ECOLOGICAL AND CLIMATIC DISCRIMINATION IN THE OCCUPIED CRIMEA: DIMENSIONS AND THREATS

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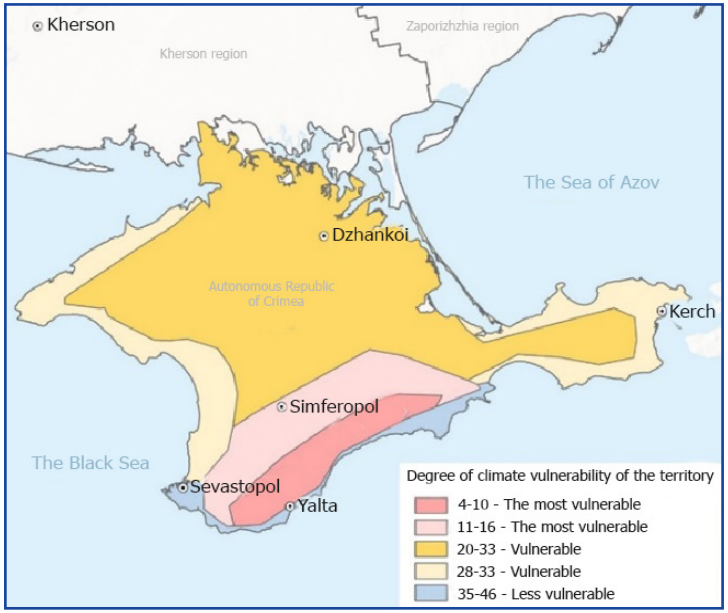

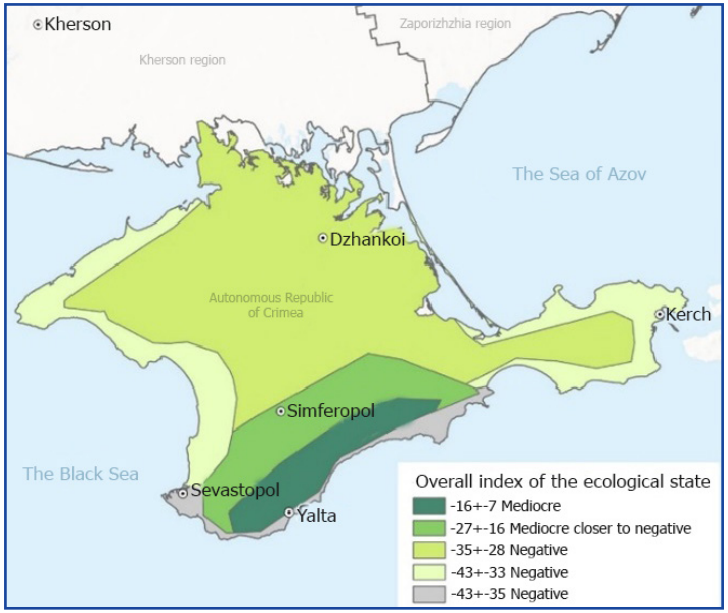

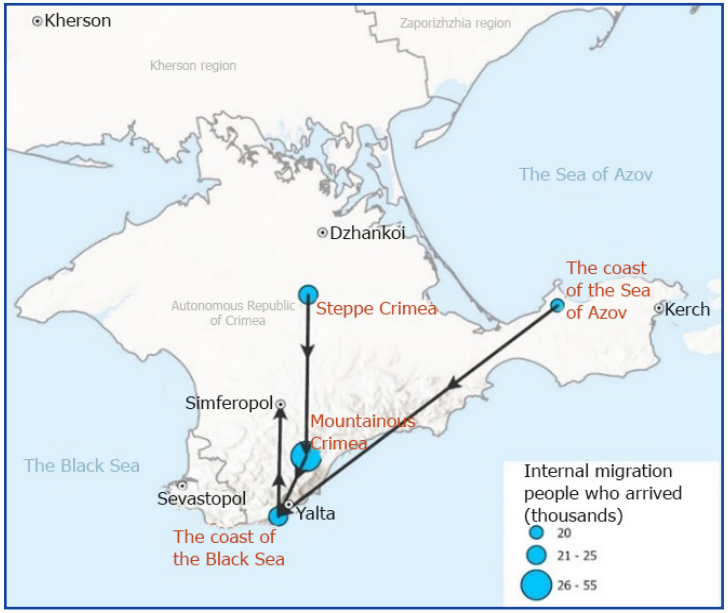

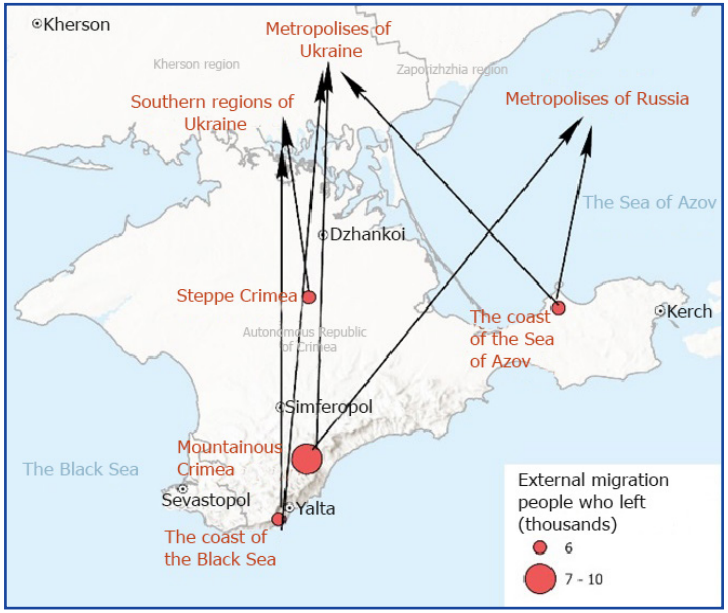

Kyiv — 2022

CRIMEAN TATAR RESOURSE CENTER

UDC 502/504+551.58](477.75-074)
JEL code E45

«Ecological and Climatic Discrimination in the Occupied Crimea: Dimensions and Threats» / S.G. Boychenko, S. M. Voloshyn, T. L. Kuchma, O. V. Pozniak, Ye. V. Khlobystov; Crimean Tatar Resource Center-Kyiv, 2022 — 115 p.

ISBN 978-617-95190-2-4

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Approved by the Expert Council of Crimean Tatar Resource Center for Environmental Protection and Sustainable Development of Crimea (Protocol No. 2 as of June 15, 2022).

Abstract: as part of the study, the ecological and climatic vulnerability of the territory has been assessed in terms of indicators, based on determining the features of climate change, the degree of climatic comfort for the population, vulnerability to adverse weather conditions, and assessing the overall state of the environmental situation. Having analyzed regulatory violations in the environmental sphere during the occupation period of the peninsula, it has been found that the largest number of offenses was recorded in the areas of use and protection of water bodies, management of industrial and household waste, and protection of protected areas. Prerequisites for internal or external migrations caused by the ecological and climatic situation and offenses in the environmental sphere have been identified. The paper provides recommendations on the response of parties concerned to ecological and climatic discrimination and possible migration processes.

Ініціатива з розвитку екологічної політики й адвокації в Україні

INTERNATIONAL RENAISSANCE FOUNDATION

Швеція Sverige

CRIMEAN TATAR RESOURSE CENTER

This study was prepared within the frame of Environmental Policy and Advocacy Initiative in Ukraine, that has been implemented by the International Renaissance Foundation and enabled by the financial support from Sweden.

Views, conclusions, or recommendations belong to the authors of this study and do not necessarily reflect the official position of the Government of Sweeden . The responsibility over the content lies solely with the authors of this study and the Crimean Tatar Resource Center.

ISBN 978-617-95190-2-4

Content

INTRODUCTION

Relevance of the study. Modern climate change has certain regional features and negative consequences for the environment, economic activity, and public health. The last few decades have been significantly affected by an increase in the frequency of abnormal weather and natural events (droughts, cloudbursts, dry winds, etc.). However, irrational human activities and ill-considered managerial decisions make the negative effects of climate change even worse and more difficult to overcome.

On the territory of the occupied Crimea, the ecological and climatic situation is quite difficult due to several reasons, both natural and anthropogenic, in particular::

- natural arid climatic conditions and unfavorable climate changes, which are manifested in an increase in the frequency of abnormally high temperatures, rainless periods, dry winds, heavy rains, etc.;
- intensive water use as a result of tourism intensification and militarization on the peninsula;
- predatory use and exploitation of natural resources (groundwater, soil, forests of the reserve fund, and marine ecosystems);
- environmental pollution as a result of man-made accidents and industrialization (accident on the Titan, construction of roads and the Kerch Bridge);
- uncontrolled developments on the sea coasts, as well as on the territory of wildlife sanctuaries;
- failure to provide reliable information on the environmental situation and failure to raise awareness of climate change;
- discriminatory legal norms in violation of human rights to a clean environment, and ineffective managerial decisions of Crimean occupation authorities.

All these circumstances create uncomfortable living conditions and pose threats to the health and life of the local population. In addition, unjustified and ill-considered management in difficult environmental, climatic and hydrological conditions complicates traditional farming. Such regions on the territory of Crimea should include the northern steppe regions (arid conditions and lack of alternative water supply, salinization), mountainous regions (consequences of adverse weather conditions and geological processes in the absence of a systematic approach to strengthening slopes and landslide mitigation works), the coast of the Black Sea and the Sea of Azov (rising sea levels, erosion, and abrasion of the banks as well as intensive development) and large cities of Simferopol, Sevastopol, Yalta, etc. (problems with a water supply and water quality, flooding, air pollution, clogging, etc.).

All of the above is a violation of the human rights to a clean and healthy environment, as well as the right of access to environmental information, which does not improve the adaptive resilience of the community to climate change and is a manifestation of environmental and climatic discrimination.

As a result, this can lead to local environmental conflicts over the redistribution of resources and encourage internal and external climate migrations of the population. Among the possible migration flows, we can also distinguish the southern regions of Ukraine with the greatest load on Kherson region. These circumstances can lead to a number of negative social, environmental, and economic effects in the southern regions.

Study activities. In the course of the study, the features of climate change, the manifestation of natural phenomena and trends in climate comfort for the population of Crimea have been analyzed, and the territories most vulnerable to environmental changes have been identified. The existing regulatory legal acts and management decisions of Crimean authorities that cause environmental and climatic discrimination on the peninsula will be analyzed. This will make it possible to identify territories where prerequisites are created for internal and/or external migrations caused by climate change, difficult environmental situations and as a result of ecological and climatic discrimination. The possible social, environmental, and economic negative effects of climate migrations for Kherson region will be analyzed.

Expected results. Changes in the ecological and climatic situation in Crimea over the past 30 years have been studied; territories where internal and/or external migrations caused by climate change, difficult environmental situations and as a result of ecological and climatic discrimination can potentially occur have been identified; recommendations to Ukrainian authorities and international organizations on responding to environmental and climatic discrimination in the territory of Crimea and possible climate migration to the southern regions of Ukraine have been developed; an analytical report has been distributed and state authorities, international organizations and representative offices of the states participating in Crimean platform have been informed.

Justification of the possibility of solving the problem based on the results of the study. The materials of the study will be used on international platforms and sent to international organizations for further development of mechanisms for additional pressure on the aggressor state to solve these problems. Recommendations will also be developed for state authorities to form a state policy to respond to environmental and climate threats in the occupied Crimea and southern regions of Ukraine.

Purpose of the study. Draw the attention of the Ukrainian authorities and international organizations to ecological and climatic discrimination on the territory of the temporarily occupied Crimea, which can lead to climate migrations in the region, by conducting a study on changes in the ecological and climate situation in Crimea during 2010–2021, taking into account the anthropogenic activities of the occupation authorities of the peninsula and conducting a public information campaign.

Target audience of the results of the study. Representatives of state authorities, experts of the relevant working group of Crimean platform, members of environmental public organizations, representatives of international organizations, and diplomatic missions of the countries participating in Crimean platform.

Study methods and materials. Based on the assessment of the vulnerability of the territory of Crimea according to climatic, environmental and migration criteria, a system of assessment in terms of indicators has been developed, taking into account changes in indicators in the specified regions.

The climate vulnerability of the territory is assessed on the basis of an analysis of the state of climatic conditions, climate changes and challenges from them, the peculiarities of the manifestation of adverse weather conditions, and the comfort of climatic conditions for the population of Crimea. For climate change analysis, data from meteorological observations at stations located on the territory of Crimea (average monthly surface air temperature and monthly amount of precipitation) were used, and daily values of surface temperature, humidity, and wind speed for the period 1990–2021 were used to calculate the comfort index of climatic conditions.

To assess the vulnerability of the territory of Crimea according to environmental criteria, an assessment system has been developed and indicators of vulnerability of the territory have been proposed in the following areas: the general ecological situation, the degree of water supply, fires, sea level rise, erosion and abrasion of the coast, the load on the environment from tourism, the impact on the environment of military training areas and units, the state of natural ecosystems.

The satellite remote sensing materials used provide important spatiotemporal information for determining regional trends in the state of the Normalized Difference Vegetation Index (NDVI) and the water surface area of reservoirs. To analyze satellite data, we used the methods recommended by UN-SPIDER, the United Nations program for the use of space information for emergency prevention and response. Satellite images were processed on the basis of the Google Earth Engine Cloud Platform for access to open long-term satellite data sets of various satellite missions. The spatiotemporal distribution of NDVI averaged over the growing period in Crimea for the period 1982–2020 and the difference of NDVI for the periods 1982–2000 and 2001–2020, as well as the area of the water surface of reservoirs in Crimea for the period 2015–2021.

Data on the ecological state in the territory of Crimea has been also systematized and analyzed based on the annual reports "On the state and protection of the environment in the territory of the Republic of Crimea" for 2015–2021.

The forecast assessment of migration scales is based on an analysis of the progress of the process during 2006–2013, and its transformations in 2014–2021, taking into account the extrapolation of existing trends and expert assessments of possible further changes.

To estimate the approximate number of environmental emergencies and violations of environmental legislation, data from the reports of the occupation Ministry of Ecology and Natural Resources of the Republic of Crimea “On the results of the implementation of the program for the prevention of violations of mandatory requirements of environmental legislation” have been used, in particular: the number of protocols on administrative offenses that indicate the presence of specific violations of environmental legislation.

CHAPTER 1. ASSESSMENT OF THE ECOLOGICAL AND CLIMATIC VULNERABILITY OF THE CRIMEAN PENINSULA

1.1 Assessment of the climate vulnerability of the Crimean Peninsula territory

The climate vulnerability of the territory is assessed on the basis of an analysis of the state of climatic conditions, climate changes and challenges from them, the peculiarities of the manifestation of adverse weather conditions, and the comfort of climatic conditions for the population of Crimea, in particular:

1 - assessment of natural climatic conditions (taking into account the state of climatic conditions, seasonality and aridity);

2 - assessment of the degree of vulnerability of the territory to climate change (trends of changes in the annual and seasonal course of surface temperature and the amount of precipitation);

3 - assessment of the degree of comfort of climatic conditions for the population (based on the ratio of comfortable and uncomfortable weather conditions);

4 - assessment of the vulnerability of the territory to adverse weather conditions (repeatability of such phenomena as abnormal heat, heavy precipitation, strong winds, hail, etc.), as well as regarding the Mountainous Crimea, natural phenomena that are provoked by weather conditions (landslides, avalanches, landslides) were additionally considered.

Based on this analysis, a system of assessment in terms of indicators of the vulnerability of the territory based on climate criteria has been developed (*see Table 1.1*).

