscape

According to the results of the data of the territory and objects of the nature reserve fund submitted by the executive authorities at the local level, ensuring the implementation of the state policy in the field of environmental protection, as of 01.01.2018 the nature reserve fund of Ukraine consists of 8296 territories and facilities with a total area of 4.318 million hectares within the territory of Ukraine (actual area 3.985 million hectares) and 402500.0 hectares within the Black Sea

Cultural heritage and tangible assets

Almost one and a half thousand towns and villages and about 8 thousand villages of Ukraine have valuable objects of cultural and historical heritage. There are about 140,000 monuments on the state register, of which almost 49.8% are archeological monuments, almost 37% are historical monuments, more than 11% are architectural and urban monuments, and 2% are monuments. monuments of monumental art, science and technology, landscape art. On the basis of complexes of monuments of special cultural value, there are 63 historical and cultural reserves in Ukraine, a third of which has received the status of national

Population, health and safety

The number of the current population in Ukraine as of January 1, 2019 was 42,153.2 thousand people. During 2018, the population decreased by 233.2 thousand people. 2017 was characterized by the deterioration of the medical and demographic situation among the country's population in the context of hostilities in the east of the country, which are associated with the anti-terrorist operation. The hostilities led to the forced relocation of large numbers of people from the eastern regions to other regions. Deteriorating economic situations in the country are the cause of significant labor migration, especially in cross-border areas. 2017 was also characterized by a decrease in the priority of health for the population and a responsible attitude of the population to personal health, accompanied by a decrease in timely treatment of the population and an increase in the number of neglected cases in which medical care requires more resources .

Data of the patrol police on traffic accidents (Table 2.29) show a reduction in road deaths per day for the first quarter. 2019, compared to 2018. Therefore, the main reserves for prolonging life expectancy in Ukraine should be considered in overcoming the causes of mortality of the working age population from diseases of the circulatory system, tumors and causes of death caused by non-diseases - the so-called. external causes.

A number of tasks of the Action Plan are aimed at combating deaths from accidents and injuries, which should be regarded as the contribution of the Ministry of Infrastructure of Ukraine to the joint efforts of health authorities and other agencies in combating mortality from the above causes.

Energy efficiency

In order to implement paragraph 80 of the Action Plan for the implementation of the stage "Reforming the energy sector (until 2020)" of the Energy Strategy of Ukraine for the period up to 2035 "Security, energy efficiency, competitiveness", approved by the Cabinet of Ministers of June 6, 2018 № 497-p. Accordingly, the State Agency for Energy Efficiency of Ukraine has defined energy efficiency indicators, while energy efficiency indicators in transport are calculated for two types of road transport [32]: passenger and freight transport (Table 2.40). Regarding energy efficiency trends in the transport sector, experts from the International Energy Agency note significant positive prospects that can set an example for other countries.

Noise

According to experts from the Dnieper State Academy of Civil Engineering and Architecture, every second inhabitant of Ukraine lives in a zone of acoustic discomfort. The population of Donetsk, Zaporizhia, Kharkiv and Luhansk oblasts is the most affected by noise pollution. The maximum permissible noise levels have been exceeded in 72 settlements .

The total area of the territories subject to constant noise action of motor transport makes about 50% of all territory of the city. Recently, the average noise level produced by transport has increased by 12–14 dBA .

Waste

In 2017, the situation in the field of waste management shows a tendency to a slight increase in their generation, compared to the previous year, when the declining trend, which began in 2012, was reduced. The dynamics of waste generation and management in Ukraine in recent years are given in table. 2.45. Compared to the previous year, the volumes of waste utilization and disposal increased, but their value, compared to 2013, remains low.

Of the total amount of waste generated, in particular, in 2017, 98.4% (360.2 million tons) accounted for waste generated as a result of economic activity of enterprises and organizations, and 1.6% (5.9 million tons) - in households .

The largest amount of waste is generated in the mining industry and quarrying (Table 2.47), and in 2017 there was an increase in waste generation compared to the previous year.

11.3. Characteristics of the state of the environment, living conditions of the population and the state of its health in the territories that are likely to be affected

The measures envisaged by the draft Action Plan for 2019–2021 for the implementation of the National Transport Strategy of Ukraine for the period up to 2030, as already noted, are justified in the following areas:

competitive and efficient transport system;

innovative development of the transport industry and global investment projects;

safe for society, environmentally friendly and energy efficient transport;

unhindered mobility and interregional integration.

These directions and content of measures indicate that they are aimed at minimizing the impact on the environment, including the health of the population, both transport infrastructure and transport in general. Given that the state planning document is of national importance, its measures are closely related not only to the implementation of the National Transport Strategy of Ukraine until 2030, but also aimed at overcoming the environmental problems of Ukraine, which are directly or indirectly related to the transport sector or its subsectors.

Thus, the root causes of environmental problems in Ukraine are [30]:

– subordination of ecological priorities to economic expediency; failure to take into account the consequences for the environment in legislative and regulatory acts, in particular in the decisions of the Cabinet of Ministers of Ukraine and other executive bodies;

– predominance of resource- and energy-intensive industries in the structure of the economy with mostly negative impact on the environment, which is significantly exacerbated by unregulated legislation in the transition to market conditions;

–physical and moral depreciation of fixed assets in all sectors of the national economy;

–inefficient system of public administration in the field of environmental protection and regulation of the use of natural resources, in particular the inconsistency of actions of central and local executive bodies and local governments, unsatisfactory state of the system of state environmental monitoring;

–low level of understanding in society of the priorities of environmental protection and the benefits of balanced (sustainable) development, the imperfection of the system of environmental education and training;

–unsatisfactory level of compliance with environmental legislation and environmental rights and responsibilities of citizens;

–unsatisfactory control over compliance with environmental legislation and failure to ensure the inevitability of liability for its violation;

–Insufficient funding from state and local budgets for environmental measures, funding for such measures on a residual basis.

The above directions and content of the draft Action Plan are justified through the prism of the introduction of safe for society, environmentally friendly and energy efficient transport, the report will consider only the possible potential negative impact of construction work under the planned activities.

11. 4. Environmental issues, including risks to the health of the population, related to the state planning document, in particular in relation to areas with environmental status

As noted in Section 2 of this report, in particular paragraphs. 2.4, according to the results of accounting data of territories and objects of the nature reserve fund, submitted by the executive authorities at the local level, ensuring the implementation of state policy in the field of environmental protection, as of 01.01.2018 the nature reserve fund of Ukraine includes 8,296 territories and facilities with a total area of 4.318 million hectares within the territory of Ukraine (actual area 3.985 million hectares) and 402500.0 hectares within the Black Sea .

Ensuring the preservation of natural habitats and natural fauna and flora on the territory of Ukraine is done by defining the territories of the Emerald Network within Ukraine and their preservation. The process of defining and conserving the Emerald Network in Ukraine only acquires an institutional basis in accordance with the requirements of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and the Directive № 2009/147 / EC on the Conservation of Wild Birds and the Directive № 92/43 / EC on the conservation of natural habitats and of species of natural fauna and flora.

Directive № 2009/147 / EC on the conservation of wild birds and Directive № 92/43 / EC on the conservation of natural habitats and of species of natural fauna and flora provide for the establishment and operation of the EU NATURA 2000 network of protected areas.

At the same time, today there is no scientific approach to ensuring the conservation of populations of species of flora and fauna, natural habitats at the biogeographical level, which is used in the formation of the NATURA 2000 network in the EU. This leads to a further reduction in the level of biodiversity in Ukraine. The principle of biodiversity conservation at the level of natural habitats (biotopes) is currently not implemented in national legislation, ie one of the key mechanisms of nature protection in the EU in Ukraine does not function. While the formation of a network of protected areas on the basis of the settlement principle creates conditions not only for the conservation of species, but also for the reproduction of their populations. Therefore, the monitoring of the conservation status of species of wild flora and fauna and natural habitats is not carried out systematically .