Table 1.1 Indicators of the vulnerability of the territory in terms of climate criteria (in points):

State of climatic conditions		Degree of vulnerability to climate change		Adverse weather conditions		Degree of comfort of climatic conditions for the population	
10-15	The Mountainous Crimea	–8÷–6	the most vulnerable	(–8 ÷ –6) 140–120 phenomena	the most vulnerable	5-9	uncomfortable conditions
16-20	The Steppe Crimea	–5÷–3	vulnerable	(–5 ÷ –3) 119–90 phenomena	vulnerable	10-15	sub-comfortable conditions
21-25	The South Coast	–2÷–1	less vulnerable	(–2 ÷ –1) 89–50 phenomena	less vulnerable	16-20	comfortable conditions
		0	slightly vulnerable	0–49 phenomena	slightly vulnerable		

1.1.1. Features of climatic conditions of the Crimean Peninsula and their assessment in terms of indicators

The climatic conditions on the peninsula have certain differences and therefore there are three climatic subzones (*see Fig. 1.1*) [1,2]:

- ***The Steppe Crimea:*** the climate is moderately continental steppe and coastal steppes. It is the driest on the Crimean Peninsula with hot, arid summers and short, dry winters with frequent thaws and very changeable weather (Gorczynski continentality index is 37 ± 5 [3]). The steppe zone covers 2/3 of the territory of the peninsula: it extends from the Black Sea lowland, Karkinit Bay and Sivash Bay – in the north to the Crimean Mountains – in the south, to the Black Sea – in the west, and to the Sivash Bay and the Kerch Peninsula – in the east. The average annual surface temperature in the plane (steppe) regions ranges from 9.7 to 11.5°C, in January, it is +1.0–3.0°C in the north of the steppe zone and up to +1.0...–1.0°C in the south of the steppe zone. In summer, the average temperature is about +22–24°C, daytime air temperature can reach +35–37°C in the shade, at night – up to +23–25°C. The annual amount of precipitation in the north-west and west, as well as in the coastal zone of the Kerch Peninsula is 340–370 mm; in the central part of the plain, their number increases to 430–450 mm.

- ***The Crimean Mountains:*** climate is moderately continental of foothill forest and steppe regions and mountainous forest regions. Climatic features are determined by the presence of mountain massifs (and therefore are determined by vertical zoning and depend on the height above sea level and exposure to slopes) and proximity to the Black Sea (the influence of breeze circulation). Summers are quite hot and dry, while winters are wet and mild. In summer, cloudbursts are observed, which cause mudflows and landslides (forest-steppe, forest and yaylin landscapes). The foothills have signs of a forest-steppe climate, which belongs to the semi-arid type with moderately hot and warm summers and rather mild (in the West) and less mild (in the central regions and in the East) winters. With altitude, the landscapes turn into forest and yaylin landscapes. The average annual temperature varies no more than 9.0–12.1°C, and the average monthly temperature in July is +21.0–2.5°C, in January – –1.2...+0.3°C. The annual amount of precipitation is 1000–2000 mm. Of these, 120–160 mm fall in summer, 105–125 in winter, and a little less in spring and autumn – 80–110 mm per season. The climate of the southern slopes of Crimean Mountains is subtropical Mediterranean.

- ***The South Coast:*** the climate is subtropical Mediterranean. According to climatic conditions, the South Coast is divided into two parts: the eastern part (from Alushta to Feodosia) and the western part (from Cape Aya to Alushta). The climate is arid, with hot summers and very mild winters. Climatic conditions in summer and autumn are formed under the influence of tropical masses of Atlantic origin, and in winter and spring – by air masses of temperate latitudes of marine and continental origin. Cyclonic activity in winter generates maximum precipitation. The average annual air temperature is 12–14°C, and the average monthly temperature in January is +1.3–2.9°C, in July – +23–24°C. But in some years, in winter in Alushta, the temperature drops to –18°C, in Sudak and Feodosia to –22, –25°C. The frost-free period lasts 235 days, the summer period – 142–147 days. The first minor frosts are observed in autumn, in the second half of November, and the last – in spring, at the end of March. During the year, about 272–425 mm of precipitation falls, less in the eastern part, more in the western part (and in the warm season, 210–225 mm of precipitation falls, in the cold – 130–200 mm of precipitation).

In general, for the plain part of Crimea, the average annual surface temperature is (12.4 ± 0.8)°C, the annual precipitation is (460 ± 124) mm/year.

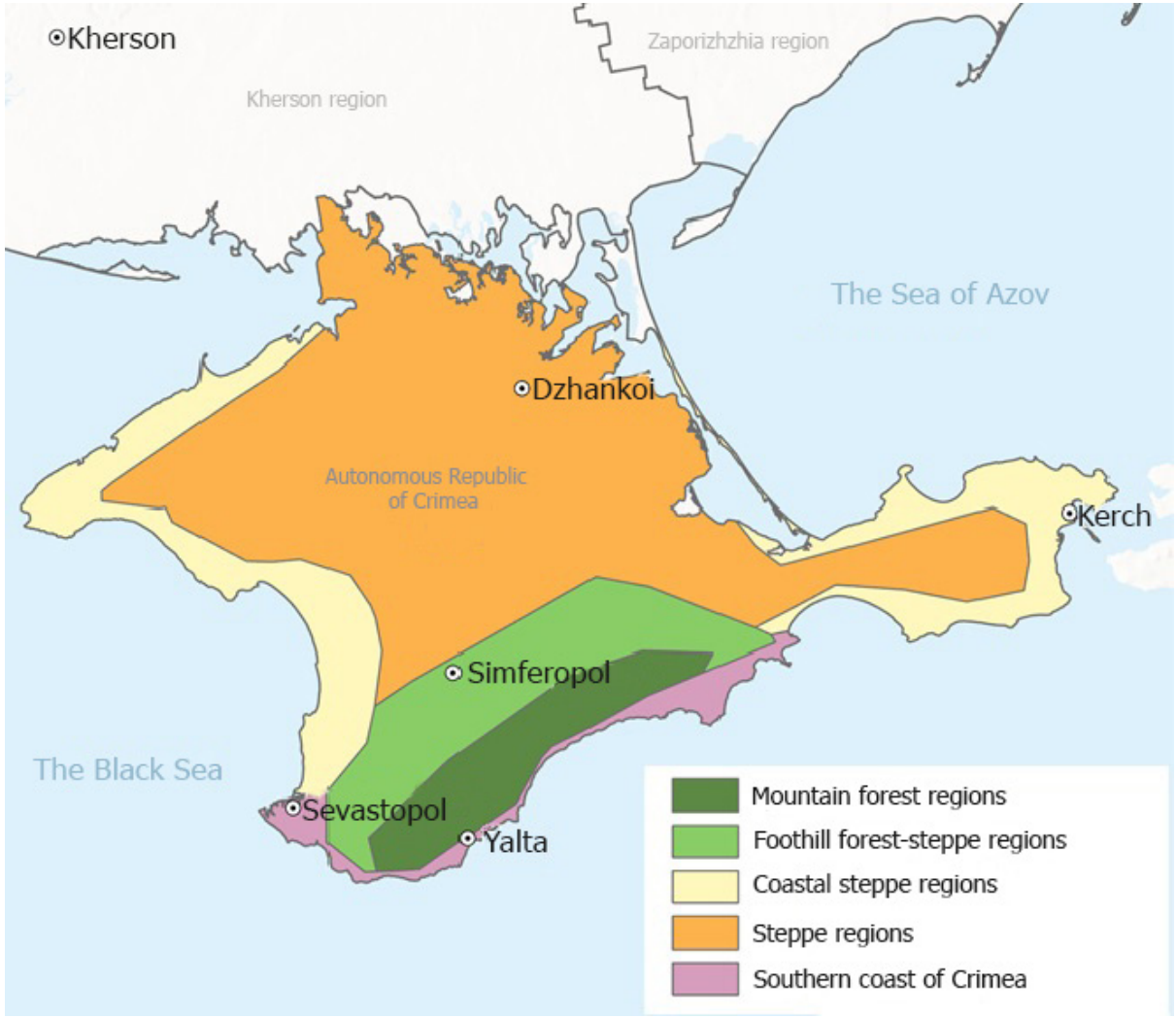

Fig. 1.1. Natural and climatic zones of the Crimean Peninsula

The values of surface air temperature and the sum of precipitation and trends for the periods 1961–1991 [4] and 1991–2020 [5] at weather stations located on the Crimean Peninsula, and trends of changes are presented *in Table 1.2.* It should be noted that according to the requirements of the WMO (World Meteorological Organization), it is necessary to use observation data for at least 30 years to assess climate change.

Table 1.2. Comparison of the climatic norm of the average annual surface air temperature and the annual amount of precipitation recorded at weather stations located on the Crimean Peninsula, and trends of changes for the periods 1961–1991 and 1991–2020.

Weather station	Surface Temperature, °C			Precipitation		
	1961-1990	1991-2020		1961-1990	1991-2020	
	<T>, °C	<T>, °C	T_{trn}, °C/10 years	<P>, мм/year	<P>, мм/year	P_{trn}, мм/10 years
Ai-Petri	5,7±0,6	6,5±1,0	+0,88	1080±260	990±257	–44
Dzhankoi	10,7±0,9	11,7±0,9	+0,84	417±79	405±128	–3
Kerch	11,0±0,8	11,9±1,0	+0,87	434±76	430±129	–61
Yevpatoria	11,5±0,8	12,6±0,9	+0,82	404±78	370±83	–26
Simferopol	10,6±0,8	11,4±0,9	+0,84	505±93	501±133	–22
Feodosia	11,9±0,8	12,8±0,8	+0,65	449±99	475±114	–47
Yalta	12,9±0,8	13,8±0,9	+0,83	628±164	591±144	–22

Assessment in terms of indicators of the state of climatic conditions of Crimea. Assessment of climatic conditions on the peninsula is carried out for three natural and climatic zones, taking into account seasonality and aridity (in conditional points) (*see Table 1.4*):

The Mountainous Crimea (10–15 points): the climate is moderately continental, with pronounced seasonality, vertical zoning, with a significant repetition of strong winds, windy, most of the year there is excessive humidity (annual precipitation is 1000–2000 mm), with certain differences depending on the height above sea level and the exposure of the slopes and proximity to the Black Sea. Summers are quite hot and dry (but with heavy rains), winters are wet and mild. The climate of the southern slopes

of the Crimean Mountains is subtropical Mediterranean. The temperate continental climate in foothill forest-steppe regions (13–15 points) and the climate in mountainous forest regions (10–12 points) have certain differences.

The Steppe Crimea (16–20 points): the climate is moderately continental, with pronounced seasonality. The driest region on the peninsula with hot, arid summers and short, low-snow winters with frequent thaws and very changeable weather (occupies 2/3 of the peninsula's territory). According to the humidification mode, we separately distinguish two regions (the northern and western parts and the central and eastern parts). The annual amount of precipitation in the north-west and West, as well as in the coastal zone of the Kerch Peninsula is 340–370 mm; in the central part of the plain, their number increases to 400–500 mm. ***The temperate continental steppe climate (16–18) and the climate of coastal steppes (19–20) have certain differences.***

The South Coast (21–25 points): the climate is subtropical Mediterranean with the influence of breeze circulation and less pronounced seasonality. According to climatic conditions, the South Coast is divided into two parts: the eastern part (from Alushta to Feodosia) and the western part (from Cape Aya to Alushta). The climate is arid, with hot summers and very mild winters. During the year, about 300–425 mm of precipitation falls, less in the eastern part, more in the western part.

1.1.2. Features of climate change on the Crimean Peninsula and their assessment in terms of indicators

The assessment of the vulnerability of the territory to climate change was based on an analysis of the trend of changes in the annual and seasonal course of surface temperature and the amount of precipitation.

During the period 1900–2021, the average air temperature on the peninsula increased by (0.8 ± 0.2)°C/100 years, while on the territory of mainland Ukraine, an increase in surface temperature was recorded in the range of 1.0–1.2°C/100 years [6]. During the period 1990–2021, warming significantly increased, for example, the air temperature on average increased by 0.7–0.8°C/10 years, but most of all warmed in mountainous regions by + 0.9°C/10 years (*see Fig. 1.2*).

In the seasonal course of surface air temperature in the territory of Crimea, a pronounced maximum is released in July +20.1–23.0°C (with a climatic norm of +19.2–21.5) and a minimum in January of +0.4–2.5 (with a climatic norm of –0.5...+2.4) (*see Fig. 1.3*). In some months, climate anomalies may occur in some years.

In the conditions of modern climate changes, certain trends of changes in the seasonal course have emerged, for example, the period 1990–2021 is characterized by a tendency to warm up throughout the year (in winter by 0.5–1.2°C/10 years, and in summer by 0.5–1.0°C/10 years). Consequently, the greatest warming occurred in the spring and summer months of the year.

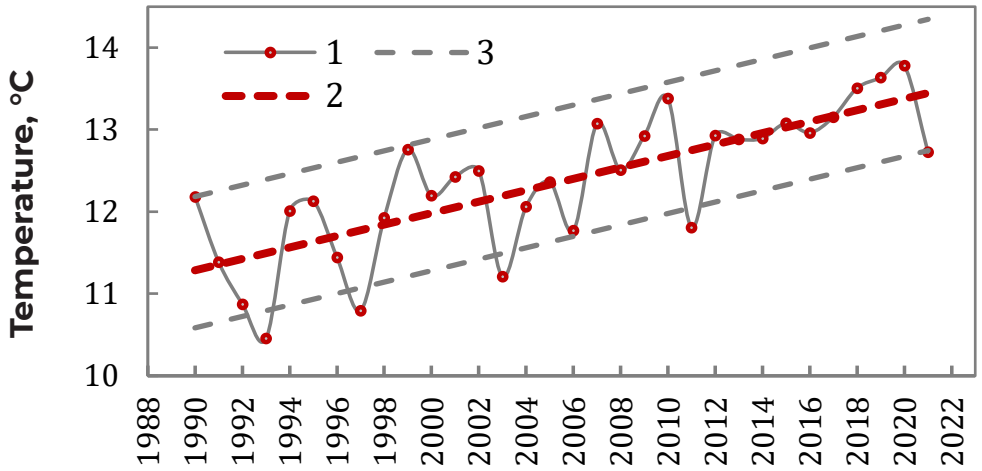

Fig. 1.2. The time course of the average annual surface air temperature is averaged over the territory of the plain Crimea (1: average series, 2: trend, 3: ±σ) for the period 1990–2021.

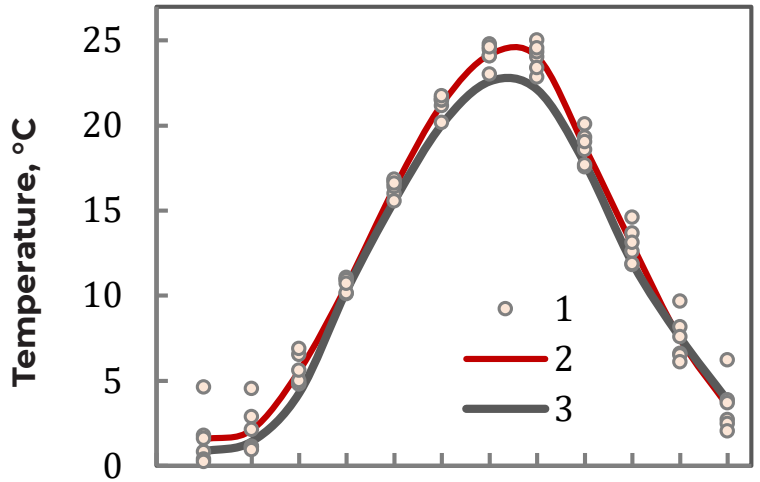

Fig. 1.3. Seasonal course of surface temperature averaged over the territory of the plane Crimea (1: data from Weather Stations, 2: average series for the period 1990–2021, 3: average series for the climatic norm for the period 1961–1991)

In the conditions of modern climate changes, certain trends of changes in the seasonal course have emerged, for example, the period 1990–2021 is characterized by a tendency to reduce the amount of precipitation during the year, especially in July – August (up to 15 %) and an increase only in December – January by 5–7 %.

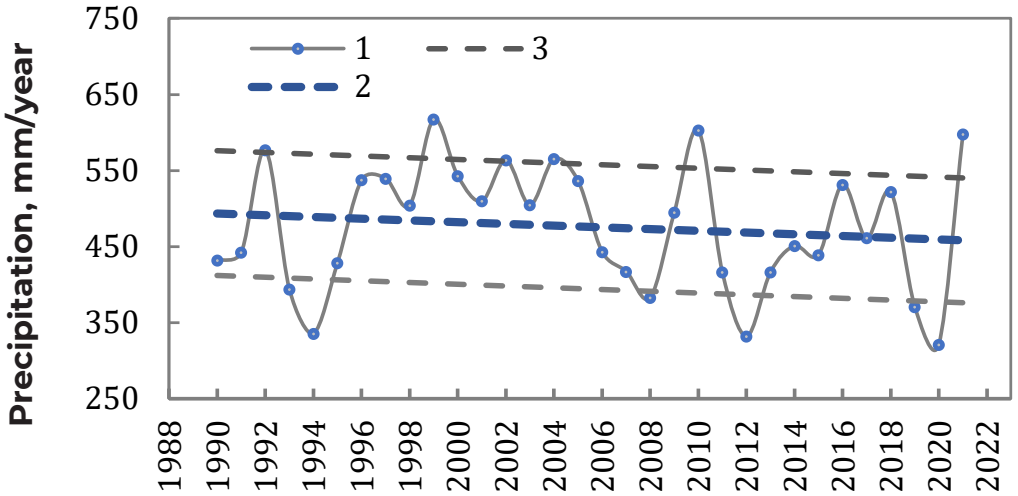

Fig. 1.4. The time course of the annual amount of precipitation averaged over the territory of the plane Crimea (1: average series, 2: trend, 3: ±σ) for the period 1990–2021.

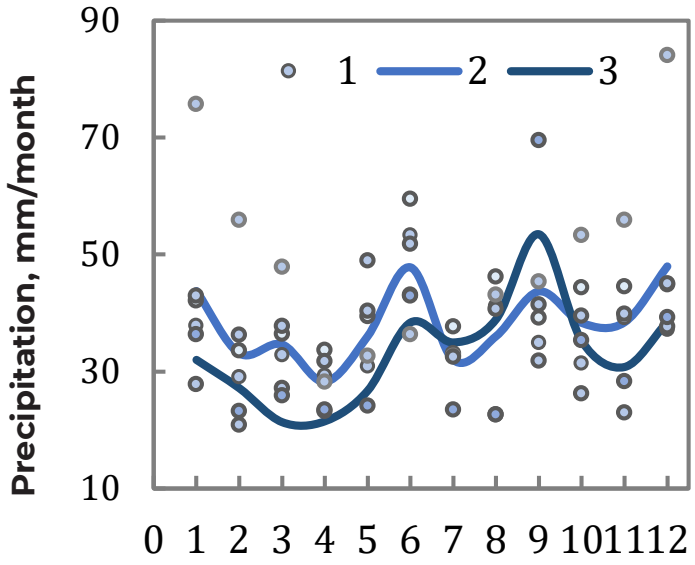

Fig. 1.5. Seasonal course of the sum of precipitation averaged over the territory of the plain Crimea (1: data from Weather Stations, 2: average series for the period 1990–2021, 3: average series for the climatic norm for the period 1961–1991)

On the peninsula in recent decades, there has been a decrease in the amount of precipitation by an average of 25–32 mm/10 years, or by 13–18 %, for the period 1990–2021 (***see Fig. 1.4***). In the seasonal distribution of the amount of precipitation in Crimea, there are three highs in December – January, May – June, and September – October, and two lows in February – April and July – August (***see Fig. 1.5***). In some months, climate anomalies may occur in some years.

Assessment in terms of indicators of climate change on the peninsula. Based on assessments of climate change on the peninsula identified the following indicators of vulnerability of the territory: ***the most vulnerable area (–8 ÷ –6), vulnerable territory – (–5 ÷ 3), less vulnerable (–2 ÷ –1)*** (*see Table 1.5*).

1.1.3. Assessment of the degree of comfort of climatic conditions for the population

The climatic conditions of the region have a direct and indirect impact on the health, comfort and well-being of people. Certain changes in comfortable thermal conditions are caused by changes in the climate of the region. A shift towards more comfortable climatic conditions is observed in winter. At the same time, in summer, a shift towards less comfortable climatic conditions was recorded due to the repetition of abnormally high temperatures and aridization. Rising temperatures and more frequent periods of extreme heat correlate with a significant increase in a number of diseases and deaths, especially among the elderly.

Bioclimatic indices are used to assess climatic comfortable conditions for humans. This study uses the equivalent-effective temperature index [7,8]. For temperate latitudes, comfortable thermal conditions for humans have the value IEET (16 ÷ 23), and sub-comfortable thermal conditions with values of (12 ÷ 16)°C can also be considered comfortable if the person is active [7–9]. For subtropical and Mediterranean climates, comfortable thermal conditions for humans can have greater values of IEET (18 ÷ 25). The largest number of days with comfortable weather conditions is typical for the south coast of the Black Sea – about 65–70, in steppe regions – 50–56, and in the mountainous regions – 40–45 days.

Using the comfort estimates of climatic conditions published in [9], indicator estimates of the comfort of climatic conditions on the peninsula were determined (***see Table 1.3***): ***the Mountainous Crimea (5–9)*** – uncomfortable conditions, ***the Steppe Crimea (10–15)*** – sub-comfortable conditions, ***the South Coast (16–20)*** – comfortable conditions.

Table 1.3. Indicator assessment of the degree of comfort of climatic conditions for the population of Crimea

Region	Degree of comfort of climatic conditions for the population (points)
The Mountainous Crimea	5–9 uncomfortable conditions
mountain forest regions	5-7
foothill forest-steppe regions	8-9
The Steppe Crimea	10–15 sub-comfortable conditions
steppe regions	10-12
coastal steppe regions	13-15
The South Coast of Crimea	16–20 comfortable conditions
Cities	
Simferopol	9
Sevastopol	16
Kerch	13
Yalta	20
Dzhankoi	10

1.1.4. Assessment of the vulnerability of the territory to adverse weather conditions

Climate changes in recent decades on the peninsula have become more noticeable due to an increase in the frequency of abnormally high summer temperatures (above 30°C), an intensification of evaporation, a decrease in precipitation, especially in the warm period of the year, with an increase in the frequency of heavy rains, as well as due to significant warming in winter and increased weather variability [1,10].

Adverse weather conditions (according to the frequency of such phenomena as abnormal heat, heavy precipitation (heavy rain), strong winds, hail, ground frost), as well as for the Mountainous Crimea, natural phenomena that are provoked by weather events (landslides, avalanches, landslides) were additionally considered, presented in Table 1 of the Annex.

To generalize the assessment of the repeatability of adverse weather conditions in relation to a given territory (*see Table 1.4*), conditional scores were determined depending on the average frequency of adverse events during the year: ***the most vulnerable region (–8 ÷ –6) – 140–120 phenomena, the vulnerable region (–5 ÷ –3) – 119–90 phenomena, the less vulnerable region (–2 ÷ –1) – 89–60 phenomena.***

Table 1.4. Frequency of adverse weather conditions in Crimea during 2014–2021

The Mountainous Crimea							The Steppe Crimea						The South Coast of Crimea					
Totally	Anomaly heat	Heavy rain	Strong winds	Hail	Ground frost	Landslides, avalanches, villages	Total	Anomaly heat	Heavy rain	Strong winds	Hail	Ground frost	In general	Anomaly heat	Heavy rain	Strong winds	Hail	Ground frost
122	12	49	36	4	10	11	117	12	55	38	9	3	78	14	32	26	3	3

1.1.5. General assessment of the vulnerability of different regions of Crimea according to climate criteria

To assess the vulnerability of the Crimean territory to climate change, an assessment system was developed and indicators of the territory's vulnerability based on climate criteria were proposed (*see Table 1.4*): ***most vulnerable region (0–19), vulnerable region (20–34), less vulnerable region (35–50).***

In Fig. 1.6, the spatial distribution of the degree of vulnerability of Crimean territory according to climatic criteria is presented.

So, the most vulnerable regions from a climatic point of view are the Crimean Mountains, the north of the steppe zone, and the coast of the seas due to challenges from climate change in conditions of significant anthropogenic load.

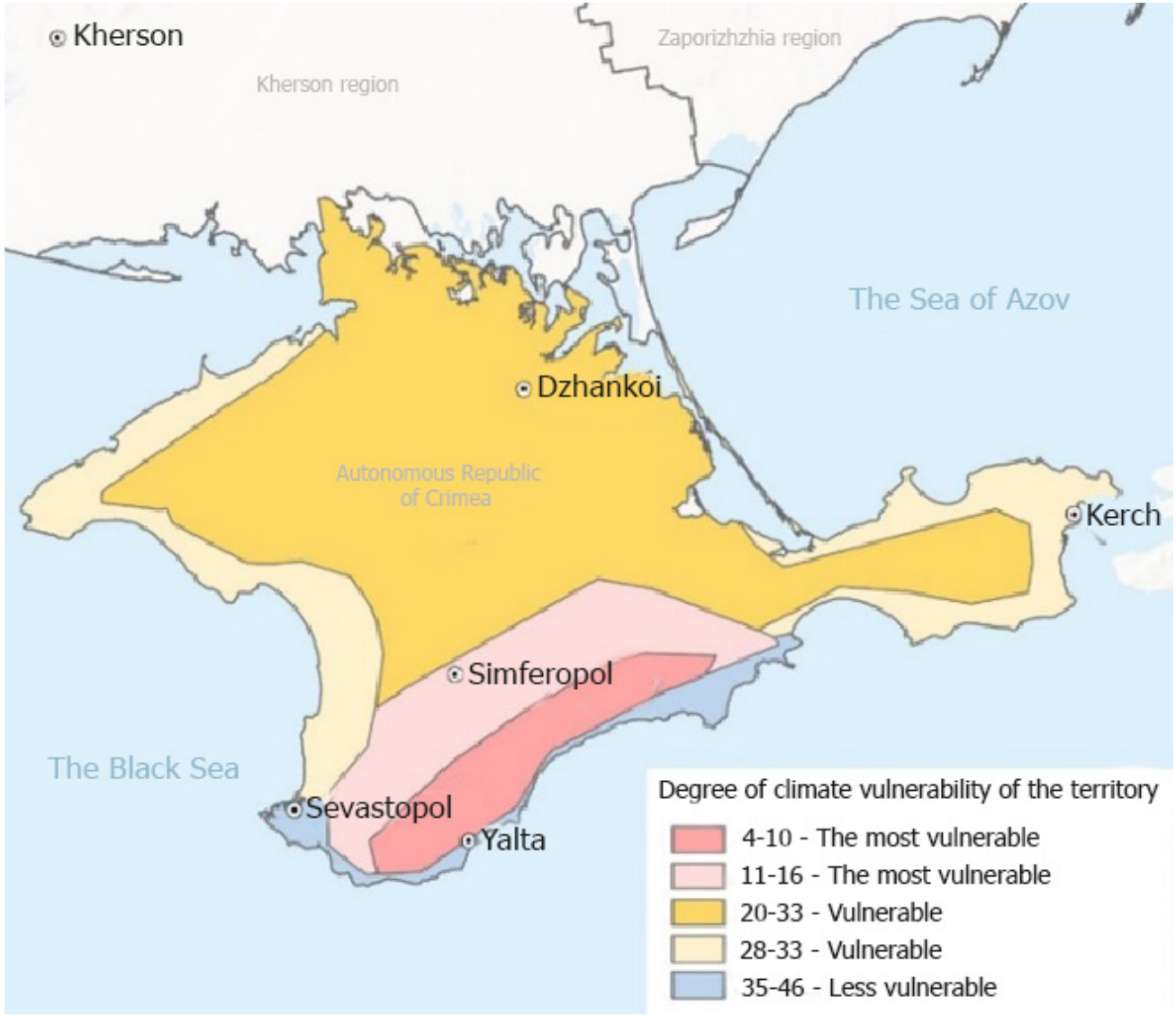

Fig. 1.6. Spatial distribution of degrees of vulnerability of the territory of Crimea according to climatic criteria

Table 1.5. Indicators of vulnerability of the Crimean regions by climate criteria (in points):

Region	Climate conditions	Degree of vulnerability to climate change			Adverse weather conditions							Degree of comfort of climatic conditions for the population	Degree of vulnerability of the region
		In general	Temperature	Precipitation	In general	Abnormal heat	Heavy rain	Strong winds	Hail	Ground frost	Landslides, avalanches,		
The Mountainous Crimea												5–9 uncomfortable conditions	most vulnerable
mountain forest	15-17	–8÷–7	++	↓	–8±–7	+	++	++	++	++	++	5–7	4–10
foothill forest steppe	17-19	–7÷–6	++	↓↓	–7±–6	+	++	++	++	+	+	8–9	11–16
The Steppe Crimea												10–15 sub-comfortable conditions	vulnerable
steppe	20-22	–5÷–4	++	↓↓	–5±–4	++	++	+	+	+		10–12	20–33
coastal steppes	23-24	–4÷–3	+	↓↓	–4±–3	++	++	+	+	+	+	13–15	28–33
The South Coast of Crimea	25-30	–4÷–3	+	↓	–3±–2	++	++	+	+	+	+	16–20 comfortable conditions	34–40 less vulnerable

–: decrease, +/–: changes within the normal range, +: minor changes, ++: significant changes

1.2. Assessment of the degree of vulnerability of the territory according to environmental criteria

To assess the vulnerability of the territory of Crimea according to environmental criteria an assessment system was developed and indicators of the territory's vulnerability were proposed (*see Table 1.6*). The environmental vulnerability of the territory was assessed in the following areas:

Table 1.6. Indicators of vulnerability of Crimean regions by environmental criteria

General environmental situation	Degree of availability of Water Resources	Fires	Sea level rise, coastal erosion and abrasion	Environmental impact from tourism	Environmental impact of military training grounds and units	General environmental status index	State of natural ecosystems
1	2	3	4	5	6	7	8
–11÷–15	*–11÷–15*	*–8÷–10*	*–9÷–12*	*–7±–9*	*–7±–9*	*–51±–70*	*–5÷0*
highly negative situation	highly negative situation	highly negative situation	highly negative situation	highly significant load	very significant impact	very negative	highly negative situation
–7÷–10	*–7÷–10*	*–4÷–7*	*–5÷–8*	*–4±–6*	*–4±–6*	*–31±–50*	*1÷5*
negative situation	negative situation	negative situation	negative situation	very significant load	significant impact	negative	negative situation
–1 ÷ –6	*–1 ÷ –6*	*–1 ÷ –3*	*–1 ÷ –4*	*–1 ± –3*	*–1 ± –3*	*–6–30*	*6 ÷ 10*
mediocre situation	mediocre situation	mediocre situation	mediocre situation	significant load	minor impact	moderate	mediocre situation
0 ÷ +5	*0 ÷ +5*	*0 ÷ +5*	*0 ÷ +5*	*0*	*0*	*0 ± 20*	*11 ÷ 15*
positive situation	positive situation	positive situation	positive situation	minor load	there is no impact	positive	positive situation

1.2.1. Assessment of the state of the environmental situation in Crimea

Based on the materials [14–21], the environmental situation in Crimea has been analyzed.

The main ecological and economic characteristics of various regions of Crimea are presented in Table 2 of the Annex.

The main danger to the environment of Crimean Peninsula is the activities of industrial and Agro-Industrial Enterprises, Housing and communal services, Motor Transport and the extractive industry.

The main environmental problems include: significant air pollution by major industrial enterprises, a significant amount of accumulated industrial waste, pollution of water resources due to the deterioration of water supply and sewerage networks and an increase in emissions of pollutants into the atmosphere by mobile sources.

Possible man-made emergencies that may affect the state of the region's environment include accidents at industrial enterprises, gas stations, gas filling stations, accidents on gas supply networks, gas distribution and electric power and life support systems.

So, for example, in Crimea, the main air pollutants are enterprises engaged in the production of chemicals and chemical products, which account for about 49 % of total emissions, in particular, enterprises engaged in land and pipeline transport – 5.4 %, mining – 16 %, construction – 7 %, providing electric energy, gas and steam – 4.8 %, collecting, processing and disposing of waste – 3–5 %, crop and animal husbandry – 1.5 % [14–21].

In the northern part of Crimea, the main sources of air emissions are chemical industry enterprises – the Armenian branch of titanium Investments LLC and PJSC Crimean soda plant. Various pollutants are released into the atmospheric air from the activities of production facilities, the main of which are nitrogen dioxide, sulfur dioxide, carbon monoxide and suspended solids. Specific substances that are released by chemical industry enterprises in the northern Crimea are sulfuric acid, hydrogen fluoride, hydrogen chloride, ammonia, formaldehyde, chlorine, bromine, etc.