11. 5. Obligations in the field of environmental protection, including those related to the prevention of negative impact on public health, established at the international, state and other levels related to the state planning document, as well as ways to take into account such obligations. during the preparation of the state planning document

The draft Action Plan is developed taking into account Ukraine's obligations in the field of environmental protection, including those related to the prevention of negative impact on public health, in particular:

Law of Ukraine "On Strategic Environmental Assessment" of 20.03.2018 2354-VIII, which regulates relations in the field of environmental impact assessment, including public health, the implementation of state planning documents and applies to state planning documents relating to, in addition to another, transport;

Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context, ratified by the Law of Ukraine of 01.07.2015 № 562-VIII;

provisions of Article 363 of Chapter 6 "Environment" and Annex XXX to the Association Agreement between Ukraine, of the one part, and the European Union, the European Atomic Energy Community and their Member States, of the other part, ratified by the Law of Ukraine of 16 September 2014 . № 1678-VII, incl. Directive 2001/42 / EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programs on the environment;

Of the Law of Ukraine On Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the period up to 2030 dated 28.02.2019 2697-VIII, in particular, ensuring the goal of the state environmental policy - achieving good environmental status by introducing an ecosystem approach to all areas of socio-economic development of Ukraine ensuring the constitutional right of every citizen of Ukraine to a clean and safe environment, the introduction of balanced nature

management and the preservation and restoration of natural ecosystems, as well as the basic principles of state environmental policy:

maintaining a state of the climate system that will make it impossible to increase the risks to human health and well-being and the environment;

Ukraine's achievement of the Sustainable Development Goals, which were approved at the United Nations Summit on Sustainable Development in 2015;

promoting balanced (sustainable) development by achieving balanced components of development (economic, environmental, social), focusing on the priorities of balanced (sustainable) development;

integration of environmental requirements during the development and approval of documents of state planning, sectoral (regional), regional and local development and in the decision-making process on the planned activities of facilities that may have a significant impact on the environment;

intersectoral partnership and stakeholder involvement;

prevention of emergencies of natural and man-made nature, which involves the analysis and forecasting of environmental risks, based on the results of strategic environmental assessment, environmental impact assessment, as well as comprehensive monitoring of the environment;

ensuring environmental safety and maintaining ecological balance on the territory of Ukraine, increasing the level of environmental safety in the exclusion zone;

ensuring the inevitability of liability for violations of environmental legislation;

application of the principles of caution, prevention (prevention), priority of eliminating sources of environmental damage, "polluter pays";

responsibility of executive bodies and local self-government bodies for availability, timeliness and reliability of ecological information;

stimulation by the state of domestic economic entities that reduce greenhouse gas emissions, reduce energy and resource consumption, modernization of production aimed at reducing the negative impact on the environment, including improving the environmental tax system for pollution and payments for the use of natural resources resources;

introduction of the latest means and forms of communication and effective information policy in the field of environmental protection.

Thus, Objective 2 "Ensuring sustainable development of natural resource potential of Ukraine" of the Basic Principles (strategy) of state environmental policy of Ukraine for the period up to 2030 provides for the task of reducing losses of biological and landscape diversity, in particular, by improving the principles of ecological network expansion and inexhaustible use and preservation of unique natural landscapes; conservation and restoration of the number of species of

natural flora and fauna, including migratory species, their habitats, rare and endangered species, species of fauna and flora and typical natural plant communities subject to protection; reducing the negative impact of urbanization on the environment, stopping the destruction of the environment within cities, in particular, preventing unjustified destruction of greenery within cities during construction or other works, illegal allocation of land occupied by greenery for construction; ensuring sustainable use and protection of land, improving the condition of affected ecosystems and promoting the achievement of a neutral level of land degradation, raising awareness of the population, landowners and land users on the problems of land degradation; stimulating the renewal of worn-out fixed assets of industrial and transport infrastructure and housing and communal services through direct government subsidies, cheaper loans, partial compensation of interest rates on loans, etc .;

Objective 3 "Ensuring the integration of environmental policy in the decision-making process for socio-economic development of Ukraine", the objectives of which are, in particular:

development of sectoral strategies for:

improving air quality;

improving water quality and managing water resources, including the marine environment. Complete gradual cessation of discharge of untreated and insufficiently treated wastewater into water bodies and ensuring compliance of the degree of wastewater treatment with the established norms and standards, as well as prevention of groundwater pollution;

preservation of the ozone layer;

climate change prevention and adaptation;

ensuring the protection and preservation of nature;

conservation of biodiversity and landscapes;

handling of hazardous chemicals.

Objective 4 "Reduction of environmental risks in order to minimize their impact on ecosystems, socio-economic development and public health", in particular the tasks in part:

reduction of air and water pollution;

reduction of anthropogenic impact on the ecosystems of the Black and Azov Seas;

introduction of environmental risk management based on its modeling in real time with the involvement of the latest information technologies to protect natural ecosystems, health and well-being of the population;

prevention of the spread of invasive species and control of the emergence and spread of such species in natural ecosystems, including marine ones;

reducing the amount of removal of radionuclides outside the exclusion zone and the zone of unconditional (compulsory) resettlement;

solving environmental problems, restoration and preservation of the environment of Donbass;

Sustainable Development Strategy "Ukraine - 2020", approved by the Decree of the President of Ukraine of January 12, 2015 № 5/2015, in particular, on the vector of development - the reform of transport infrastructure;

The Agreement on Certain Aspects of Air Services of 1 December 2005 and the initialed draft Agreement between the EU and its Member States on the Common Aviation Area;

UN Framework Convention on Climate Change, ratified by the Law of Ukraine of October 29, 1996 № 435/96-VR;

Paris Agreement, ratified by the Law of Ukraine of July 14, 2016 № 1469-VIII,

UN General Assembly Resolution September 25, 2015 № 70/1 "Transforming our world: The 2030 Agenda for Sustainable Development"

Medium-term plan of priority actions of the Government until 2020, approved by the order of the Cabinet of Ministers of Ukraine dated April 3, 2017 № 275;

Strategy of low-carbon development of Ukraine until 2050, as well as to implement the orders of the Cabinet of Ministers of Ukraine dated December 7, 2016 № 932-r "On approval of the Concept of state policy in the field of climate change until 2030" in terms of climate change prevention through reduction anthropogenic emissions and increased absorption of greenhouse gases and ensuring a gradual transition to low-carbon development of the state;

Law of Ukraine “On Ukraine's Accession to the United Nations Convention to Combat Desertification in Countries Suffering from Serious Drought and / or Desertification, Especially in Africa” of 4 July 2002 № 61-IV;

Law of Ukraine "On Ukraine's participation in the Convention on Wetlands of International Importance, Mainly as a Habitat for Waterfowl" of October 29, 1996 № 437/96-VR;

Strategy for the development of the public financial management system, approved by the order of the Cabinet of Ministers of Ukraine dated August 1, 2013 № 774-r, because such a system is the basis for sustainable development and guaranteed social obligations to citizens, and public finances are of strategic importance for regulation , in particular, the real sector of the economy and the financial sector, ensuring the development of the regions, supporting business activities, and their potential is the basis of economic and social development of Ukraine. The effectiveness of the public financial management system is important to ensure the stability of the budget system, as well as overall financial security and sustainable economic growth;

State Strategy for Regional Development for the period up to 2020, approved by the Cabinet of Ministers of Ukraine dated August 6, 2014 № 385, and the Action Plan for 2018-2020 for the implementation of the State Strategy for Regional Development for the period up to 2020, approved by the Cabinet of Ministers of Ukraine September 12, 2018 № 733, in part, in particular, settlement at the legislative level of the issue of concession activities, in particular on the mechanism of selection of the concessionaire and preparation for the implementation of quality projects on concession terms that will comply with international practice;

Action plan for deregulation of economic activity, approved by the order of the Cabinet of Ministers of Ukraine dated August 23, 2016 № 615-r, in terms of cancellation of pre-trip and post-trip medical examinations of drivers, as well as the introduction of liability for release of vehicles that have not passed review; simplification of the procedure of organization and control over the training, retraining and advanced training of drivers of vehicles; simplification of issuance of one-time permits to the west to the river ports of Ukraine of vessels under foreign flags; abolition of fees for breeding and / / lifting bridge trusses; abolition of locking fees for ships, the obligation of hydropower plants to maintain lock facilities; reduction of tariffs for services of river pilots on pilotage of the vessel by river inland waterways; demonopolization of the market of services on pilotage of vessels by river inland waterways, further liberalization of such market, definition on rivers of inland waterways of sites (areas) of obligatory pilotage; ensuring the provision of business entities and state supervision (control) to the information system of the port community in electronic form of information in the form approved in accordance with the legislation used in the processing of goods in seaports, instead of documents in paper form;

Action Plan for the implementation of best practices of quality and effective regulation, reflected by the World Bank Group in the methodology of rating "Doing Business", approved by the Cabinet of Ministers of Ukraine dated December 16, 2015 № 1406 (as amended by the Cabinet of Ministers of Ukraine dated November 23, 2016 № 926-r).

Therefore, all measures of the Action Plan do not contradict Ukraine's obligations in the field of environmental protection, including those related to the prevention of negative impact on public health.

11. 6. Description of the consequences for the environment, including for the health of the population, including secondary, cumulative, synergistic, short-, medium- and long-term (1, 3–5 and 10–15 years, respectively, and if necessary - 50-100 years), permanent and temporary, positive and negative consequences

The draft state planning document does not contain quantitative and qualitative characteristics of infrastructure facilities, the construction of which is planned in the draft Action Plan. In this regard, the description of secondary cumulative, synergistic, short-, medium- and long-term (1, 3-5 and 10-15 years, respectively, and if necessary - 50-100 years), permanent and temporary, positive and negative consequences , can be implemented at the stage of implementation of specific infrastructure projects by mode of transport.

Implementation of the measures of the draft Action Plan may affect:

air quality. Atmospheric emissions (mainly of particulate matter and gases) are expected during the infrastructure construction phase. The impact of airports on air quality in nearby settlements is usually determined by the type and scale of activity at the airport, as well as the distance to the source of pollution. In general, the overall impact of the draft state planning document on air quality is positive, given the range of tasks to stimulate the development of urban electric transport, rail, river and sea transport;

climate change. Greenhouse gas emissions are expected during the infrastructure construction phase. In general, the overall impact of the measures of the draft state planning document on climate change is positive, given the range of tasks to stimulate the development of urban electric transport, rail, river and sea transport;

soils and changes in land use. The most negative consequences of the draft Land Use Action Plan are the withdrawal or transformation of land for the construction and operation of transport infrastructure. As most of the transport infrastructure already exists, and the draft state planning document provides for its reconstruction, restoration and modernization, minor additional impacts are expected. Significant impact on soils is likely due to the implementation of measures for river and sea transport and is determined by the extent of environmental interference and the specifics of a particular place. Adverse effects on soils are likely due to sedimentation of contaminated sediments. Erosion of river and sea coasts is also a possible consequence;

water and sea. The impact (positive or negative) of rail, road, air transport on water resources is limited. Construction works are characterized by the potential for contamination of surface and groundwater, especially due to the possible leakage of fuels and lubricants from machines used for earthworks. Inland water transport has a significant impact on reservoirs both during construction and during operation. Development / modernization of inland waterways and river ports requires engineering works on the water body. The greatest negative impact on water is likely during dredging. We also assume the negative impact of maritime transport on the seas. The most significant impact is expected due to the dispersion of pollutants in surface waters during dredging works, works in ports / terminals, washing equipment and tanks, discharge of black (sewage) and gray (shower, sink, galley), ballast water, illegal waste and garbage;

habitats, flora and fauna, areas subject to special protection, and landscape. The measures of the draft state planning document for rail, road and air transport primarily envisage the reconstruction and modernization of the existing infrastructure. Therefore, no significant additional direct impacts on habitats, flora, fauna, specially protected areas and landscape are expected. However, given that the planned activities involve new construction works, the main potential impact of land transport (road, rail) is likely to be habitat fragmentation. The negative impact on the flora and fauna of measures for the reconstruction / construction of waterways or ports is inevitable, as they cause a reduction in the area covered with vegetation, which is also the habitat of animal species. Negative impact on the flora and fauna of inland waterways is possible due to the generated noise (especially during the nesting season of birds or fish migration), in case of accidents (rupture of fuel tanks on transport equipment, flooding, damage to the riverbed). With regard to inland waterway transport, there is a possibility of some loss of biodiversity during construction works in ports due to land allotment and / or dredging. The main consequences caused by maritime transport are closely related to the impact on water quality. With regard to air transport, it should be borne in mind that birds pose a danger to aircraft flights, as collisions between aircraft and birds have become more frequent and serious;

cultural heritage and tangible assets: the draft Action Plan for rail, road, air transport mainly provides for the restoration and modernization of existing infrastructure. Therefore, no significant additional direct impact on cultural heritage is expected. However, the negative impact may occur at the stage of infrastructure construction, which should be carefully assessed when issuing environmental permits for work;

population: in general, the draft state planning document and the envisaged measures are formulated in the context of sustainable development of the transport sector, compatible with the relevant European policy and stimulating the development of public transport, so it is likely that their impact will be positive;

Energy efficiency : The draft Action Plan is expected to have a positive impact on energy efficiency, as this document promotes the implementation of integrated transport planning, energy saving transport and encourages the provision of regular public transport services in cities. Implementation of a comprehensive environmental policy in the field of transport and renewal of the fleet and rolling stock will have significant additional positive effects on improving the energy efficiency of the transport sector of Ukraine;

noise: during the reconstruction and construction works in all subsectors of transport with construction machinery, equipment and vehicles on the construction site, noise will be generated. Noise is defined as the biggest problem of negative impact on the environment on the way of movement of heavy vehicles on highways, while the movement of other vehicles is also a source of noise. Increased noise and vibration levels are likely near the railway, but are due to the time of day and frequency of trains. River and sea vessels are not considered as a source of noise, unlike ports, where cargo is transshipped, which is amplified by noise due to the movement of vehicles and machinery. There is a high probability that the improvement of air traffic will lead to a significant increase in noise load in the areas adjacent to the airports. In cities, traffic noise is a major problem;

waste generation: implementation of the measures of the draft state planning document will lead to such a negative impact as waste production, in particular construction / demolition waste. Improper waste management (collection and disposal) is characterized by the potential impact of measures on soils and water resources. Wastes on railway transport are represented by used railway sleepers and composites, municipal waste at stations and tracks, as well as waste equipment from railway transport components, lubricants, etc. During the operation of ports, different types of waste are generated, including near waste storage facilities; those generated on board, wastewater on ships, etc. Achieving the task of increasing passenger traffic is likely to be accompanied by an increase in waste;

health and safety. Negative impact on health due to the implementation of the state planning document is expected during construction near the construction site. In general, the implementation of the draft state planning document will help increase the safety of the transport sector in Ukraine;

The following paragraphs summarize the results of the assessment procedure per SEA objectives.

TRANSPORT SEGMENT	AIR	CLIMATE CHANGE	SOIL AND LAND USE CHANGE	WATER	SEA	HABITATS. FLORA AND FAUNA	PROTECTED AREAS	LANDSCAPE	CULTURAL HERITAGE AND MATERIAL ASSETS	POPULATION	ENERGY	NOISE	WASTE	HEALTH AND SAFETY
ROAD TRANSPORT														
Construction phase	- DI LT LO CU	- DI LT LO CU	- DI LT LO CU	- DI LT LO CU	0	0	0	0	(?)	0	0	-DI OC LO CU TR	- IN OC LO	0
Utilization phase	- DI ST LO CU TR	- DI LT LO CU	- DI LT LO CU	- DI LT LO CU	0	- DI LT LO CU	0	- DI LT LO CU	0	(?)	- DI LT LO CU	--DI OC LO CU TR	- DI LT LO CU	- DI LT LO CU
RAILWAY TRANSPORT														
Construction phase	- DI LT LO CU	- DI LT LO CU	- - DI LT LO CU	- DI LT LO CU	0	0	0	0	(?)	0	0	--DI OC LO CU TR	--DI OC LO CU TR	0
Utilization phase	++ DI IN MT ST LO RE CU	++ DI IN MT ST LO RE CU	- DI LT LO CU	0	0	- DI LT LO CU	0	- DI LT LO CU	0	++ DI IN MT ST LO RE CU	++ DI IN MT ST LO RE CU	--DI OC LO CU TR	- DI LT LO CU	++ DI IN MT ST LO RE CU
INLAND WATERWAY TRANSPORT														

TRANSPORT SEGMENT	AIR	CLIMATE CHANGE	SOIL AND LAND USE CHANGE	WATER	SEA	HABITATS. FLORA AND FAUNA	PROTECTED AREAS	LANDSCAPE	CULTURAL HERITAGE AND MATERIAL ASSETS	POPULATION	ENERGY	NOISE	WASTE	HEALTH AND SAFETY
Construction phase	- DI LT LO CU	- DI LT LO CU	-	(DI ST LO RE CU TR AC		- DI ST LO RE CU TR AC	- DI ST LO RE CU TR AC	- DI ST LO RE CU TR AC	(?)	0		DI ST LO RE CU TR AC	DI ST LO RE CU TR AC	
Utilization phase	- DI IN MT ST LO RE CU	++ DI IN MT ST LO RE CU		(DI ST LO RE CU TR AC		- DI ST LO RE CU TR AC	- DI ST LO RE CU TR AC	- DI ST LO RE CU TR AC	0	+ + DI IN MT ST LO RE CU	+ DI IN MT ST LO RE CU	DI LT LO CU	DI ST LO RE CU	+ DI IN MT ST LO RE CU
MARITIME TRANSPORT														
Construction phase	- OF LT LO CU -	- DI LT LO CU	-	(DI ST LO RE CU TR AC		- DI LT LO CU	- DI LT LO CU	- DI LT LO CU	(?)	0		DI ST LO RE CU TR AC	DI ST LO RE CU TR AC	
Utilization phase	- DI ST LO RE	- DI ST LO RE	-	(DI ST LO RE CU TR AC		- DI LT LO CU	- DI LT LO CU	- DI LT LO CU	0	+ + DI IN MT ST LO RE CU	+ DI IN MT ST LO RE CU	- DI LT LO CU	DI ST LO RE CU	I IN MT ST LO RE CU

TRANSPORT SEGMENT	AIR	CLIMATE CHANGE	SOIL AND LAND USE CHANGE	WATER	SEA	HABITATS. FLORA AND FAUNA	PROTECTED AREAS	LANDSCAPE	CULTURAL HERITAGE AND MATERIAL ASSETS	POPULATION	ENERGY	NOISE	WASTE	HEALTH AND SAFETY
AIR TRANSPORT														
Construction phase	- OF LT LO CU -	- OF LT LO CU -	?)	(OF LT LO CU -		0	0	0	(?)	0		DI ST LO RE CU TR AC	DI ST LO RE CU TR AC	
Utilization phase	- DI ST LO CU TR	- OF LT LO CU -		(OF LT LO CU -		- OF LT LO CU -	0	- OF LT LO CU -	0	(?)	OF LT LO CU -	DI ST LO RE CU TR AC	DI ST LO RE CU	OF LT LO CU -
URBAN TRANSPORT														
Construction phase	- OF LT LO CU -	- OF LT LO CU -	- OF LT LO CU -			0	0	0	?	0		DI ST LO RE CU TR AC	DI ST LO RE CU TR AC	
Utilization phase	+ + DI IN MT ST LO RE CU	- + DI IN MT ST LO RE CU		(		0	0	0	0	+ + DI IN MT ST LO RE CU	+ DI IN MT ST LO RE CU	+ DI IN MT ST LO RE CU	- DI ST LO RE CU	+ DI IN MT ST LO RE CU

LEGEND:

Grades of possible preliminary positive and negative impacts

MARK	EXPLANATION
-	Significant adverse impact. Significant adverse impact should be minimized with the application of mitigation measures to become insignificant.
-	Moderate adverse impact. This impact is acceptable.
0	No impact or neutral. Intervention has no effect that could be proven, or such impact is negligible.
+	Moderate positive impact
++	Significant positive impact
(?)	The significance of the impact cannot be assessed with certainty due to the lack of data on environmental components, planned activities or for some other reasons.
DI / IN	Direct / Indirect
LT / MT / ST / O	Term-Long (p ermanent, 50-100 years) / Medium-term (10-15 years) / Short-term (3-5 years) / Occasional (t emporary , 1 year)
LO / RE	Local / Regional
CU / SI / TR	Cumulative / Synergic / Transboundary
AC	Accidental event

The assessment includes the magnitude and significance, in qualitative and quantitative terms, of the potential impacts (direct and indirect, temporary or permanent, positive and negative, short and long-term, transboundary and cumulative) of the Strategic Action Plan and Subsector Action Plans .