The main type of water pollution is wastewater and industrial water pollution. The predominant water consumption (> 60–80 %) is typical for industrial needs, and the most acute water shortage is observed in the agricultural sector.

On the peninsula in recent years there has been a deterioration in the quality of drinking water due to:

- intensive water extraction from wells and non-compliance with the operating mode at individual water intakes;
- lack of water reserves in reservoirs due to the long dry period;

- lack of approved sanitary protection zones for centralized drinking water supply sources;
- large wear and tear of water supply networks, which leads to frequent emergencies;
- lack of decontamination plants and water aftertreatment units on water pipes.

The total amount of solid municipal waste generated as a result of the life of the population and business entities on the peninsula is more than 1157 thousand tons per year, and emissions of pollutants into the atmosphere from stationary sources are about 38,310 tons per year.

Emissions of pollutants into the atmosphere from stationary sources and the total amount of solid municipal waste in different regions of Crimea in 2020 are presented *in Table 1.7.* The largest environmental pollutants are Krasnoperekopsk, Saky, Simferopol, and Sevastopol regions.

Table 1.7. Emissions of pollutants into the atmosphere from stationary sources and the total amount of solid municipal waste in different regions of Crimea in 2020, tons/year [15]

Region	Emissions of pollutants into the atmosphere, tons/year	Total amount of municipal solid waste, thousand tons / year
Bilohirsk region (central part)	600	23
Bakhchysarai region (south-western part)	2400	33
Dzhankoi region (northern part)	2000	39
Kirovske region (eastern part)	360	18
Krasnohvardiiske region (central part)	800	31
Krasnoperekopsk region (northern part)	8000	41

Leninske region (eastern part)	2100	126
Nyzhnohirskyi region (north-eastern part)	150	16
Pervomaiske region (north-western part)	200	11
Rozdolne region (north-west)	450	10
Saky region (western part)	4100	147
Simferopol region (central part)	6800	82
Sovietskyi region (eastern part)	300	19
Chornomorske region (extreme west)	1200	9
Alushta region (south coast)	400	35
Sevastopol (south-western part)	7000	360
Sudak region (south-eastern part)	200	22
Feodosia region (east coast)	650	35
Yalta region (south coast)	600	100

To assess vulnerability to the amount of air pollution emissions and the amount of solid municipal waste in different regions of Crimea a system of assessment in terms of indicators was developed (*see Table 1.8*): extremely negative situation (–11 ÷ –15), negative situation (–7 ÷ –10), mediocre (–1 ÷ –6), positive (0 ÷ 5).

Table 1.8. Determination of the degree of vulnerability of the territory to environmental pollution in the territory of Crimea (in points)

Region	Emissions of pollutants into the atmosphere from stationary sources	Total amount of municipal solid waste	Overall
The Mountainous Crimea			
mountain forest	–1÷–2	–1÷–2	–2÷–4
foothill forest steppe	–2÷–3	–2÷–3	–4÷–6
The Steppe Crimea			
steppe	–4÷–5	–4÷–5	–8÷–10
coastal steppes	–5÷–6	–5÷–6	–10÷–12
The South Coast of Crimea	–2÷–3	–5÷–6	–7÷–9

1.2.2. Degree of water resources availability

The issue of water resources of the Crimean Peninsula is the instability of seasonal runoff, the loss and use of a large amount of water resources caused by natural and anthropogenic factors. The lack of water in Crimea has become a highly relevant issue in the last few years when water levels in a number of reservoirs have approached critical [22].

The Crimean authorities solve the problem of the lack of fresh water by [23]:

- desalination of marine and brackish groundwater (for example, a desalination plant has been built on the seashore in the village of Mykolaivka, it is expected to receive desalinated water up to 40 thousand cubic meters of water per day);
- use of underground water from wells in the plain part of the peninsula (for example, wells were drilled near Simferopol, which can produce up to 10 thousand met cubic meters of water per day, but the water is often brackish and needs additional treatment);
- increase in the amount of precipitation due to active influences on atmospheric processes (for example, in 2020, aviation works were carried out to artificially increase precipitation and increase the water content of the reservoir);
- construction of a permanent water pipeline from the Taihan reservoir in Bilohirsk district of Crimea to Simferopol, which can cause serious changes in natural ecosystems;

- use of submarine underground sources under the Black and Azov seas, for example, under the Sea of Azov there are fresh water reserves, according to preliminary estimates, about 0.5–1.2 billion m3. In July 2020, drilling of wells in the sea of Azov began, but it turned out that the water does not meet the chemical composition criteria for drinking water and it can be used for technical needs;

- large-scale collection of precipitation in the Mountainous Crimea (Marseille experience), using karst cavities as underground water storage facilities (underground reservoirs). But, according to experts, this can harm ecosystems and small rivers in mountainous and adjacent regions, most often located in wildlife sanctuaries.

The results of a regional analysis of satellite images revealed intensive drying of almost all major reservoirs of Crimean Peninsula. At the same time, the area of the water surface of reservoirs in 2020, compared to 2015, decreased by 45 %, and the area of the water mirror of lakes decreased by 25 % [22]. Estimates of the state of water bodies within Crimean Peninsula during 2015–2021 based on Sentinel-1 satellite radar data are presented *in Table 1.9.*

Table 1.9. Comparison of the area of the water mirror of Crimean reservoirs for 2015, 2020 and 2021 using Sentinel-1 radar satellite data [24]

№	Name of the reservoir	Reservoir water mirror area (ha)				Change in the area of the reservoir's water mirror in April 2021 (%) compared to:		Change in the area of the reservoir's water mirror in April 2022 (%) compared to:	
		average for 2015	as of April 2020	as of April 2021	as of April 2022	an average for 2015	April 2020	an average for 2015	April 2021
1.	Chornorichenske	453,0	426,5	356,7	493,3	–21	–16	8,9	38,3
2.	Bilohirsk	142,5	90,6	164,0	180,7	+15	+81	26,8	10,2
3.	Frontove	341,8	148,2	131,8	130,5	–61	–11	–61,8	–1,0
4.	Feodosiiske	177,0	145,0	124,0	163,3	–30	–14	–7,7	31,7
5.	Yuzmak	124,0	157,0	113,4	111,7	–9	–28	–9,9	–1,5
6.	Partyzanske	168,0	119,1	94,4	178,0	–44	–21	6,0	88,6
7.	Samarlynske	109,6	96,4	93,7	95,2	–15	–3	–13,1	1,6

8.	Simferopol	282,3	272,3	85,5	281,0	–70	–69	–0,5	228,7
9.	Zahorske	137,2	104,9	77,2	137,0	–44	–26	–0,1	77,5
10.	Schaslyvenske	48,0	43,6	46,5	52,0	–3	+7	8,3	11,8
11.	Taihanske	116,7	109,0	36,9	84,7	–68	–66	–27,4	129,5
12.	Izobilnenske	52,4	47,4	33,5	51,8	–36	–29	–1,1	54,6
13.	Aianske	28,2	26,0	30,0	32,9	+6	+15	16,7	9,7
14.	Mizhhirske	116,2	24,2	18,6	101,9	–84	–23	–12,3	447,8
15.	Starokrymske	20,8	28,0	15,0	13,5	–28	–46	–35,1	–10,0

Assessment in terms of indicators of the degree of provision of the territory with water resources on the peninsula. Depending on the availability of Water Resources in the region (drinking water of the population and fresh water for irrigation and for traditional farming), a ranking was carried out (in conditional points) (*see Table 1.10*): extremely negative situation (–11 ± –15), negative situation (–7 ± –10), mediocre (–1 ± –6), positive (0 ± 5).

Table 1.10. Determination of the degree of water supply in the region

Region	Provision of the territory with water resources (points)
The Mountainous Crimea	
mountain forest	–1÷–4
foothill forest steppe	–5÷–6
The Steppe Crimea	
steppe	–9÷–10
coastal steppes	–7÷–8
The South Coast of Crimea	–5÷6
Cities	

Simferopol	–10
Sevastopol	–6
Kerch	–8
Yalta	–6
Dzhankoi	–10

1.2.3. State of natural ecosystems

Satellite remote sensing materials, in addition to climate data, provide important spatiotemporal information for determining regional trends in the state of natural ecosystems. In particular, the normalized differential vegetation index (NDVI) [25] obtained from satellite images is widely used to monitor the photosynthetic capacity and primary vegetation productivity [26]. NDVI has a strong correlation with maximum temperature, potential evapotranspiration, and aridity. The positive trend of NDVI was noticeable in most of Ukraine and Crimea [27].

Climate change causes regional seasonal changes in temperature and precipitation [24]: the duration of the cold season has decreased, and the duration of the growing season has increased. The dynamics of NDVI in the region for the periods 1982–2021 are shown ***at Fig. 1.7.***

For the period 1982–2020, there is a positive trend in changing the NDVI values by 0.0015 units. for a year. The increase in NDVI values by 2000 indicates a positive impact of rising temperatures on ecosystem productivity. The integral increase in NDVI values obviously has two reasons – the lengthening of the growing season and the growth of more comfortable conditions for vegetation (temperature increase and growth 2) [28].

The spatiotemporal distribution of NDVI averaged over the growing season (April-October) in Crimea for the period 1982–2020, and the difference in NDVI for the periods 1982–2000 and 2001–2020 are shown ***at Fig. 1.8.***

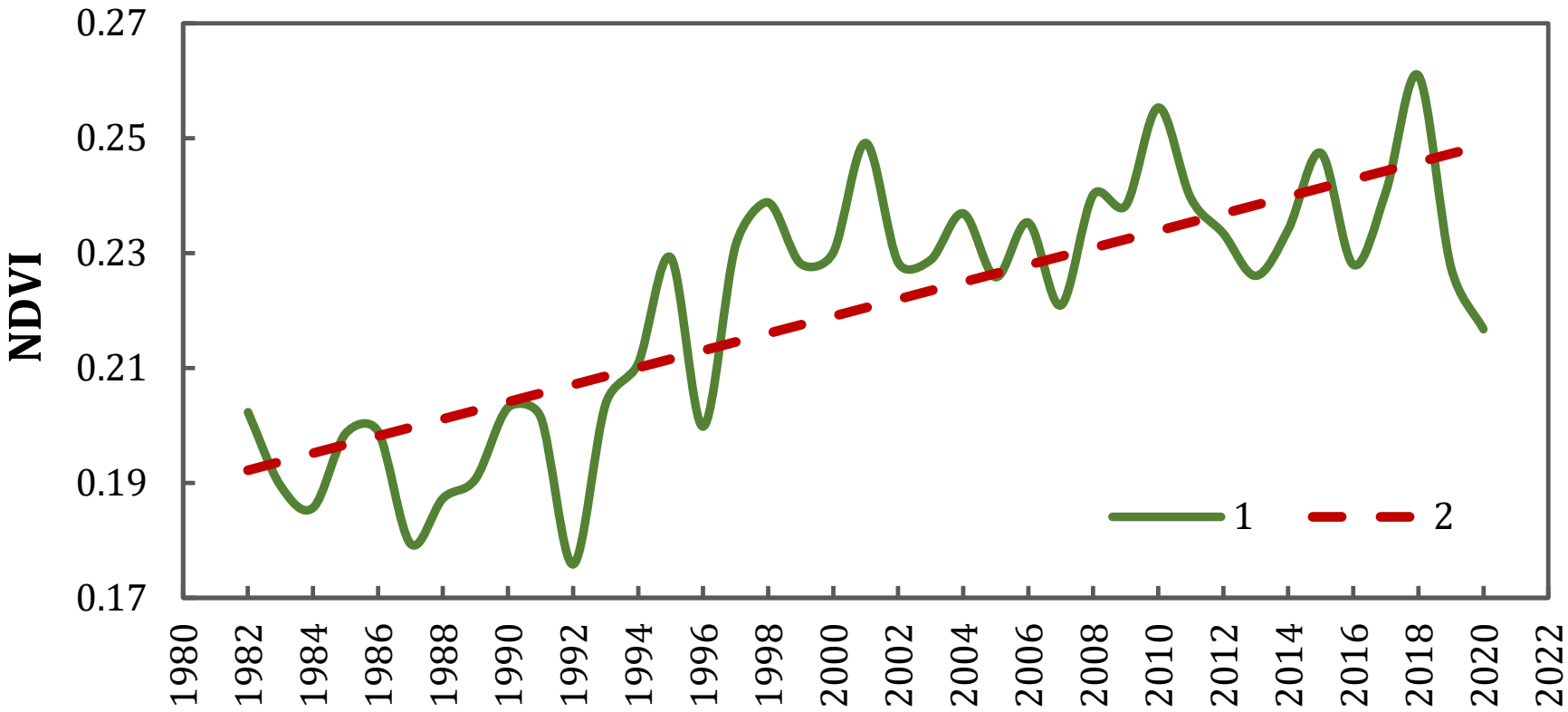

Fig. 1.7. Dynamics of NDVI values (1), averaged over the growing season (April – October) from satellite images in Crimea for the period 1982–2020, and linear trend (2). Original data obtained from NOAA AVHRR datasets [25].

As can be seen from this figure, the last 20 years are characterized by a decrease in ecosystem productivity due to the aridization of climatic conditions during the growing season and an increase in the frequency of abnormally high temperatures in summer.

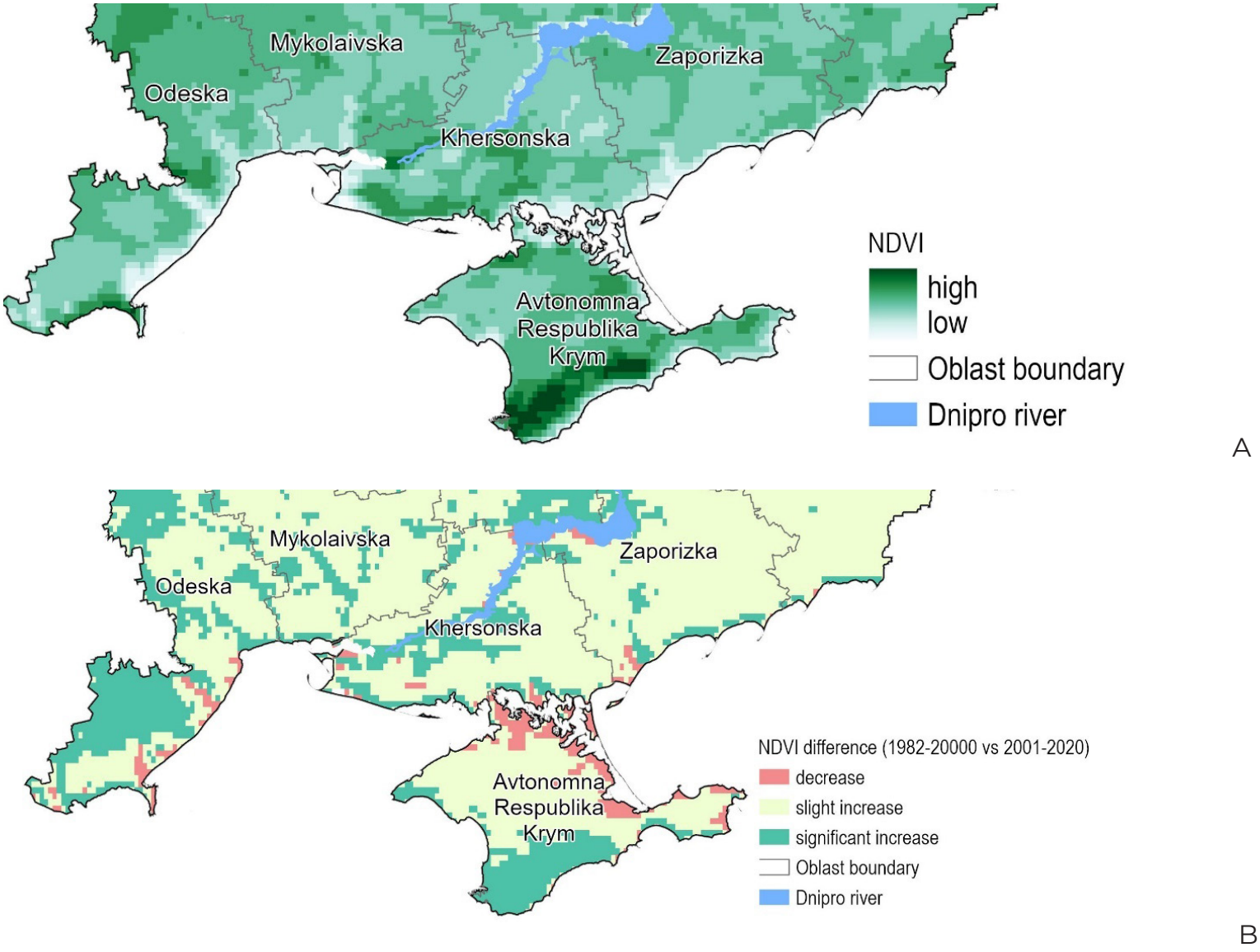

Fig. 1.8. Spatiotemporal distribution of NDVI averaged over the growing season (April – October) in Crimea for the period 1982–2020 (A), and the difference NDVI for the periods 1982–2000 and 2001–2020 (B).