11.7 . Measures to be taken to prevent, reduce and mitigate the negative consequences of the implementation of the state planning document

The measures proposed are based on the impacts assessed in the previous chapter and the international experience in similar conditions. However, the measures proposed provide general guidance for addressing the adverse impacts, while detailed measures must be examined case by case during the development of specific projects and incorporated during the environmental permitting process.

SEA SEGMENT	SEA OBJECTIVES	PROPOSED ENVIRONMENTAL MITIGATION MEASURES
GENERAL	All of them bellow	The Strategic Action Plan and Subsector Action Plans and their implementation should be in coordination with other development strategies of the country such as Spatial Development strategy. Carefully design all planned infrastructure. The provisions of the Strategic Action Plan and Subsector Action Plans for studies / programs / plans assessing the necessity and feasibility of infrastructure should be prioritized. Adopt European and international environmental standards and know-how on the prevention and mitigation of adverse environmental impacts. Introduce and implement the Strategic Environmental Assessment (SEA) for each transport program / plan developed and introduced. Prepare Environmental Impact Assessment (EIA) and other necessary environmental documentation for each transport project that

		should include mitigation measures and monitoring plan in line with EU environmental legislation and environmental performance documents (EBRD Environmental and Social Policy, IFC EHS guidelines). Detailed mitigation measures should be presented at the environmental permitting phase of each intervention resulting from the Strategic Action Plan and Subsector Action Plans implementation. Adopt good engineering construction management practices, norms and standards for all construction works, to prevent / minimize environmental impacts to all parts of the environment. Prepare a Site Construction Management Plan to define: local transport, storage of materials, wastewater management, construction waste management and other waste, measures for occupational health and safety, fire protection system. Apply appropriate technical solution to prevent negative impacts to water and sea in case of extraordinary events (eg spillages of hazardous substances).
AIR AND CLIMATE CHANGE	Minimize the risk of potential effect on the air quality Adapt transport infrastructure to climate change Decrease greenhouse gases	Ensure that new infrastructure projects include operational strategies for managing extreme weather events and changes in climatic conditions such as winds, rainfalls and temperatures. Sustainable design and construction techniques should include climate change adaptation techniques. **Road transport** Considerate design options for the reduction of traffic congestion. **Inland waterway and maritime transport** Develop air quality management procedures applicable to ship operators and land based activities. Dry bulk materials storage and handling facilities on ports, harbors and terminals should be designed to minimize or control dust emissions. Where practicable, design new facilities on ports, harbors and terminals to minimize travel distance from ships off-loading and on-loading facilities to storage areas.

		Air transport Optimize ground service infrastructure on airports to reduce aircraft and ground vehicle movements on taxiways and idling at the gate. Improve ground service vehicle fleets. Minimize fugitive air emissions from jet kerosene and other fuel storage and handling activities. Supply electrical power and preconditioned air through ground based equipment to minimize the use of aircraft APUs.
SOIL AND LAND USE CHANGE	Avoid or minimize adverse effects upon soils	Constrain conversion of most valuable agricultural land of agricultural land, or if it is not possible, limit redevelopment for transport infrastructure interventions. Develop Erosion and Sediment Control Plans for the inland and maritime port construction activities.
WATER AND SEA	Avoid or minimize adverse effects upon water and sea resources	**Road transport** Avoid the use of salt for de-icing of the road transport network. **Inland waterway and maritime transport** Prior to initiation of dredging activities, materials should be evaluated for their physical, chemical, biological, and engineering properties to inform the evaluation of dredge materials reuse or disposal options. Conduct dredging only if necessary, and based on an assessment of the need for new infrastructure components or port navigation access to create or maintain safe navigation channels, or, for environmental reasons, to remove contaminated materials to reduce risks to human health and the environment. Excavation and dredging methods should be selected to minimize suspension of sediments, minimize destruction of benthic habitat, increase the accuracy of the operation, and maintain the density of the dredge material, especially if the dredge material includes contaminated areas. Apply commonly used dredging methods depending on the depth of the sediments and environmental concerns such as the need to minimize sediment suspension and increase dredging

		accuracy. Areas sensitive for marine life such as feeding, breeding, calving, and spawning areas should be identified. Where sensitive species are present, dredging (and blasting) should be conducted in a manner to avoid fish migration or spawning seasons, routes, and grounds. Conduct inspection and monitoring of dredging activities to evaluate the effectiveness of impact prevention strategies, and re-adjusted where necessary. Analyze dredged material to select appropriate disposal options (eg land reclamation, open water discharge, or contained disposal). Consider beneficial reuse of uncontaminated, dredged material (eg for wetland creation or enhancements, habitat restoration, or creation of public access / recreational facilities). Use techniques (eg silt curtains), to minimize adverse impacts on aquatic life from the re-suspension of sediments. Avoid installation of storm drainage catch basins that discharge directly into surface waters, but using containment basins in areas with a high risk of accidental releases of oil or hazardous materials (eg fuelling or fuel transfer locations), and oil / grit or oil / water separators in all runoff collection areas. Maintain oil / water separators and trapping catch basins regularly to keep them operational. Install filter mechanisms (eg draining swabs, filter berms, drainage inlet protection, sediment traps and sediment basins) to prevent sediment and particulates from reaching the surface water. Port operators should provide collection, storage, and transfer and / or treatment services, and facilities of sufficient capacity and type for all wastewater generated by vessels at the port in accordance with MARPOL and national regulations. Equip smaller vessels used for harbor services with recycling or chemical toilets, or holding tanks, that can be discharged to shore facilities. **Air transport**

		Primary use mechanical de-icing methods such as sweepers and plows complemented by chemical means. Pre-treate pavement surfaces with such means prior to the onset of ice to allow for easy removal. Substitute urea or glycol de-icers with less toxic, more biodegradable, and lower biochemical oxygen demand (BOD) alternatives. Provide a stormwater management system to collect and treat surface run-off containing aircraft and airfield anti-icing and de-icing fluids, including water originating from heaps of snow cleared from aprons and runways.
HABITATS, FLORA AND FAUNA, PROTECTED AREAS AND LANDSCAPE	Avoid adverse effects upon internationally and naturally designated nature conservation sites Avoid or minimize adverse effects upon important habitats, species and landscape	New development should avoid internationally and naturally designated nature conservation sites and other designated and sensitive sites. Avoid excessive lighting to minimize bird disturbance. **Road transport** Sit roads and support facilities to avoid critical terrestrial and aquatic habitat (eg old-growth forests, wetlands, and fish spawning habitat) utilizing existing transport corridors whenever possible. Design and construct wildlife access to avoid or minimize habitat fragmentation, considering motorist safety and the behavior and prevalence of existing species. Possible techniques for terrestrial species may include wildlife underpasses, overpasses, bridge extensions, viaducts, enlarged culverts, and fencing. Possible techniques for aquatic species include bridges, fords, openbottom or arch culverts, box and pipe culverts. Avoid or modified construction activities during the breeding season and other sensitive seasons or times of day to account for potentially negative effects. Prevent short and long term impacts to the quality of aquatic habitats by minimizing clearing and disruption of riparian vegetation, provide adequate protection against scour and erosion and consider the onset of the rainy season with respect to construction schedules.