Assessment in terms of indicators of changes in ecosystem productivity in the context of climate change on the peninsula. Depending on changes in ecosystem productivity (NDVI) in the context of climate change on the peninsula, ranking (in conditional points)was carried out (*see Table 1.11*): ***extremely negative situation (–5 ÷ 0), negative (1 ÷ 5), mediocre (6 ÷ 10), positive (11 ÷ 15).***

Table 1.11. Indicators of changes in ecosystem performance

Region	Indicators of changes in ecosystem performance (points)
The Mountainous Crimea	
mountain forest areas	10÷13
foothill forest-steppe regions	11÷15
The Steppe Crimea	
steppe regions	5÷7
coastal steppe regions	6÷10
The South Coast of Crimea	11÷15

1.2.4. Rising sea levels, coastal erosion and abrasion

Since the second half of the 19th century, the level of the Black and Azov Seas has risen by 20÷3 cm/100 years due to climate change, which corresponds to the rate of increase in the level of the world's oceans [29–32]. According to the scenarios (RCP4.5 – (ΔT ~2.0°C), the sea level will rise to 25–35 cm by 2050 [32]. Modern climate changes, rising levels of the Black and Azov seas in the conditions of increasing man-made load on the environment (household, agriculture, tourism, transport, industry) have caused a number of negative phenomena and processes, namely [29–32]:

- increased processes of abrasion, erosion, flooding of coastal and sea braids. For example, out of 820 km of the Azov coast of Ukraine, 480–500 km of the coast collapses;
- changes in the characteristics of seawater (a decrease in the salinity of water by 2–3 %) and the level of water transparency by more than 2 times (up to 2–8 m), expansion of hypoxia zones. For example, in the Black Sea – from 3 to 40 thousand

km^2, increased the area of sea flowering zones several times;

- degradation of biological species (reduction of the population of crustaceans, bottom fish and planktonic, reduction of marine mammals by almost 20 times);
- an increase in the number of single-celled organisms and jellyfish, as well as harmful exotic organisms;
- increased fish mortality (mass death of terrestrial biocenoses over significant areas over the past 20 years, losses of terrestrial fauna have reached 60 million tons, including fish – about 3 million tons);
- the decline in fish catch in the Black and Azov Seas has decreased 5 times over the past 10 years;
- reduction of total river runoff in the seas (by 5–7 % over 100 years in the study of over-regulation of runoff).

Trends in changes in the environment of the black and Azov Sea coasts have certain consequences for economic activity (deterioration of the sanitary and epidemiological state, decrease in the quality of recreational resources) and the origin of the threat to public health.

When assessing the vulnerability of various regions of Crimea to sea level rise, erosion and Coast abrasion, the following assessment in terms of indicators were determined: (***see Table 1.12***): extremely negative situation (–9 ÷ –12), negative situation (–5 ÷ –8), mediocre (–1 ÷ –4), positive (0 ÷ 5).

Table 1.12. Indicators of vulnerability of the territory to rising sea levels, erosion and abrasion of the coast (points)

Region	Vulnerability of the territory to rising sea levels, erosion and abrasion of the coast
The Mountainous Crimea	
mountain forest	0
foothill forest steppe	–1
The Steppe Crimea	
steppe	0
coastal steppes	–3 ÷–2
The South Coast of Crimea	–3 ÷–4

1.2.5. Fires recorded in forest districts of Crimean Peninsula

The total area of forests in Crimea is 237.6 thousand hectares. The forest cover of Crimea is 10.7 %. Forests are located mainly in the southern mountainous part of the peninsula. The rest is assigned to the plain part. The breed composition of forests is related to the climatic and soil conditions of the regions. In the forests of Crimea, the predominant species are: low – trunked oak – 108.3 thousand hectares (58.3 %), pine – 28.1 thousand hectares (15.1 %), beech – 26.2 thousand hectares (14.1 %), hornbeam – 10.2 thousand hectares (5.5 %) of the land area covered with woody vegetation. The rest of the breed accounts for 7 %.

The main factors determining the dynamics and fire hazard situation are the humidification regime of the territory at the beginning of the fire season (starting from mid-July and lasting until mid-October) and the volume of snow reserves and the level of anthropogenic load (63–94 % of fires are caused by anthropogenic factors). The peaks of fire-prone seasons, as a rule, coincide with periods of intensive agricultural work and mass departure of tourist groups. Increased fire danger in forests is also created by the presence of a network of highways, bases and Recreation camps, and mass visits to forests by the population, etc. Summary data on the situation with forests on the territory of Crimean Peninsula are presented in Table 1.13.

During 2015–2020, about 559 cases of fires with a total coverage area of 225 hectares were recorded in the territory of forest districts of Crimean Peninsula (*see Table 1.13 and Table 1.14*) [14–20]. The highest frequency of fires in forest districts was recorded in Simferopol and Starokrymske forestry districts and on the territory of Yalta wildlife sanctuary.

Table 1.13. Summary data on the situation with forests on the territory of the Crimean Peninsula for the period 2015–2020

Indicator	2015	2016	2017	2018	2019	2020
Lost forest stands, ha			6	118	146	25
of them from forest fires			6	116	118	19
Number of forest fires, thous.	54	63	82	79	69	64
Forest area covered by fires, thousand hectares	58,5	46,0	495,2	121,0	484,6	90,3
Forest stands burned down, m^3			41	1623	24 744	3458
Reforestation, ha	45	13	39	5	7,7	57,5
in particular, artificial (creation of forest crops)	17	8	39	5	2	57,5
Area of foci of harmful organisms at the end of the reporting year, thousand hectares	5,0	10,3	5,7	5,8	2,1	

Table 1.14. The number of cases and areas of fires recorded in forest districts of Crimean Peninsula during 2015–2020

№	Item name	2015		2016		2017		2018		2019		2020		Total number of cases	Environment area, ha
		Cases	Area, ha	Cases	Area, ha	Cases	Area	Cases	Area, ha	Cases	Area, ha	Cases	Area		
1	Alushta Forestry Department	7	5.6	2	0.0	6	1.0	9	18.8	9	1.8	9	0.3	42	4.6
2	Bakhchysarai Forestry Department	4	3.0	7	4.1	2	0.0	8	2.8	8	0.4	8	37.4	37	8.0
3	Bilohirsk Forestry Department	8	31.5	0	0.0	2	0.2	1	0.0	1	197.5	0	0.0	12	38.2
4	Dzhankoi Forestry Department	1	0.1	0	0.0	0	0.0	0	0.0	1	0.7	0	0.0	2	0.1
5	Yevpatoria Forestry Department	7	1.8	12	18.5	11	4.2	17	17.2	13	12.8	0	0.0	60	9.1
6	Kuibyshev Forestry Department	3	0.9	4	0.7	1	0.3	0	0.0	2	0.7	7	4.5	17	1.2
7	Rozdolne Forestry	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
8	Simferopol Forestry Department	15	3.7	27	18.9	36	5.5	19	1.9	12	220.7	11	17.0	120	44.6
9	Starokrymske Forestry Department	8	11.5	10	3.6	21	91.6	24	79.7	16	41.9	24	19.2	103	41.3
10	Sudak Forestry Department	1	0.4	1	0.0	3	392	1	0.5	7	8.1	4	11.6	17	68.8
11	Yalta wildlife sanctuary	27	2.8	19	1.4	14	1.7	21	3.3	15	4.0	26	9.8	122	3.8
12	Crimean wildlife sanctuary	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	12	1.7	13	0.3
13	Karadah wildlife sanctuary	–	–	–	–	–	–	–	–	–	–	2	1.2	2	1.2
Totally in Crimea		**81**	**61.3**	**82**	**47.4**	**96**	**497.0**	**102**	**151.3**	**85**	**488.7**	**103**	**102.7**	**549**	**224.7**

When assessing the vulnerability of various regions of Crimea as a result of fires, the following assessment in terms of indicators were determined: (*see Fig. 1.1*5): extremely negative situation (–8 ± –10) – 100 or more cases, negative situation (–4 ± –7) – 99–50 cases, mediocre (–1 ± –3) – 49–0 cases, positive situation (0–5) – almost no fires.

Table 1.15. Indicators of regional vulnerability to fires (points)

Region	Vulnerability of the territory to fires
The Mountainous Crimea	
mountain forest	–2÷–4
foothill forest steppe	–3÷–8
The Steppe Crimea	
steppe	–3÷–5
coastal steppes	–2÷–4
The South Coast of Crimea	–2÷–4

1.2.6. Availability of military training grounds and units and their impact on the environment

During the annexation, Crimea became a territory with a high level of militarization. The Steppe Crimea is almost not used for military purposes, even for training purposes. At the same time, according to Russian sources and reports of Ukrainian NGOs, it is noted that the vast majority of regular exercises take place on the territory of the Kerch Peninsula, where 55,000 hectares are actually involved in military activity, these are the Opuk and Chauda ranges, as well as in the north of the peninsula – the Baherove training ground (information about the operation of the Starokrymske military training area, which was supposed to be involved in military exercises before the end of 2021, is not yet available [33]). In general, the concentration of landfills on the Kerch Peninsula is the largest in Crimea (landfills occupy 1/6 of the peninsula). The city of Kerch is also actively used in military activities, in particular, as part of the control of navigation through the Kerch Strait.

The Mountainous Crimea is used to a lesser extent, except for Russian air defense systems and complexes in Crimea.

Among the major cities of Crimea, Sevastopol is totally militarized as a naval base of the Black Sea fleet of the Russian Federation, as the location of senior structures of units of the armed forces of the Russian Federation, the FSB, the Ministry of emergency

situations, Roshvardiia, and other law enforcement agencies, and the place of residence of commanders and senior personnel.

The South Coast of Crimea is almost not used for exercises due to the high density of buildings, in particular by leading figures in politics, business and law enforcement agencies of the Russian Federation, while the use of the coastal territories of Crimea for military purposes has not stopped.

However, it is the firing from ships and watercraft of the Black Sea fleet of the Russian Federation that occurs in the direction of the Kerch Peninsula, and not the South Coast of Crimea. The administrative center of Crimea – the city of Simferopol – is now the location of several military units, but exercises are not conducted in the city, and training does not have a significant territorial coverage and is concentrated within the location of military units (information about the location of military units and the specifics of conducting military exercises was summarized in sufficient detail in the study of the NGO KrymSOS "Research "On the Environment of Crimea: Changes and Losses During the Occupation" Part II. Environmental Pollution and Depletion of Natural Resources") [34].

The creation of military training grounds and periodic exercises deprives the population of the opportunity to use the territory and carry out traditional economic activities, as well as leads to regional and local environmental pollution, which negatively affects the health of the population and the unique fauna and flora of the peninsula.

The Steppe Crimea has a significant load of training grounds and deployment of military units, especially on the territory of the Kerch Peninsula. The main active landfills are located on the territory of the steppe part of Crimea. The destruction of vegetation cover, the animal component of ecosystems, and soil degradation in landfills are almost continuous.

The Mountainous Crimea is represented by bases (or separate complexes) of air defense (air defense) and radar surveillance systems, these objects do not have a special environmental danger. There are no landfills on the territory of the Mountainous Crimea, so this area has low conditional scores on environmental risks.

The South Coast of Crimea is less involved in military activities and activities, but the territory of the coast around Feodosia (port facilities) is used for moving military equipment, equipment, personnel, and dual-use goods due to the availability of logistics conditions.

Individual cities of Crimea are involved in military activities in a very diverse way, there are no identical conditions and functions. The most militarized cities are Sevastopol and Kerch (the latter has a powerful air defense system and a logistics hub tied to the port and the Crimean Bridge). Especially noted is Yevpatoria, which has several training grounds for the Marine Corps, a repair base for military aviation and the Nytka test site (ground-based Aviation Training Complex) [34], which is now used to train military pilots in a training mode. The city of Dzhankoi is now a center of concentration of ground forces and a logistics

hub for motorized brigades and formations of the Russian armed forces, but no armed forces training or weapons testing is conducted directly around Dzhankoi.

When assessing the vulnerability of various regions of Crimea as a result of militarization, the following assessments in terms of indicators were identified: (*see Table 1.16*): availability of military units (depending on the scale) – (–5 ÷ –10) points, availability of training grounds – (–1 ÷ –5). Taking into account the military load on this region, the levels of environmental pollution from the militarization of the peninsula were determined: (–7 ÷ –9) – very significant impact, (–4 ÷ –6) – significant impact, (–1 ÷ –3) – insignificant impact, no impact – 0.

Table 1.16. Determination of the degree of presence of military training grounds and units and the level of environmental impact as a result of the militarization of the peninsula (points)

Region	Availability of military training grounds and units	The level of environmental impact resulting from the militarization of the peninsula
The Mountainous Crimea		
mountain forest	–2÷–1	–2÷–1
foothill forest steppe	–3÷–2	–3÷–2
The Steppe Crimea		
steppe	–5÷–4	–5÷–6
coastal steppes	–4÷–3	–4÷–5
The South Coast of Crimea	–3÷–2	–3÷–2
Cities		
Simferopol	–3	–3
Sevastopol	–9	–9
Kerch	–8	–8
Yalta	–1	–1
Dzhankoi	–4	–4
Yevpatoria	–6	–6

1.2.7. Intensification of tourism on the peninsula and its impact on the environment

The intensity of tourism in Crimea is determined by natural and climatic conditions, the availability of places for recreation and the state of tourist infrastructure, as well as the potential opportunity to take on vacation a certain number of recreants, both organized and individual, that is, without reference to a specific institution. As a rule, such vacationers focus on friendly housing and food offers and actually make the greatest contribution to the well-being of households. It should be noted that according to the ratio of macroeconomic indicators similar in natural and climatic conditions in Crimea and the Krasnodar Territory (Russian Federation), it can be concluded that, despite almost 1.5 trillion rubles. from 2014 to 2019, the economy grew by about 2.9 %, and macroeconomic indicators per capita are 5 times less than in the Krasnodar Territory [35]. This means that the main part of the tourist economy of the peninsula is located in the "gray zone" (that is, it is not fully recorded by state statistics).

If we trace the territorial organization of tourist and recreational activities in Crimea, we can distinguish several key areas. West Crimean, represented by Yevpatoria and Saky, and the area around these places. It is this part of Crimean coast that is located in the steppe zone, as well as the Kerch Peninsula, which still has a very attractive Azov Coast for tourist development (for example, the city of Shcholkino and the Kazantip Peninsula). The intensity of tourism can be defined as seasonal and medium intensity (compared to greater Yalta). Therefore, taking into account the greatest potential for tourism development in these areas, the expert assessment of tourism intensity on a 10–point scale is –7 ÷ –8. The Mountainous Crimea is represented by a much lower level of development, most routes are proactive in nature and are rather sluggishly provided with infrastructure (there are separate tourist complexes in Bakhchysarai and Sokolyne), so the expert assessment of tourism intensity on a 10–point scale is –3 ÷ –4. The South Coast of Crimea, especially the area of Greater Yalta, which includes almost 30 administrative units of local level (settlements), with a huge tourist infrastructure, places of organized and unorganized Recreation, where the seasonal population is several times higher than the permanent composition, has high indicators of tourism intensity on a 10–point scale equal to –8 ÷ –9.

Individual cities are represented in tourist activity heterogeneously. They have correspondingly different tourist potential and opportunities for its development. In addition, some of the recreational natural resources of Crimea constantly suffer from their predatory assimilation and sometimes destruction, despite the protests of local activists [36]. The lowest potential is typical for the administrative center of Crimea – the city of Simferopol. Just as unattractive for tourist activities is the city of Dzhankoi, which is characterized by a rather low tourist potential. Practically located in the steppe part of Crimea, focused on the development of industry and processing of agricultural products, the city of Dzhankoi was not a center of tourist attraction and tourist services. Almost the same can be said about the city of Kerch, which mainly performed industrial and port functions, and the few recreation centers along the Kerch Strait did not attract non-local tourists. Kerch had practically no tourist component, and this explains the specialization of the city, the state of Natural Resources and water quality in the Kerch Strait. The city of Sevastopol developed more harmoniously. The combination of administrative, military and Recreation

functions was typical for the city for many years, but the vast majority of tourists used Sevastopol to travel towards greater Yalta or the western coast of Crimea. Therefore, according to the intensity of tourism within the 10-point scale, the city of Sevastopol can be estimated at –7 ÷ –8 points. Of course, the maximum indicators will be Yalta, which is practically the center of tourist attraction of the entire Crimea, where tourist services, a variety of landscapes, a large selection of recreation and treatment options are combined. Therefore, it has the maximum value of the tourism intensity indicator.

When assessing the vulnerability of various regions of Crimea as a result of the burden on the environment from tourism, the following assessments in terms of indicators were determined: (*see Table 1.17*): very significant load (–7 ÷ –9), significant load (–4 ÷ –6), minor load (–1 ÷ –3), no load – 0.

Table 1.17. Determination of the degree of intensification of tourism on the peninsula (points)

Region	Level of environmental impact from tourism
The Mountainous Crimea	
mountain forest	–2÷–1
foothill forest steppe	–3÷–2
The Steppe Crimea	
steppe	–5÷–4
coastal steppes	–8÷–6
South Coast of Crimea	–9÷–10
Cities	
Simferopol	–4
Sevastopol	–9
Kerch	–7
Yalta	–9
Dzhankoi	–3
Yevpatoria	–8

1.2.8. Overall assessment in terms of indicators of the environmental vulnerability of the territory of Crimea

According to the developed indicators of the vulnerability of the territory in terms of the intensity of natural, environmental and social processes, which have been analyzed above, an overall assessment of the vulnerability of Crimean regions was carried out according to the environmental criteria presented in *Table 1.18.* The overall index of the ecological state of the region was assessed on a scale: very negative (–51 ± –70), negative (–31 ± –50), mediocre (–6–30), positive (0 ± 20).

Table 1.18. Indicators of territory vulnerability by environmental criteria:

Region	General environmental situation	Degree of availability of Water Resources	Fires	Sea level rise, coastal erosion and abrasion	Level of environmental impact from tourism	Level of environmental impact from militarization	General environmental status index
The Mountainous Crimea (less vulnerable region)							
mountain forest	–4÷–2	–4÷–1	–4÷–2	0	–2÷–1	–2÷–1	–16÷–7
foothill forest steppe	–6÷–4	–6÷–5	–8÷–3	–1	–3÷–2	–3÷–2	–27÷–16
The Steppe Crimea (vulnerable region)							
steppe	–10÷–8	–10÷–9	–5÷–3	0	–5÷–4	–5÷–4	–35÷–28
coastal steppes	–12÷–10	–8÷–7	–4÷–2	–3÷–2	–8÷–6	–8÷–6	–43÷–33
The South Coast of Crimea (vulnerable region)	–9÷–7	–6÷–5	–4÷–2	–4÷–3	–10÷–9	–10÷–9	–43÷–35

In Fig. 1.8 the spatial distribution of degrees of environmental vulnerability of the territory of Crimea is presented.

So, an extremely negative ecological situation is typical for the coastal steppe region (and the northern steppe), negative – for the steppe regions and the south coast of the Black Sea, for mountainous regions the ecological situation is mediocre.

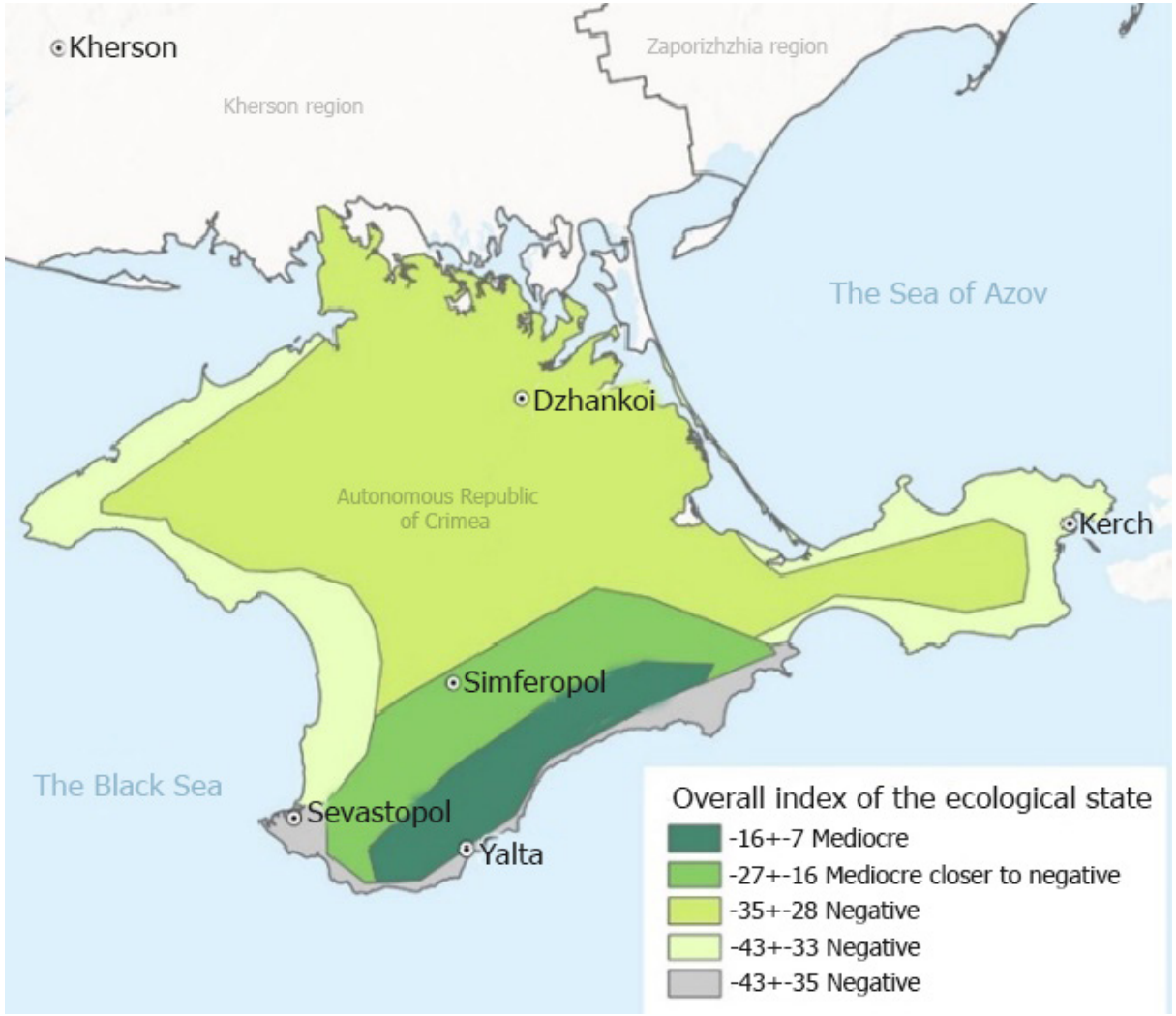

Fig. 1.8. Spatial distribution of degrees of ecological vulnerability of the territory of Crimea

CHAPTER 2. PREREQUISITES FOR INTERNAL AND/OR EXTERNAL MIGRATIONS CAUSED BY CLIMATE CHANGE, DIFFICULT ENVIRONMENTAL SITUATION AND AS A RESULT OF ENVIRONMENTAL AND CLIMATE DISCRIMINATION

2.1. Assessment of migration processes in Crimea

The analysis and forecast assessment of the migration situation in Crimea was carried out in the context of four enlarged regions of the peninsula: the Steppe Crimea, the Mountainous Crimea, the Black Sea coast, the coast of the Sea of Azov, as well as five cities (Simferopol, Sevastopol, Kerch, Yalta, Dzhankoi), each of which is considered separately.

The implementation of zoning of the territory of Crimea in the context of migration research is associated with a number of problems. Since information on the course of social and demographic processes, in particular information on Population migration, is published at the level of administrative entities, it is impossible to analyze and predict the situation in the context of physical and geographical regions. Therefore, the enlarged regions of Crimea in this study are considered as groups of administrative districts and city councils in accordance with the administrative-territorial structure of Ukraine, which was in force before entry into force in July 2020 of the Resolution of the Verkhovna Rada of Ukraine "On the Formation and Liquidation of Districts" [37]. The occupation administration of the Russian Federation has left this administrative-territorial structure unchanged (if you do not take into account changes in terminology, for example, instead of the concept of "City Council," the occupation authorities use the term "City district"), that is, statistical data (in particular on migration movements) have been collected since 2014 within the same territorial units as before.

However, almost all administrative districts of Crimea include the territories of two physical and geographical zones. Moreover, Nyzhniohirskyi district covers mountainous and steppe territories and the coast of the Sea of Azov, while the Krasnoperekopsk district is located in the steppe zone and is washed by the waters of two seas. The proposed zoning is based on two principles:

- assigning each administrative district to a particular enlarged region, based on which physical and geographical conditions (mountain, steppe, or coastal) have the greatest impact on the life of the district's population;
- avoiding territorial separation of selected enlarged regions.

Based on the above, the following grouping of administrative districts is considered optimal:

The Steppe Crimea: Krasnoperekopsk district, Krasnoperekopsky City Council, Armiansk City Council, Rozdolne district, Pervomaiske district, Krasnohvardiiske district.

The Mountainous Crimea: Bakhchysarai district, Simferopol district, Bilohirsk district, Alushta City Council, Sudak City Council, Feodosia City Council

The Black Sea coast: Chornomorske district, Saky district, Saky City Council, Yevpatoria City Council.

Coast of the Sea of Azov: Dzhankoi district, Nyzhnohirskyi district, Sovietskyi district, Kirovske district, Leninske district.

Cities: Simferopol City Council, Sevastopol City Council, Kerch City Council, Yalta City Council, Dzhankoi City Council.

The dynamics of arrivals in different regions of Crimea and leavings during the period 2014–2021 are presented *in Table 2.1. and Table 2.2.*

The cities of Simferopol, Kerch and Yalta receive the largest number of migrants.

Table 2.1. Dynamics of the number of arrivals in various urban districts and municipal districts in the territory of Crimea during the period 2014–2021, all flows [38]

Territory / Year	2014	2015	2016	2017	2018	2019	2020	2021
Urban districts								
Simferopol	3944	9492	11 883	9451	8848	9477	7564	8578
Alushta	953	2038	1483	1793	1596	1866	1916	1726
Armiansk	278	404	476	420	651	652	1013	1093
Dzhankoi	460	1092	741	876	664	640	1081	870
Yevpatoria	2034	2242	2171	3050	3304	3181	3786	3477
Kerch	2677	4010	3899	4294	4761	5068	5384	4090
Krasnoperekopsk	357	304	226	248	330	397	741	645
Saky	411	477	317	488	580	636	750	800
Sudak	814	434	661	656	627	401	516	558
Feodosia	1625	2029	1876	2667	2916	2909	3639	3853
Yalta	2733	4916	4678	3420	3831	3754	4424	4048

Municipal districts								
Bakhchysarai	481	1001	885	822	1045	2124	2066	1969
Bilohirsk	362	870	1136	1262	1306	1603	1718	1651
Dzhankoi	519	512	304	526	686	801	1098	894
Kirovske district	547	1015	664	1149	1267	1534	1618	1473
Krasnohvardiiske	816	2591	2200	2055	2113	2176	2621	2313
Krasnoperekopsk	199	242	195	186	350	357	778	687
Leninske district	496	760	643	824	941	1016	1029	723
Nyzhnohirskyi	289	689	685	466	661	920	1005	931
Pervomaiske	292	226	218	189	188	368	872	641
Rozdolne	421	636	618	679	722	820	1248	1201
Saky	966	1095	1135	1678	1741	2280	2796	2791
Simferopol	1806	4910	4295	4998	4453	4844	6467	6931
Sovietskyi	332	390	234	421	501	581	664	642
Chornomorske	349	508	409	800	790	886	1255	1306
Republic of Crimea	24 161	42 883	42 032	43 418	44 872	49 291	56 049	53 891

Table 2.2. Dynamics of the number of people who left different regions of Crimea during the period 2014–2021, all flows [39]

Territory / **Year**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Urban districts								
Simferopol	2250	5253	6203	8036	8938	8686	9857	7658
Alushta	263	717	861	981	974	1040	1076	1045
Armiansk	90	369	430	521	774	681	859	846

Dzhankoi	123	571	747	633	716	715	946	1032
Yevpatoria	351	1792	1820	1958	1932	2127	2405	2304
Kerch	346	1809	2087	2337	3278	3397	3300	3380
Krasnoperekopsk	144	417	448	412	469	492	596	515
Saky	126	403	413	418	469	488	639	536
Sudak	118	400	488	497	552	602	575	656
Feodosia	398	1648	1597	1906	2121	2169	2590	2061
Yalta	496	1696	2066	2412	2962	3165	3310	2958
Municipal districts								
Bakhchysarai	240	1248	1313	1527	1656	1464	1562	1853
Bilohirsk	205	732	994	1193	1310	1404	1740	1319
Dzhankoi	207	978	1018	1056	1130	1042	1118	1084
Kirovske district	187	641	775	801	948	1279	1522	1277
Krasnohvardiiske	280	1310	1817	2003	2316	2204	2257	1969
Krasnoperekopsk	104	341	386	393	425	453	792	708
Leninske district	338	1072	1103	1185	1184	1145	1239	1219
Nyzhnohirskyi	156	640	736	782	814	731	750	798
Pervomaiske	162	417	508	519	581	599	802	689
Rozdolne	112	491	662	708	802	936	997	923
Saky	313	1087	1316	1195	1381	1333	2031	1799
Simferopol	472	1648	2105	2599	3160	3341	3620	3645
Sovietskyi	170	435	477	529	591	682	792	652
Chornomorske	121	471	571	541	608	632	734	622
Republic of Crimea	7772	26 586	30 941	35 142	40 091	40 807	46 109	41 548

On Fig. 2.1 the number of people who arrived in the cities and territories of Crimea and left the peninsula for the period 2014–2021 is presented. As you can see, over the past seven years, the number of people who arrived in different regions of the peninsula was about 357 thousand people (on average, about 44.6 thousand people arrived annually), and the number of people who left was 269 thousand people (on average, 4.4 thousand people left annually).