		Minimize removal of native plant species, and replanting of native plant species in disturbed areas. Explore opportunities for habitat enhancement through such practices as the placement of nesting boxes in rights-of-way, bat boxes underneath bridges, and reduced mowing to conserve or restore native species. Implement Integrated Vegetation Management (IVM). **Rail transport** Avoid fragmentation or destruction of critical terrestrial and aquatic habitats by siting railways, rail yards, support facilities, and maintenance roads to avoid such locations or by utilizing existing transport corridors whenever possible. Where fragmentation of critical habitats cannot be avoided, maximize the availability of animal crossings (eg bridges, culverts, and over-crossings) and provide jointing chambers to allow small animals a means of escape from the railway. When rail crossings of watercourses are unavoidable, maintain water flow and fish access by utilizing clear-span bridges, open-bottom culverts, or other appropriate methods. Where sensitive habitats cannot be avoided by rail alignment, construction of bridges should be considered to span at-risk areas (eg wetlands). Avoid construction activities during the breeding season and other sensitive seasons or times of day, especially where critically endangered or endangered species are concerned. Avoid the introduction of invasive species during reinstatement activities, preferably use native plant species and, when feasible, clear invasive species during routine vegetation maintenance. Regular maintenance vegetation within road / railroad rights-of-way to avoid interference with vehicle travel and road maintenance or with train operations and track maintenance. **Inland waterway and maritime transport**

		Potential impacts to shoreline vegetation, wetlands, fisheries, bird life, and other sensitive aquatic and near-shore habitat habitats during port construction and operation should be fully assessed with special consideration for areas of high biodiversity value or those required for the survival of critically endangered or endangered flora and fauna. The depth of the port should be considered at the design phase in terms of habitat destruction and the amount and nature of dredging required. Additionally, specific prevention and mitigation measures should be adopted for blasting activities which can cause considerable impacts to marine organisms and their habitats during construction. Port facilities that conduct cleaning or repair of ballast tanks should be equipped with adequate reception facilities able to prevent the introduction of invasive species. Treatment technologies may include those applied to other effluents accepted in port reception facilities or more specific methods such as filtration, sterilization (eg using ozone or ultraviolet light), or chemical treatment (eg biocides). Ports should provide ship operators with details on the port, state, or port authority ballast water management requirements, including the availability, location, and capacities of reception facilities, as well as with information on local areas and situations where ballast water uptake should be avoided .
CULTURAL HERITAGE AND MATERIAL ASSETS	Avoid adverse effects upon Ukrainian and World Cultural Heritage sites Minimize adverse effects on unknown and intangible cultural heritage sites, material assets and other infrastructure	New development should avoid Ukrainian and World Cultural Heritage sites and other designated and sensitive sites. In case of archaeological finds, suspend the works and inform the competent authorities, which will take further action per its legal authority. Quarry rehabilitation plans should be elaborated for the quarrying areas.

POPULATION	Contribute towards direct or indirect to employment Improve social cohesion and sustainable mobility	Through various forms of media inform the public on the local and regional levels of the implemented strategy / plans. Strategically plan works on existing infrastructure in a way that as little as possible disrupt traffic flows.
ENERGY	Contribute and increase the energy efficiency in the transport	Promote use of renewable energy (eg photovoltaic) for street lighting, or lighting of stations, airports and ports.
NOISE	Avoid or minimize adverse effects of transport noise upon health and wellbeing of human communities	**Road transport** Considerate noise impacts during road design to prevent adverse impacts at nearby properties through the placement of the road right-of-way and / or through the design and implementation of noise control measures. Design and implement noise control measures: - Construction of the road below the level of the surrounding land - Noise barriers along the border of the right-of way (eg earthen mounds, walls, and vegetation) - Insulation of nearby building structures (typically consisting of window replacements) - Use of road surfaces that generate less pavement / tire noise such as stone-matrix asphalt Reduce project traffic routing through community areas wherever possible. **Rail transport** Implement noise reduction or prevention measures at the source: - Use of modern non-metallic disc brakes (non-metallic disc brakes also reduce wearing of wheels and rails)

		- Reduce the roughness of running surfaces through regular maintenance of wheels and tracks, and consideration for replacing traditional jointed track with continuously welded rail Install noise controls at the source for improved sound-proofing, and other noise reducing features (eg engine enclosures and exhaust muffling for diesel engines, and shielding of wheels with vehicle-mounted shrouds). Depending on the location of noise-sensitive areas, noise and vibrations should be considered in the design, construction, and operation of railways (eg through alignment choice, relocation of nearby buildings, and soundproofing, such as noise barriers, along railways or next to buildings). Ensure reducing noise levels of passing trains in populated areas, especially at night (consider the possibility of reducing the speed of trains in urban areas, installation of noise barrier, etc.). **Inland waterway and maritime transport** Noise reduction options on ports that should be considered include: - Selecting equipment with lower sound power levels - Installing silencers for fans - Installing suitable mufflers on engine exhausts and compressor components - Improving the acoustic performance of constructed buildings, apply sound insulation - Installing acoustic barriers without gaps to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective - Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas

		- Re-locating noise sources to less sensitive areas to take advantage of distance and shielding - Siting permanent facilities away from community areas if possible - Taking advantage of the natural topography as a noise buffer during facility design - Developing a mechanism to record and respond to complaints **Air transport** Plan site for airport location (new developments and expansion of existing facilities), and orientation of routes for arriving and departing aircraft relative to actual and projected residential development and other noise sensitive receptors in the surrounding area. This may include coordination with local authorities with influence over land-use planning and overall transportation planning activities. Plan flight routes, timing and altitude for aircraft (airplane and helicopter) flying over community areas. In areas where significant impacts are anticipated, implement preferred procedures and routes for landing and take-off (LTO) to minimize potential noise from approaching and departing aircraft for noise-sensitive areas. These procedures may include instructions on the use of descent profiles or “noise preferential” routes (NPRs), such as the “continuous descent approach” to avoid noise-sensitive areas, the use of “Low Power / Low Drag” (LPLD) procedure to fly the aircraft in a 'clean' condition (eg no flap or wheels deployed) if possible to minimize airframe noise and instructions on minimizing reverse thrust on landing. An alternative approach may include the dispersion of noise through equal use of multiple flight tracks as opposed to a preferential flight track. Use night-time or other operating restrictions. If necessary, work with local authorities to identify and implement noise prevention and control strategies in noise abatement zones (eg

		sound insulation of buildings that are exposed to aircraft noise above levels stipulated by local authorities or limitations on night-time operation of certain landing routes) . Ensure power supply to the aircraft to reduce or eliminate the need for use of APUs.
WASTE	Avoid or minimize adverse effects of waste generation	Implement Waste Management Plans that should include waste prevention / generation / minimization, segregation, reuse, recycle, transport, disposal and monitoring activities for hazardous and non-hazardous waste in line with EU waste legislation. Establish a solid waste recycling program, depending on the existence of local facilities, involving the placement of labeled waste containers in passenger terminals for metals, glass, paper, and plastics. Food establishments should segregate compostable and other food waste for recycling as agricultural fertilizer and animal feed. Passenger operators and cleaning contractors should be encouraged to segregate waste in the vehicles by separating the collection of newspapers / papers, plastic, and metallic containers and used pillows. Used pillows should be recycled in furniture manufacturing or as insulation. Compost vegetation waste for reuse as a landscaping fertilizer. Manage with sediment and sludge removed from storm drainage systems maintenance activities as a hazardous or non-hazardous waste based on an assessment of its characteristics. Collect animal carcasses in a timely manner and dispose of it through prompt burial or other environmentally safe methods. **Road transport** Maximize the rate of recycling of road resurfacing waste either in the aggregate (eg reclaimed asphalt pavement or reclaimed concrete material) or as a base. Incorporate recyclable materials (eg glass, scrap tires, certain types of slag and ashes) to reduce the volume and cost of new asphalt and concrete mixes.

		Manage with of all removed paint materials suspected or confirmed of containing lead as a hazardous waste. **Rail transport** Where feasible, avoid use of sleepers treated with chromated copper arsenate and consider use of copper azote for wood treatment as a substitute, or using concrete sleepers. Recycling of sleepers may involve crushing for recovery of the steel rebar and use of the crushed material in road construction. Wood sleepers may be chipped for reuse, burnt, or disposed of in landfills. Landfill facilities should be capable of handling wastes that may have chemical leaching properties. Disposal of wood sleepers by incineration or recycling should consider associated air emissions and secondary product residues of preservative chemicals.

11. 8. Justification of the choice of justified alternatives considered, description of the way in which the strategic environmental assessment was carried out, including any complications (lack of information and technical means during such assessment)

The order of the Cabinet of Ministers of Ukraine of May 30, 2018 № 430-r approved the National Transport Strategy of Ukraine for the period up to 2030, the implementation of which will contribute to Ukraine's rapprochement with the EU, as it concerns the implementation of the Association Agreement and creating conditions for Ukraine's gradual integration. EU internal market; improving the quality of transport services, effective implementation of administrative reform, fight against corruption, transparency of decision-making, clear delineation of functions and division of powers between the executive and business entities, ensuring a level playing field for the provision of transport services.

The action plan for 2019-2021 to implement the National Transport Strategy of Ukraine for the period up to 2030 promotes the implementation of the Strategy in the near future, which will strengthen the institutional capacity of organizations involved in the harmonization of Ukrainian legislation with the EU and create grounds for strengthening the control mechanism for its implementation to obtain an efficient transport complex of Ukraine.

The proposed draft Action Plan for 2019-2021 for the implementation of the National Transport Strategy of Ukraine for the period up to 2030 contains a list of tasks, relevant measures and responsible for the implementation of government, deadlines, expected results, as well as identified sources of funding, calculations / need for financing.