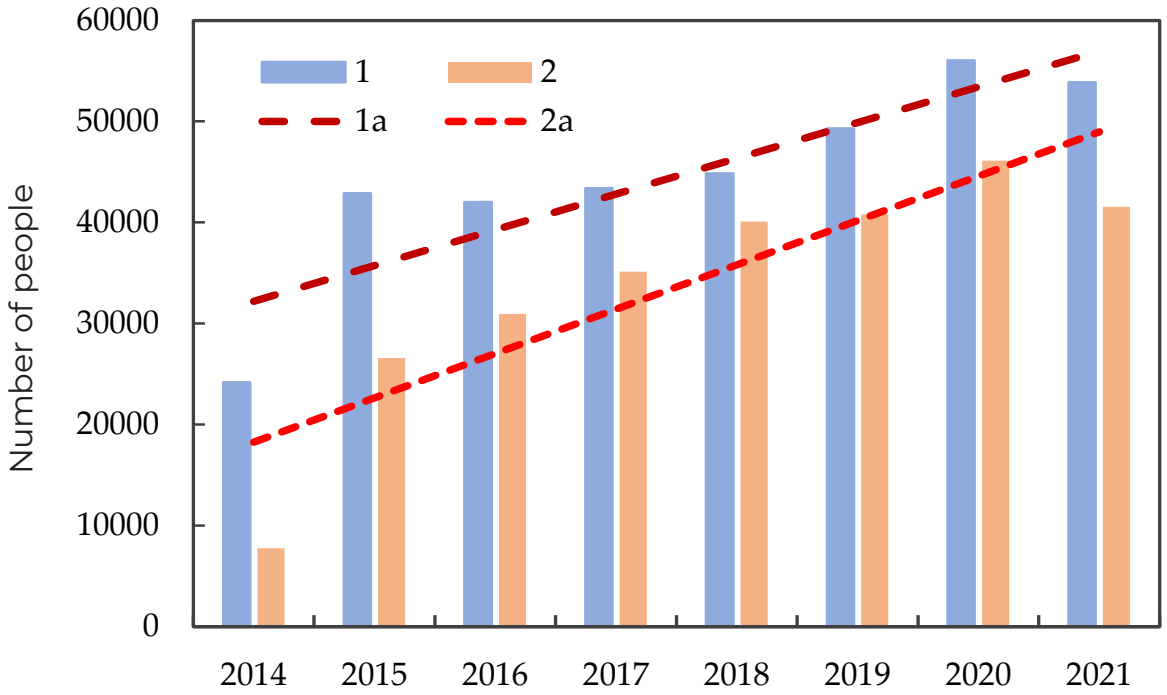

Fig. 2.1. Number of people who arrived in different regions of Crimea (1) and left (2) for the period 2014–2021 (1A and 2A – trend, people for the year)

2.2. Forecast assessment of migration processes in Crimea

The main recipient regions in the forecast period will be Simferopol, Sevastopol, and Yalta (in intra-Crimean migrations – also Kerch). The greatest migration losses will be suffered by the Steppe Crimea and the coast of the sea of Azov.

According to the terms of reference, the prospective volumes of migrations associated with changing the official place of residence, that is, de-registration in one locality and registration in another (so-called stationary migration), and forced (permanent/long-term and short-term) migrations associated with negative environmental and climatic phenomena are separately estimated.

The forecast period covers years starting from the current year (2022) and ending with 2035. In accordance with the established rules of demographic forecasting, the duration of the forecast period must be equal to or less than the duration of the base (analytical) period. Since the forecast period covers 14 years, the start of the base period should be at least 2008. However, a special feature of the retrospective analysis of the migration situation in Crimea is the presence of two sub-periods during which the territory of the peninsula was controlled by different states (until 2014 and since 2014). Therefore, it was considered appropriate to rely on the equality of the duration of the two components of the base period. Since the second sub-period lasts 8 years at the time of the forecast assessment, 2006 was chosen as the beginning of the first sub-period (and the base period as a whole).

The forecast assessment of migration scales is based on an analysis of the progress of the process during 2006–2013, its transformations in 2014–2021, taking into account the extrapolation of existing trends and expert assessments of possible prospective changes (*see Table 2.1 and Table 2.2*).

The directions of future stationary migrations within Crimea and to/from mainland Ukraine were determined based on the peculiarities of migration relations of the population of different regions of Crimea and the general patterns of modern population migrations. The results of the forecast estimate of the number of arrivals and leavings in the regions and cities of Crimean Peninsula in total for the period 2022–2035, as well as possible migration directions, are presented in lines 1–4 of Tables 2.3 and 2.4.

At the same time, it should be taken into account that this forecast was developed before the start of the Ukrainian-Russian war and was considered as likely if Crimea is returned peacefully to Ukrainian control or Russian control over the peninsula is maintained in the absence of any armed conflicts in Crimea and neighboring territories.

The new conditions make significant adjustments to the course of migration processes. There was a forced migration of residents of the Kherson region and other regions of mainland Ukraine to the western regions of the country and abroad, according to

media reports, there are facts of departure from Crimea of families of Russian security forces, as well as persons who settled on the peninsula after the Russian occupation [40]. On the other hand, many employees of Russian law enforcement agencies come to the temporarily occupied territories, in particular cities and districts of the Kherson region.

Future trends in population migrations in Crimea depend on difficult-to-predict factors: the further course of the Ukrainian-Russian war, the presence/absence of hostilities on the territory of the peninsula, the general economic situation in the country and the speed of restoration of infrastructure and housing stock after its completion, the intensity of the return of Ukrainian refugees from other countries, etc. After the end of the war and the beginning of the recovery of the Ukrainian economy, this forecast should be revised.

The threat of flows of forced displacement of the population due to environmental and climatic problems for Crimea is more than real. In particular, coastal areas may face flooding due to rising sea levels, droughts and the spread of fires are likely in the steppes, and there is a real danger of heavy downpours in the mountains and foothills. Such phenomena encourage people to change their place of residence – both for a short time (until the situation normalizes), and irrevocably.

According to Rosstat, almost 2.5 million people lived in Crimea (along with Sevastopol) at the beginning of 2021. It is clear that the emergence of conditions under which the entire (or almost all) population of Crimea will be forced to change their place of residence is unlikely. Moreover, different types of disasters are unlikely to occur simultaneously, covering the entire peninsula.

To assess the potential for departure as an analog, we can take the current intensity of departure of the population from areas of active hostilities (according to local administrations, the volume of forced departure reaches half of the pre – war population), as well as the movement of residents from uncontrolled (as of February 23, 2022) areas of Donbass during the first phase of the war (2014–2021) - in general, almost a third of the population left the occupied territories, after reducing the intensity of the conflict, the number of IDPs (excluding the so-called “pension tourists”) halved.

According to the monitoring of IDPs, which is carried out by the IOM representative office in Ukraine [41], 30–40 % of the real number of Internally Displaced Persons have completely abandoned the idea of returning to their previous place of residence.

Table 2.3. Determination of the scale and directions of migration flows, the estimated number of people and social groups in the territory of Crimea

№	Indicator	The Steppe Crimea	The Mountainous Crimea	Black Sea coast	Coast of the Sea of Azov	Cities (Simferopol, Sevastopol, Kerch, Yalta, Dzhankoi)
1.	Scale of internal migration (arrivals/leavings, thousand people)	25/32	55/52	24/24	20/32	137/121
2.	Directions of internal migration (leaving)	Cities, the Mountainous Crimea	Cities, Black Sea coast	Cities	Cities, the Mountainous Crimea	Cities
3.	Directions of external migration (disposal)	Southern regions of Ukraine	Metropolises of Ukraine and Russia	Southern regions and metropolises of Ukraine	Southern regions of Ukraine, metropolises of Ukraine and Russia	Neighboring regions and metropolises of Ukraine and Russia with Crimea
4.	Scale of external migration to the territory of Ukraine	5/6	12/10	7/6	5/6	28/25
5.	Influx of displaced persons from other territories, thousand people:a) for permanent residence;b) for a short stay	2-3 20-30	8-12 100-150	4-6 40-60	2-3 24-35	29-41 251-375
6	Social groups of displaced persons: a) working-age population; b) retirees	Reduced share of the working-age population (up to 50 %), increased share of retirees (over 30 %)	Reduced share of the working-age population (up to 50 %), increased share of retirees (over 30 %)	Reduced share of the working-age population (up to 50 %), increased share of retirees (over 30 %)	Reduced share of the working-age population (up to 50 %), increased share of retirees (over 30 %)	Reduced share of the working-age population (up to 50 %), increased share of retirees (over 30 %)
7	Gender groups of the displaced population: a) women; b) men	Noticeable advantage of women (more than 60 %)	Noticeable advantage of women (more than 60 %)	Noticeable advantage of women (more than 60 %)	Noticeable advantage of women (more than 60 %)	Noticeable advantage of women (more than 60 %)

Table 2.4. Determining the scale and directions of migration flows in the cities of Crimea

№	Indicator	Cities					
		Simferopol	Sevastopol	Kerch	Yalta	Dzhankoi	Total
1.	Scale of internal migration (arrivals/ leavings, thousand people)	52/54	53/44	13/9	16/10	3/4	137/121
2.	Directions of internal migration (leaving)	Sevastopol, Yalta	Yalta, Kerch, Simferopol	Sevastopol, Yalta	Sevastopol, Simferopol	Simfero-pol,Black Sea coast	Cities
3.	Directions of ex-ternal migration (disposal)	Metropolises of Ukraine and Russia	Metropolises of Russia	Azov-Black Sea regions and metropo-lises of Russia	Metropolises of Russia	Southern regions of Ukraine, me-tropolises of Ukraine and Russia	Neighboring regions and metropolises of Ukraine and Russia with Crimea
4.	Scale of external migration to the territory of Ukraine	8/9	11/7	3/3	5/4	1/2	28/25
5.	Influx of displaced persons from other territories, thousand people: a) for permanent residence; b) for a short stay	7-10 100-150	12-16 100-150	3-5 20-30	6-8 24-35	1-2 7-10	29-41 251-375

6	Social groups of displaced persons: a) working-age population; b) retirees	Reduced share of the working-age population (up to 50 %), increased share of retirees (over 30 %)	Reduced share of the working-age population (up to 50 %), increased share of retirees (over 30 %)	Reduced share of the working-age population (up to 50 %), increased share of retirees (over 30 %)	Reduced share of the working-age population (up to 50 %), increased share of retirees (over 30 %)	Reduced share of the working-age population (up to 50 %), increased share of retirees (over 30 %)	Reduced share of the working-age population (up to 50 %), increased share of retirees (over 30 %)
7	Gender groups of the displaced population: a) women; b) men	Noticeable advantage of women (more than 60 %)	Noticeable advantage of women (more than 60 %)	Noticeable advantage of women (more than 60 %)	Noticeable advantage of women (more than 60 %)	Noticeable advantage of women (more than 60 %)	Noticeable advantage of women (more than 60 %)

Based on the above, the potential for forced resettlement of people (both modern residents and future ones – born and arrived over the next 14 years) due to unfavorable ecological and climatic conditions during the late 2020s – early 2030s can be estimated at 0.9–1.3 million people, of which 150–200 thousand people will be displaced for permanent residence.

Short – term forced migrants will mainly concentrate in other regions of Crimea (most intensively-in the Mountainous Crimea and in cities), among permanent migrants, the share of those who have left for the regions of mainland Ukraine will be higher, and the role of the Kherson region in accepting permanent climate migrants will be less than in accommodating short-term ones. As the distance of movement increases, the share of able-bodied persons and men among displaced persons will increase.

Consequently, resettlement to the Kherson region and especially to other regions of mainland Ukraine will become more family-friendly than intra-Crimean movements. Significant differences in the age and gender structure of displaced persons in different regions of Crimea are not expected to be observed.

It is clear that the parameters of forced displacement will also be influenced by military factors, but unfortunately it is impossible to quantify this impact.

The results of the forecast assessment of climate migrations within Crimea are presented in lines 5–7 of Tables 2.3, 2.4, and migrations to mainland Ukraine – ***in Table 2.5.***

The study of the impact of IDPs on local markets (transport, medical and educational services, food and non-food products, Labor, Housing) showed that the threshold value at which the impact of IDPs on the functioning of markets becomes noticeable is 2 % of the permanent population [42].

Table 2.5. Analysis of the scale and consequences for the southern regions of Ukraine as a result of possible climatic migration of the Crimean population

№	Indicator	Kherson region	Other regions of Ukraine
1	Influx of displaced persons from other territories, thousand people: a) for permanent residence; b) for a short stay	50-65 170-250	55-70 145-200
2	Social groups of displaced persons: a) working-age population; b) retirees	The age structure common for the population of Crimea – the share of the working-age population is 50–55 %, and the share of retirees is 27–30 %	A higher share of the working-age population (over 55 %), a lower share of retirees (up to 25 %)
3	Gender groups of the displaced population: a) women; b) men	A slightly larger number of women (55–57 %)	Nominally larger number of women (52–54 %)

The expected number of permanent climate refugees in the Kherson region is several times higher than this threshold, that is, their resettlement in the region can limit the population's access to employment, goods and services and, accordingly, increase social tension, especially in certain areas and communities.

On Fig. 2.2 and Fig. 2.3 the scale and directions of possible internal and external population migrations provoked by the ecological and climatic situation in Crimea are presented.

So, the main recipient regions in the forecast period will be the cities of Simferopol, Sevastopol, and Yalta (migrations inside Crimea – also Kerch). The greatest migration losses will be suffered by the Steppe Crimea and the coast of the sea of Azov.

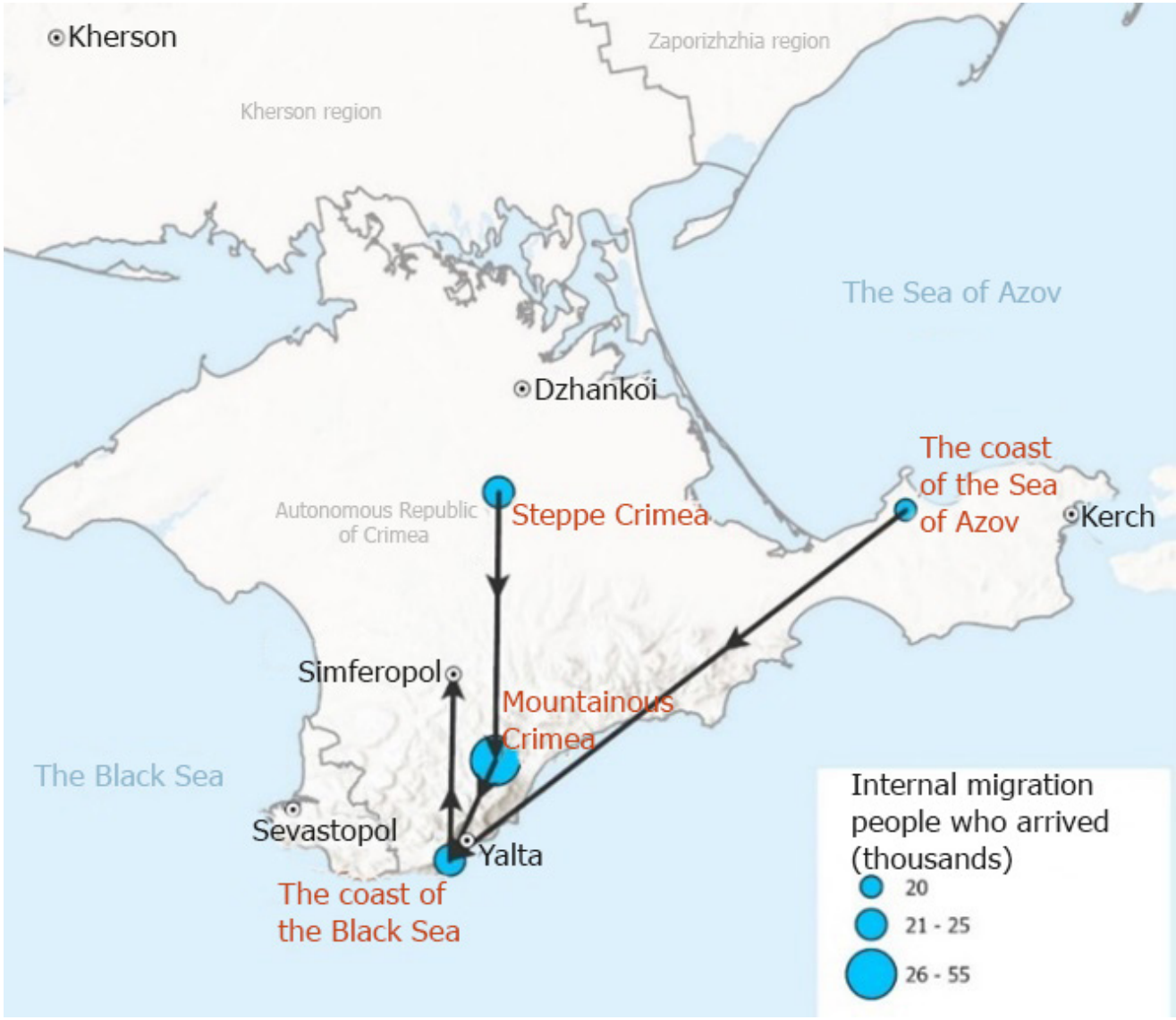

Fig. 2.2. The scale and direction of possible internal migration of the population, provoked by the ecological and climatic situation in Crimea