The most favorable option will be the approval of the proposed Action Plan for 2019-2021 for the implementation of the National Transport Strategy of Ukraine for the period up to 2030, determined by the results of the strategic environmental assessment.

In the process of strategic environmental assessment, the following alternatives are considered:

Alternative 1:

"Zero scenario", ie description, forecasting and assessment of the situation in case of non-approval of the specified state planning document;

Alternative 2:

"Action plan for 2019-2021 for the implementation of the National Transport Strategy of Ukraine for the period up to 2030 with a reduction in the priority of innovative development of the transport sector and global investment projects."

If Alternative 1 is chosen, the situation will remain unchanged. If the current situation remains unchanged, the problem will continue to exist, which will not achieve the goal and will not overcome the inconsistency of the transport industry with the requirements of effective implementation of Ukraine's European integration course and integration of the national transport network into the Trans-European Transport Network. population and economy in transportation by volume with low quality of services, imperfect system of compensation of preferential transportation and lack of mechanism for implementation and financing of socially important transportation, as provided by European legislation, systemic underfunding, insufficient maintenance of infrastructure and rolling stock, and technical backwardness. threatens not only the performance of its socio-economic functions, but also national security. The current state does not meet the strategic goals and objectives of the Basic Principles (strategy) of state environmental policy of Ukraine for the period up to 2030, approved by the Law of Ukraine of 28 February 2019 № 2697-VIII, deepening existing problems and deteriorating the current state of the environment in Ukraine. the results of the implementation of this document.

In addition, Alternative 1 does not ensure the implementation of the tasks of the National Transport Strategy of Ukraine for the period up to 2030 in all major areas:

– competitive and efficient transport system;

– innovative development of the transport industry and global investment projects;

– safe for society, environmentally friendly and energy efficient transport;

– unhindered mobility and interregional integration.

The choice of Alternative 2 would not have a significant impact on the content of the Action Plan for 2019–2021 for the implementation of the National Transport Strategy of Ukraine until 2030.

However, choosing an alternative Action Plan to reduce the priority of innovative development of the transport sector and global investment projects in terms of introducing an effective tax mechanism to attract private capital in the development of rail transport (stimulating the renewal of traction and other rolling stock), inland water transport (stimulating fleet renewal and support for long-term investments in the renewal and construction of river vessels), air transport (implementation of strategic projects in aviation, modernization and development of airport infrastructure and air navigation service provider of Ukraine, including the introduction of new technologies for remote aerodrome and dispatching services of regional airports with small volumes) would reduce the priority and make it difficult to implement such important measures as:

1) development of proposals on methods of stimulation and economic mechanisms to promote the localization of the best innovative technologies for transport infrastructure construction, production and renewal of rolling stock (taking into account the needs of people with disabilities and other low mobility groups) on the basis of domestic enterprises, including stimulating their foreign economic activity;

2) implementation of measures for state support of the shipbuilding industry in Ukraine;

3) introduction of a mechanism for targeted financing of inland water transport development;

4) settlement of the issue of taxation of port dues in the legislative plane;

5) introduction of performance-based navigation (PBN), use of global satellite systems (GNSS) as the main means of navigation; application of stepless recruitment and reduction techniques (CCO / CDO); introduction of advanced flexible use of airspace (A-FUA); harmonization of general and operational air traffic; development of communication, navigation and surveillance (SNS) infrastructure in accordance with the European ATM Master Plan, in particular: introduction of Data Processing Centers (DACs) for centralization of air navigation services (AIE); development of telecommunication infrastructure, ensuring its integration into the European network service (PENS); introduction and development of the air traffic service messaging service (AMHS); creation of ground-to-air communication infrastructure for the introduction of frequency distribution of 8.33 kHz channels; introduction of modern cooperative air traffic control systems (Mode S, ADS-B, WAM); support for non-cooperative surveillance systems; creation and maintenance of navigation infrastructure to provide performance-based zonal navigation (PBN); providing technical support for the automation of air traffic management and civil-military coordination; introduction of technologies for centralized collection, processing and dissemination of data related to air navigation; introduction of remote aerodrome control services (Remote Tower); introduction of systems of remote control, management and monitoring of ZNS objects;

6) creation of an aviation cluster with a cargo airport, a cargo carrier, a maintenance center, a flight school and the Lviv Jagellon Industrial Park.

Alternative 2 with lowering the priority of innovative development of the transport sector and global investment projects in terms of implementing an effective tax mechanism to attract private capital in the development of rail, inland waterway and air transport in general would be contrary to the National Transport Strategy of Ukraine until 2030.

The methodological basis of the strategic environmental assessment of the draft Action Plan to identify all important impacts and risks, assess their magnitude and significance, prevent, reduce and mitigate adverse effects on the environment, is a systematic approach, which in this assessment process is a combination of such research methods. in particular: general - analysis, synthesis, formalization, comparison, historical, logical, idealization, expert assessments, etc .; graphic; regulatory regulation, content analysis; economic and mathematical, modeling; information; prognostication; socio-ecological.

It is the system of tools and techniques provided for each of these methods used in the strategic environmental assessment, made it possible to propose measures to prevent, reduce and mitigate the impact on the environment in terms of environmental protection, safety of life and health. i on atmospheric air and climate change; land and land use change; waters and seas; habitats, flora and fauna, areas subject to special protection, and landscape; cultural heritage and tangible assets; protection of the population; energy efficiency; noise; waste management.

In the process of strategic environmental assessment at the state level, as well as by region, information and data on the state of the environment, living conditions and health status, environmental issues related to the state planning document, in particular on areas with environmental status: statistical information , reports on the state of the environment, information included in other acts of legislation relevant to the draft Action Plan, data on monitoring the state of the environment, expert assessments, other available information on environmental indicators that reflect the main trends of causes and consequences of the environmental situation statistical observations using administrative data.

The assessment identified a lack of statistical information on emissions of pollutants from mobile sources after 2015, energy consumption, intensity of CO2 emissions, and total energy consumption by all modes of transport, acoustic (noise) pollution, as well as the most current data (for 2018–2019) on all components of the environment and the state of health of the population - segments of strategic environmental assessment. However, an in-depth analysis of the available information on the above made it possible to characterize the current state of the environment, including public health, and projected changes in this state if the state planning document is not approved, the state of the environment, living conditions and health status. areas likely to be affected, as well as to identify environmental problems, including risks to public health, related to the draft Action Plan, in particular for areas with conservation status.

11. 9. Measures envisaged for monitoring the consequences of the implementation of the state planning document for the environment, including for public health

Monitoring the environmental impact, safety and health of the draft Action Plan is key in the strategic environmental assessment process. The information obtained as a result of monitoring will allow the Ministry of Infrastructure of Ukraine to monitor the impact of the state planning document on the environment and public health , assess the effectiveness of prevention and mitigation measures, identify unforeseen consequences and manage any uncertainties. occur in the evaluated process, in particular, to prevent adverse effects.

To determine the monitoring procedure, the following were considered:

–□environmental goals and monitoring indicators;

–□probable significant impacts identified in the process of strategic environmental assessment;

–□measures.

Monitoring of the consequences of the implementation of the state planning document for the environment, including for the health of the population, proposed in this report, takes into account the procedures already established in the country within other policy areas, in particular, the state environmental policy of Ukraine and legislation on monitoring, forecasting, accounting and information in the field of environment (Table 9.1). In addition, the measures envisaged in the draft Action Plan to improve data collection provide an opportunity to monitor the implementation and implications of this strategic document.

Table 9.1

Monitoring the consequences of the implementation of the state planning document for the environment, including for public health

Segments of strategic environmental assessment	Objectives of strategic environmental assessment	Monitoring indicators
Atmospheric air and climate change	Reduction of emissions of pollutants and greenhouse gases into the atmosphere. Adaptation of transport infrastructure to climate change	Emissions of pollutants and greenhouse gases from mobile and stationary sources of pollution (t) Dynamics of climate change
Soils and changes in land use	Prevention or minimization of negative impact on soils, minimization of fragmentation and consolidation of lands	Vegetation area and ecological balance of land use (ha) Withdrawal of land for transport infrastructure (ha)

Segments of strategic environmental assessment	Objectives of strategic environmental assessment	Monitoring indicators
Water resources and seas	Prevention or minimization of negative impact on water and marine resources	Water / sea quality / status / class Number of cases of water source / sea pollution
Habitats, flora and fauna, areas subject to special protection and landscape	Prevention or minimization of negative impact on places defined by international agreements and protected areas Prevention or minimization of negative impacts on important habitats, species of flora and fauna, landscape	Habitat fragmentation Number of cases of population collisions with wild animals
Cultural heritage and tangible assets	Prevention of negative impacts on Ukrainian and world cultural heritage sites Minimization of negative impact on unidentified cultural heritage sites, material values and infrastructure	Proximity and accessibility of transport infrastructure
People	Direct or indirect impact on employment Improving social cohesion and sustainable mobility	Investing in transport infrastructure Volume and structure of passenger and freight traffic Population using public and railway transport (persons)
Public health and safety	Minimization of negative impacts on the health and well-being of the population Minimization of the number of road accidents	Number of fatal accidents and people injured in road accidents
Energy efficiency	Promoting and improving energy efficiency in transport	Total energy consumption by transport and infrastructure
Noise	Prevent or minimize the negative impact of traffic noise on human health and well-being	Noise level from transport and infrastructure

Segments of strategic environmental assessment	Objectives of strategic environmental assessment	Monitoring indicators
Waste	Prevention or minimization of waste generation and optimization of waste management	The amount of waste generated in the field of transport and infrastructure

Monitoring of the consequences of the implementation of the state planning document for the environment, including for the health of the population is based on the indicators of the effectiveness of the implementation of the measures of the draft Plan according to the expected results defined in the document. Due to the fact that such results are characterized by institutional and organizational and economic content, their monitoring can also be carried out on indicators of overall project implementation and application of financial instruments, implementation of transport sector reform, modernization of the transport sector, in particular:

– implementation of investment projects (total amount of public expenditures for preparation and construction, programmed on the date of calculation);

– involvement of the private sector (capital expenditures should be supported by private / public funding on the settlement date);

– percentage of resources provided for short-term action plans (distributed public resources, loans signed by international financial institutions and public-private partnership entities for the next 3 years for short-term projects of the indicative list of projects);

– implementation of public policy initiatives (average% of public policy implementation / soft measures identified in the draft Action Plan);

– Directives and Regulations of the Association Agreement transposed into Ukrainian law (number of Directives and Regulations - or their updated equivalents - in the annexes to the Association Agreement adopted by the Ukrainian Parliament in the relevant national laws on the date of calculation).

– resources spent on road safety (effective costs, in figures, compared to cost forecasts);

– number of new enterprises operating on railway networks (compared to the planned indicators);

– τηε number of concession contracts concluded for the management of seaport terminals (compared to the planned indicators).

The above list of indicators for monitoring the consequences of the implementation of the state planning document for the environment, including the health of the population is not exclusive and will be detailed in the framework of the project Monitoring

11. 10. Description of the likely transboundary effects on the environment, including public health

The draft Action Plan for 2019–2021 on the implementation of the National Transport Strategy of Ukraine for the period up to 2030 does not contain data on the exact location of infrastructure facilities, therefore information on determining the cross-border implications of the state planning document and their quantification is insufficient .

Probable transboundary negative impact of all modes of transport on air quality and noise generation on the border of Ukraine with other countries (Republic of Poland, Slovak Republic, Republic of Hungary, Romania, Republic of Moldova, Russian Federation, Republic of Belarus).

Declining water quality of waterways may affect neighboring countries (Romania, the Republic of Moldova). The main transboundary negative impact is expected to be the possible pollution of the Black Sea due to navigation and port operations. At the same time, Romania and the Russian Federation may become affected states.

It is recommended that the issue of quantifying transboundary environmental impacts, including public health, be considered when developing specific modes of transport infrastructure.

references

1. Ramsar Sites Information Service . URL: https://rsis.ramsar.org/ris-search/?f[0]=regionCountry_en_ss%3AUkraine&pagetab=2

2. The Ministry of Ecology and Natural Resources of Ukraine. Ukraine's Greenhouse Gas Inventory 1990-2014. Annual National Inventory Report for Submission under the United Nations Framework Convention on Climate Change and the Kyoto Protocol. Kiev, 2016. 558 pp.

3. Ukraine's Greenhouse Gas Inventory 1990-2014. Annual National Inventory Report for Submission under the United Nations Framework Convention on Climate Change and the Kyoto Protocol / The Ministry of Ecology and Natural Resources of Ukraine, Kiev, 2016. 558 p. URL: https://menr.gov.ua/files/docs/Ukraine_NIR_2017.rar

4. Ukraine's Greenhouse Gas Inventory 1990-2017 (draft). Annual National Inventory Report for Submission under the United Nations Framework Convention on Climate Change and the Kyoto Protocol / The Ministry of Ecology and Natural Resources of Ukraine, Kiev, 2019. 504 p. URL: https://menr.gov.ua/files/docs/Zmina_klimaty/kadastr2017/Ukraine_NIR_2019_draft.pdf

5. Determining the magnitude of the risk to public health from noise pollution in the central part of the city of Poltava / Parashchienko IM and others. Construction, materials science, mechanical engineering. Series: Life safety. Issue. 105 . 2018 . Pp. 100–104.

6. Demographic situation in Ukraine in 2018 . URL: http://database.ukrcensus.gov.ua/PXWEB2007/ukr/publ_new1/2018/dem_1218.pdf

7. Demographic passport of the territory / State Statistics Service of Ukraine. URL: http://database.ukrcensus.gov.ua/Mult/Dialog/statfile1_c_files/pasport1.htm

8. State Statistics Service of Ukraine. Emissions of pollutants and carbon dioxide into the atmosphere. URL: https://ukrstat.org/uk/operativ/operativ2009/ns_rik/ns_u/dvsr_u2008.zip .

9. State Statistics Service of Ukraine. Emissions of pollutants and greenhouse gases into the atmosphere from mobile sources of pollution in 2015: stat. bulletin. K.: State Statistics Service of Ukraine, 2016. 45 p. URL: http://www.ukrstat.gov.ua/druk/publicat/kat_u/2016/bl/06/bl_vzrpg2015pdf.zip

10. State Statistics Service of Ukraine. Emissions of pollutants into the atmosphere in Ukraine for 1990–2018 . URL: https://ukrstat.org/uk/operativ/operativ2015/sg/ekolog/ukr/zr_u.xlsx .

11. State Statistics Service of Ukraine. The environment of Ukraine in 2017: stat. zb. For order. OM Prokopenko. - Kyiv: State Statistics Service of Ukraine, 2018. 225 p. URL: https://ukrstat.org/en/druk/publicat/kat_u/2018/zb/11/zb_du2017.pdf

12. State Statistics Service of Ukraine. On water use in Ukraine and regions in 2015. K., 2016, 18 p.

13. State Statistics Service of Ukraine. Statistical Yearbook of Ukraine for 2015. K.: State Statistics Service of Ukraine, 2016. 575 p.

14. State Statistics Service of Ukraine. Statistical Yearbook of Ukraine for 2017 / Edited by IE Werner. K.: State Statistics Service of Ukraine, 201 8 . 541 s.

15. State cadastre of territories and objects of the nature reserve fund of Ukraine . URL: http://pzf.menr.gov.ua

16. Dronov A. L. Heosystemnyy analysis of risk factors of technogenic emergencies in Ukraine . Ukrainian Geographical Journal. 2011. № 1. S. 63–68.

17. Energy Balance of Ukraine / State Statistics Service of Ukraine. URL: http://www.ukrstat.gov.ua/operativ/operativ2018/energ/en_bal/Bal_2017_u.xls

18. Report on the implementation of the national program for the formation of the national ecological network of Ukraine for 2015 / Ministry of Ecology and Natural Resources of Ukraine. URL: https://menr.gov.ua/files/docs/zvitEkomereja_2015.doc

19. Green Book of Ukraine / Under the general. ed. Corresponding Member NAS of Ukraine JP Didukha. K.: Альтерпрес, 2009. 448 c. URL: https://drive.google.com/file/d/1dJUnESaNKy55c4qMVfGpK8ESu6NF28oW/view

20. The concept of implementation of state policy in the field of climate change for the period up to 2030 : the order of the Cabinet of Ministers of Ukraine of December 7, 2016 № 932-r . URL: https://menr.gov.ua/files/docs/Zmina_klimaty/%D0%A0%D0%BE%D0%B7%D0%BF%D0%BE%D1%80%D1%8F%D0%B4 % D0% B6% D0% B5% D0% BD% D0% BD% D1% 8F% 20932-% D1% 80.doc

21. Concept I development of the public health , approved by Cabinet of Ministers of Ukraine dated 30 November 2016 p. №1002-p. URL : https://www.kmu.gov.ua/en/npas/249618799

22. Luchko IA, Dmitrenko AV, Tereshchenko OP The results of the study of noise load on the streets, roads and avenues of Kyiv . Bulletin of NTUU "KPI". Mining series. 2010. Vip. 19 . Pp . 188–194.

23. Ministry of Ecology and Natural Resources of Ukraine. Analytical note on "Water and Health". URL: https://menr.gov.ua/.../Water%20and%20Health%20PP%20a ..

24. Ministry of Ecology and Natural Resources of Ukraine. National report on the state of the environment in Ukraine in 2015 . K.: Ministry of Ecology and Natural Resources of Ukraine, FOP Grin DS , 2017. 308 p.

25. Ministry of Ecology and Natural Resources of Ukraine. Fifth National Report of Ukraine on the implementation of the provisions of the Convention on Biological Diversity. K., 2015. 68 p. URL: https://www.cbd.int/doc/world/ua/ua-nr-05-uk.pdf

26. The Ministry of Environment has prepared a rating of "TOP-100 largest polluting enterprises" for 2017. URL: https://menr.gov.ua/news/32941.html

27. Scientific research on monitoring and survey of agricultural lands of Ukraine according to the results of the tenth round (2011-2015) of agrochemical survey of agricultural lands. Edited by IP Yatsuk. K .: State Institution "Institute of Soil Protection of Ukraine", 2018. 66 p. URL: http://www.iogu.gov.ua/wp-content/uploads/2013/07/2-%D0%9C%D0%BE%D0%BD%D1%96%D1%82%D0%BE % D1% 80% D0% B8% D0% BD% D0% B3-compressed.pdf

28. National Atlas of Ukraine. URL: http://wdc.org.ua/atlas/default.html

29. UNESCO World Heritage Sites in Ukraine: monument / Ministry of Culture of Ukraine, Kyiv. nat. University of Culture and Arts, Sciences. b- ka; structure. A. O. Skachenko sciences. ed. Yu. M. Klyuchko. K.: Vid. KNUKiM Center, 2014. 71 p. URL: http://knukim.edu.ua/wp-content/uploads/2014/04/unesko.pdf

30. Basic principles (strategy) of the state environmental policy of Ukraine for the period up to 2030: Law of Ukraine of February 28, 2019 № 2697-VIII. URL: https://zakon.rada.gov.ua/laws/show/2697-19

31. Fifth National Report of Ukraine to the Convention on Biological Diversity / Ministry of Ecology and Natural Resources of Ukraine. URL: https://www.cbd.int/doc/world/ua/ua-nr-05-uk.pdf

32. Energy efficiency indicators / State Energy Efficiency of Ukraine . URL : http://saee.gov.ua/en/content/%D0%BF%D0%BE%D0%BA%D0%B0%D0%B7%D0%BD%D0%B8%D0%BA%D0 % B8-% D0% B5% D0% BD% D0% B5% D1% 80% D0% B3% D0% BE% D0% B5% D1% 84% D0% B5% D0% BA% D1% 82% D0% B8% D0% B2% D0% BD% D0% BE% D1% 81% D1% 82% D1% 96

33. On the territory of the Emerald Network: the draft Law of Ukraine. URL: https://menr.gov.ua/files/docs/Proekt/28022019/%D0%9F%D0%BE%D1%8F%D1%81%D0%BD%D1%8E%D0%B2%D0 % B0% D0% BB% D1% 8C% D0% BD% D0% B0% 20% D0% B7% D0% B0% D0% BF% D0% B8% D1% 81% D0% BA% D0% B0.docx

34. Public report of the State Agency of Forest Resources of Ukraine for 2018 / State Agency of Forest Resources of Ukraine. URL: http://dklg.kmu.gov.ua/forest/control/uk/publish/article?art_id=166328&cat_id=113360

35. Rakoid O. The state of reflection in the program documents of Ukraine and the status of implementation of the provisions of the UN Convention to Combat Desertification: an analytical report. K., 2017. URL: http://www.ua.undp.org/content/dam/ukraine/docs/EE/Rio/Desertification_Rakoyid_Web.pdf

36. Ramsar Convention. Ukraine and the Ramsar Convention . URL: http://pzf.menr.gov.ua

37. Strategy of low-carbon development of Ukraine until 2050 / Ministry of Ecology and Natural Resources of Ukraine. URL: https://menr.gov.ua/files/docs/Proekt/LEDS_ua_last.pdf

38. Strategy for improving the management mechanism in the field of use and protection of state-owned agricultural lands and their disposal: Resolution of the Cabinet of Ministers of Ukraine of June 7, 2017 № 413. URL: https://www.kmu.gov.ua/ua/npas / 250068882

39. Waste generation and management / State Statistics Service of Ukraine. URL: http://www.ukrstat.gov.ua/

40. Central Geophysical Observatory named after Borys Sreznevsky. Review of the state of environmental pollution on the territory of Ukraine according to the observations of hydrometeorological organizations in 2018. K., 2019. URL: http://cgo-sreznevskyi.kiev.ua/data/ukr-zabrud-viz-1/oglyad_2018_doc.doc

41. Red Book of Ukraine. Flora / ed. JP Didukha. K.: Глобалконсалтинг, 2009. 900 c. URL: https://drive.google.com/uc?id=1UHHJOnx9itYpIF_uMAL9wMuK7yGUtqoe&export=download

42. Red Book of Ukraine. Fauna / ed. IA Akimov. K.: Глобалконсалтинг, 2009. 600 c. URL: https://drive.google.com/uc?id=1Yr985B_RQh0tCL-kC3obHxg5KmAD8ehc&export=download

43. Annual report on the state of health of the population, the sanitary and epidemiological situation and the results of the health care system of Ukraine. 2017 / Ministry of Health of Ukraine, State Institution “UISD of the Ministry of Health of Ukraine”. K .: IEC "Medinform", 2018. 458 p. http://www.uiph.kiev.ua/dawnload/Vidavnictvo/Shchorichna%20dopovid/%D0%A9%D0%BE%D1%80%D1%96%D1%87%D0%BD%D0%B0%20 % D0% B4% D0% BE% D0% BF% D0% BE% D0% B2% D1% 96% D0% B4% D1% 8C.2018.pdf

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[1] For 1990 - 2002, data on road transport are displayed; since 2003 - by road, rail, air, water transport; since 2007 - for automobile, railway, aviation, water transport and production equipment.

[2] Excluding the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in Donetsk and Luhansk oblasts.

[3] For 1990 - 2002 , data on road transport are displayed; since 2003 - by road, rail, air, water transport; since 2007 - on automobile, railway, aviation, water transport and production equipment.

[4] Information for 2014–2017 is given without taking into account the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in Donetsk and Luhansk regions.

[5] Data can be refined.

[6] Data can be refined.

[7] Data can be refined.

[8] Data can be refined.

[9] B ez regard temporarily occupied territory of the Autonomous Republic of Crimea and in Sevastopol. And temporarily occupied territories of Donetsk and Lugansk regions .

[10] MPCs are divided into average daily (MPC), with which the average concentrations are compared, and the maximum one-time (MPCm), with which the one-time maximum concentrations of harmful substances are compared.

[11] Under high pollution of atmospheric air (VZ) the content of a polluting impurity which exceeds the maximum one-time maximum admissible concentration (MPCm) in 5 times and more is accepted.

[12] Comparisons of average annual and maximum concentrations of sulfur dioxide and nitrogen dioxide at both stations were performed with the average daily maximum allowable concentrations (MPC), because there was an average daily sampling.

[13] Without transit and discharge into canals .

[14] Under extremely high surface water pollution (EWC), a level is exceeded that exceeds the MPC by 100 times for substances of hazard classes 1-4; reduction of dissolved oxygen to values of 2 mg O_2/ DM^3 and less; increase in biochemical oxygen consumption for 5 days (BSC_5) to 60 mgO_2/ DM^3.

[15] Under high surface water pollution, the level is exceeded, which exceeds the MPC by 10 times, for petroleum products, phenols, copper compounds - 30 times; reduction of dissolved oxygen from 3 to 2 mg O_2/ DM^3; the value of BSC_5 from 15 to 60 mgO_2/ DM^3.

[16] To compare the concentrations of chemicals in the multiplicity of MPC hydrometeorological organizations are guided by the "Generalized list of maximum permissible concentrations (MPC) and tentatively safe levels of exposure (OBUV) of harmful substances to the water of fisheries", Ministry of Fisheries of the USSR, Moscow, 1990 .

[17] Data from systematic observations of water bodies on hydrochemical parameters are compared with the most stringent MPC for water - fishery .

[18] the total concentration of cesium-137 in the suspension and solution .

[19] data from SSE " Ecocenter ".

[20] The concentration of ^{90}Sr and ^{137}Cs in surface waters in the pre-emergency period was 10 - 15 Bq / m^3.

[21] According to the sanitary and hygienic standards " Permissible levels of radionuclides in food and drinking water (DR-2006) " permissible levels of cesium-137 and strontium-90 in drinking water are 2000 Bq / m^3 (for each separately).

[22] data are given for the surface horizon .

[23] data are given for surface and bottom horizons .

[24] without taking into account the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories of Donetsk and Luhansk regions .

[25] According to the Ministry of Ecology and Natural Resources of Ukraine, taking into account the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the anti-terrorist operation zone .

[26] The reduction of the total area of the NPF facilities was due to the reduction of the area of the Zubr local reserve in the Volyn region by 4,513.6 ha.

[27] URL: http://whc.unesco.org/en/statesparties/en

[28] URL: http://whc.unesco.org/en/158/

[29] Excluding the temporarily occupied territory of the Autonomous Republic of Crimea and the city of Sevastopol. Data on population decline and natural movement are given without taking into account part of the temporarily occupied territories in Donetsk and Luhansk oblasts .

[30] For 2015 - 2018, the data are given without the temporarily occupied territory of the Autonomous Republic of Crimea and the city of Sevastopol.

[31] Excluding the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and parts of the temporarily occupied territories in the Donetsk and Luhansk oblasts.

[32] For 1994 - 2009 , data on wastes of I-III hazard classes from economic activity of enterprises and organizations are displayed; since 2010 - for wastes of I-I V hazard classes, taking into account wastes generated in households.

[33] Data for 2014–2017 are given without taking into account the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in Donetsk and Luhansk oblasts.

[34] The waste categories by material are given in accordance with the international statistical classification EWC-StatVer.4, adapted to national conditions.

[35] Taking into account 30929.1 thousand tons of waste generated during mining operations in the process of creating mines and quarries LLC " Eristov Mining and Processing Plant ".

[36] excluding the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories of Donetsk and Luhansk oblasts.