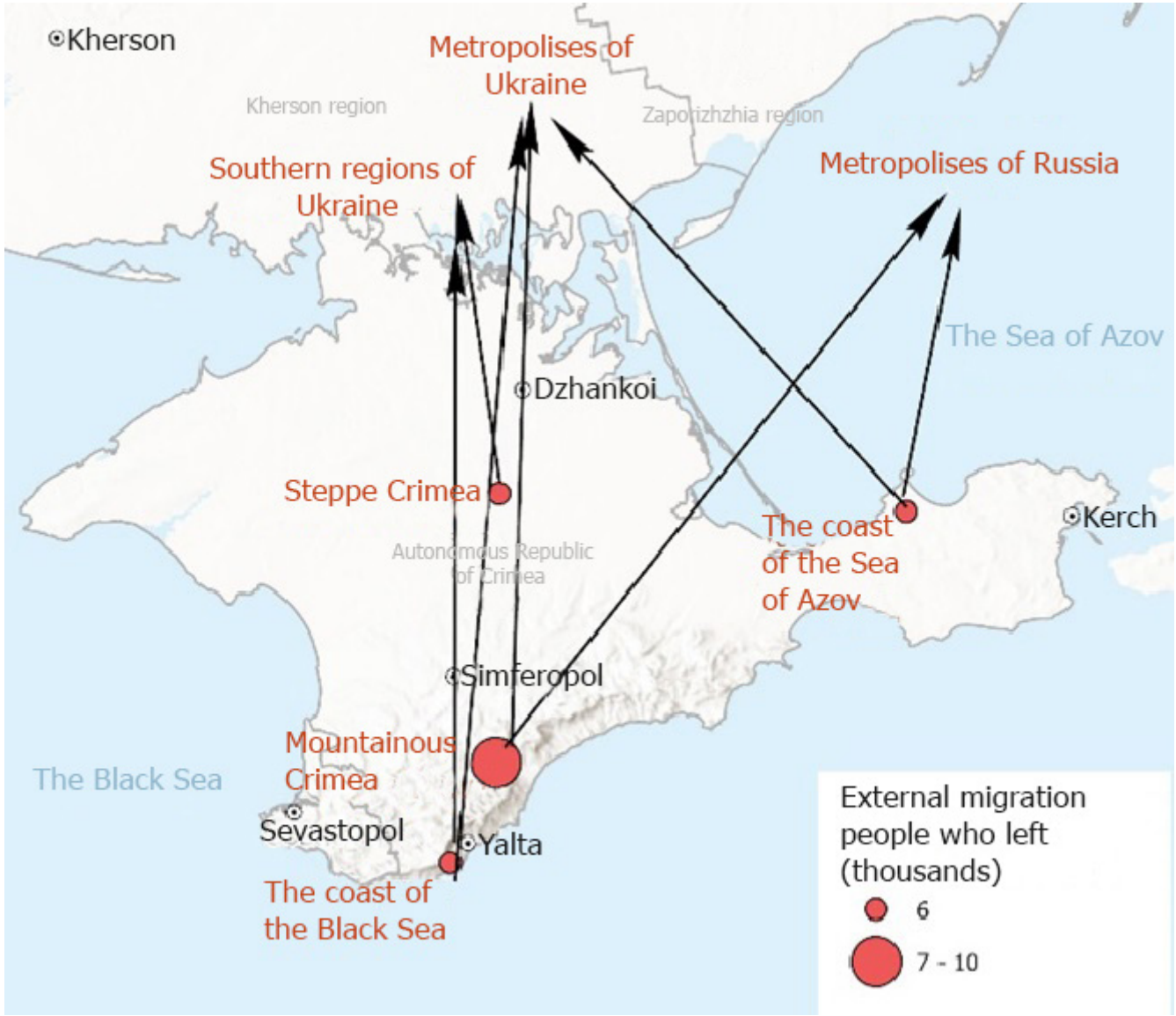

Fig. 2.3. The scale and direction of possible external migration of the population, provoked by the ecological and climatic situation in Crimea

CHAPTER 3. ANALYSIS OF REGULATORY LEGAL ACTS AND MANAGEMENT DECISIONS OF CRIMEAN AUTHORITIES THAT CAUSE ENVIRONMENTAL AND CLIMATIC DISCRIMINATION ON THE PENINSULA

Unfortunately, the territory of Crimean Peninsula is under the influence of an environmental crisis based on human irresponsibility. Environmental violations are included in the Criminal Code and in the special environmental law.

To estimate the approximate number of environmental emergencies and violations of environmental legislation, data from reports of the occupation Ministry of Ecology and natural resources of the Republic of Crimea "On the Results of the Implementation of the Program for the Prevention of Violations of Mandatory Requirements of Environmental Legislation" [11–13] were used, namely: the number of protocols on administrative offenses that indicate the presence of specific violations of environmental legislation. Each protocol is drawn up on the grounds specified in Chapter 8 of the code of administrative offenses of the Russian Federation. There is no regional data available.

Among the most common violations in the field of industrial and consumer waste management, you can select:

- non-compliance with environmental protection requirements during the collection, accumulation, transportation, processing, disposal, or neutralization of industrial and consumer waste;
- failure to comply with the obligation to assign industrial and consumer waste of hazard classes I–V to a specific hazard class to confirm such assignment or draw up waste passports of hazard classes I–IV;
- failure to comply with the obligation to keep records in the field of industrial and consumer waste management.

Common violations in the field of subsurface protection being committed by both small businesses and large enterprises: failure to follow previously issued orders; failure to follow the terms of license agreements; unlicensed use of mineral resources.
The main types of non-compliance with the license terms are:

- lack of assessment of operational groundwater reserves and reports with inventory calculation;
- lack of monitoring of static and dynamic groundwater levels;
- lack of reliable accounting of extracted underground water;
- lack of monitoring during groundwater extraction;

- failure to provide information on compliance with the terms of use of mineral resources during the year;
- lack of production quality control of fresh underground water extracted.

Typical and mass violations of the mandatory requirements of environmental legislation in this area include:

- use of the coastal protection zone of a water body, water protection zone of a water body in violation of restrictions on economic and other activities;
- unauthorized occupation of a water body or use of it in violation of the established conditions;
- violation of the requirements for the protection of water bodies, which may lead to their contamination, clogging and / or depletion, except in certain cases.

Typical and mass violations of mandatory requirements of environmental legislation in the field of water protection can include:

- violation of requirements for the protection of water bodies that may cause their contamination, clogging and/or depletion;
- unauthorized occupation or use of a water body in violation of the established conditions;
- unauthorized connection to centralized water supply and sanitation systems;
- failure to follow the condition of ensuring free access of citizens to a public water body and its coastal strip;
- violation of the rules of operation of water management or water protection structures and devices.

The most common violations in the field of atmospheric air protection include:

- implementation of economic activities by legal entities and individual entrepreneurs related to the release of harmful (polluting) substances into the atmospheric air in the absence of a permit for the release of harmful (polluting) substances into the atmospheric air;
- emissions of pollutants into the atmospheric air that are not specified in the permit for the release of harmful (polluting) substances into the atmospheric air;
- non-compliance with the standards of maximum permissible emissions and temporarily agreed emissions of harmful (polluting) substances into the atmospheric air;

- failure to comply with the approved action plan to reduce emissions of pollutants into the atmosphere within the established time frame.

Cases of violations of environmental legislation in Crimea for the period 2015–2021 are presented *in Table 3* of the Annex and systematized *in Table. 3.1.* For each case of violation of environmental legislation (environmental situation), a protocol on administrative offenses was drawn up on the grounds specified *in Chapter 8* of the code of administrative offenses of the Russian Federation.

Consequently, the largest number of violations of environmental legislation was recorded in ***the foothill forest steppe region of Crimea***, namely: violations in the sphere of industrial and household waste management during 2015–2021.

Table 3.1. The number of recorded violations of environmental legislation in the regions of Crimea and individual cities during 2015–2021

Region	Violations in the field of protection, use and reproduction of plant world objects	Violations in the use and protection of water bodies	Violations in the field of industrial and household waste management	Violations in the field of atmospheric air protection	Violations in the sphere of compliance with the requirements of land legislation	Total
The Mountainous Crimea						
mountain forest areas	No data available					
foothill forest-steppe regions	7	4	12	5	5	33
The Steppe Crimea						
steppe regions	3	4	12		4	23
coastal steppe regions		2	12		2	16
The South Coast of Crimea	4	2	5			11
Cities						

Simferopol	2	2	8	4	3	19
Sevastopol	No data available					
Kerch	1		9		1	11
Yalta	3	1	2			6
Dzhankoi	1		5		3	9

The types of environmental offenses and their dynamics recorded by the relevant management structures on the territory of Crimea during 2019–2021 are presented *in Table 3.2* based on the following documents [11–13].

The largest number of offenses on the territory of Crimea was recorded in the sphere of Use and protection of water bodies (with a tendency to increase from 196 in 2019 to 807 in 2021), in the field of industrial and household waste management (with a downward trend from 850 in 2019 to 352 in 2021) and in in the sphere of protection of protected areas (with an upward trend from 126 in 2019 to 737 in 2021). At the same time, in supervision of rational use and protection of Mineral Resources the number of offenses varies between 243–264.

Table 3.2. Types of environmental offenses and their dynamics recorded by the relevant management structures in the territory of Crimea during 2019–2021.

Types of offenses	Number of protocols		
	2019	2020	2021
in the field of industrial and household waste management	850	613	352
in the sphere of meeting the requirements of land legislation	90	92	47
in the field of protection of protected areas	126	459	737
in the sphere of use and protection of water bodies	196	457	807
in the field of atmospheric air protection	122	173	333
in the field of protection, use and reproduction of plant world objects	52	61	117

in the field of protection, use and reproduction of wildlife objects	18	5	0
in the field of supervision of rational use and protection of mineral resources	253	243	264
violation of the self-isolation regime	7	2	241
Total	**1714**	**2105**	**2898**

CHAPTER 4. CONCLUSIONS AND RECOMMENDATIONS

Modern challenges from climate change, uncomfortable living conditions, discriminatory legal norms in violation of human rights to a clean and healthy environment, inefficient management decisions of Crimean occupation authorities, complications of traditional farming and threats to the health and life of Crimean population can lead to environmental and social conflicts. Inefficient management and predatory environmental policy of the authorities do not contribute to the adaptive resilience to climate change of the community and is a manifestation of environmental and climate discrimination, and local environmental conflicts due to the complication of living conditions and through the redistribution of resources can encourage a certain part of the population of Crimea to internal and external migrations, including in the direction of the southern regions of Ukraine. Moreover, the greatest burden will fall on the Kherson region, which will entail a number of social, environmental and economic negative effects.

Having studied the environmental vulnerability of various regions of Crimea, it has been found that steppe (especially the northern part) and coastal steppe regions, as well as the Southern Black Sea coast region tend to have a negative ecological situation, while mountainous regions tend to have a mediocre ecological situation. Regarding the climate vulnerability of various regions of Crimea, it has been found that mountainous regions, steppe (especially the northern part) and coastal steppe regions are the most vulnerable, and the Southern Black Sea coast region is less vulnerable (*see Table 4.1*).

Table 4.1. Indicators of regional vulnerability by ecological and climatic criteria:

Region	Degree of climate vulnerability of the territory		Overall environmental status index		Indicators of changes in ecosystem performance	
The Mountainous Crimea						
mountainous and forest areas	4-10	the most vulnerable	–16÷–7	mediocre	16÷20	positive
foothill forest and steppe regions	11-16	the most vulnerable	–27÷–16	mediocre closer to negative	18÷25	positive

The Steppe Crimea						
steppe regions	20-33	vulnerable	–35÷–28	negative	5÷7	mediocre
coastal steppe regions	28-33	vulnerable	–43÷–33	negative	6÷12	mediocre
The South Coast of Crimea	35-46	less vulnerable	–43÷–35	negative	16÷23	positive

Migration processes: Until 2014, the Autonomous Republic of Crimea and the city of Sevastopol were donating regions for both external and interregional migration in Ukraine. After Russia imposed control over those regions, their role in the migration system of the population has not changed critically: the number of migrants arriving exceeds the number of those leaving, while a significant part of the people arriving now come from Russian regions who wouldn't have moved to Crimea if the Russian Federation had not occupied the peninsula.

The main receiving regions of the population in Crimea both before and after the occupation are the cities of Simferopol, Sevastopol, and Yalta, to a lesser extent-Kerch, Mountainous Crimea and the Black Sea coast. The Steppe Crimea and the coast of the Sea of Azov are experiencing and will continue to experience the greatest demographic losses.

Table 4.2. Analysis of the scale and consequences for the southern regions of Ukraine caused by possible climatic migration of Crimean population

Indicator	Kherson region	Other regions of Ukraine
Influx of displaced persons from other territories, thousand people: a) for permanent residence; b) for a short-term stay	50-65 170-250	55-70 145-200
Social groups of displaced persons: a) working-age population; b) retirees	The age structure is typical for the population of Crimea – the share of the working-age population is 50–55 %, the share of retirees is 27–30 %	Increased share of the working-age population (over 55 %), reduced share of retirees (up to 25 %)

Gender groups of the displaced population: a) women; b) men	A slightly larger number of women (55–57 %)	Nominal advantage of women (52–54 %)

Quite real for Crimea is the threat of flows of forced displacement of the population due to environmental and climatic problems. The potential for forced resettlement of people from Crimea due to unfavorable ecological and climatic conditions during the late 2020s – early 2030s can be estimated at 0.9–1.3 million people, of which 150–200 thousand people will be displaced for permanent residence.

If short-term forced migrants are mainly concentrated in other regions of Crimea (most intensively – in the Mountainous Crimea and in cities), then among permanent migrants the share of those who have left for the regions of mainland Ukraine will be higher. At the same time, the role of the Kherson region in accepting permanent climate migrants will be less than in accommodating short-term migrants, which will create an additional burden on local markets and the social security system of the region. In general, with an increase in the distance of movement among displaced persons, the share of those who want to stay for permanent residence, as well as the share of able-bodied persons and men, will increase.

To mitigate social and economic consequences of potentially unfavorable ecological and climatic conditions, it is proposed to:

1. Create temporary accommodation points for the population affected by natural disasters on the territory of the city councils of Simferopol, Sevastopol, and Yalta, as well as areas of the Mountainous Crimea, and provide these points with basic necessities.

2. Work out (in the post-war period) the issue of encouraging potential forced ecological and climatic migrants from Crimea to settle in the neighboring Kherson regions of Ukraine in order to reduce the burden on local markets of the Kherson region.`

Analysis of materials on the types of environmental offenses recorded by the relevant management structures on the territory of Crimea during 2019–2021 showed that the largest number of offenses on the territory of Crimea was recorded in the sphere of Use and protection of water bodies, in the field of industrial and household waste management and in the sphere of protection of protected areas.

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APP

Table 1. Repeatability and intensity of adverse natural events on the peninsula in the regions defined as potential for internal and external movements of people for the period 2014–2021 for these cities and regions

Date	Phenomenon	Consequences and scope	Links
2021			
January 18–20	Severe frost	During this period, abnormally cold weather was observed with an average daily air temperature of 7–10°C below the climatic norm. On the South Coast of Crimea, evergreen tropical plants were slightly damaged in the Nikitskyi Botanical Garden. The largest waterfall in Crimea, Uchan-Su, froze.	https://meteo.crimea.ru/?page_id=3220
January 28–31	Heavy precipitation, strong wind	On Al-Petri, small avalanches were observed on the steep southern slopes of the mountains. A strong storm damaged the embankment near Primorsky Boulevard of Sevastopol. Due to heavy snow, road traffic was suspended on some road sections. Due to the deposition of wet snow, tree branches were partially broken. On the section from the 50th to the 51st kilometer of the Bakhchysarai highway, snow drifts were observed on the roadway.	https://meteo.crimea.ru/?page_id=3220
February 12	Strong wind	In the village of Mysove and nearby settlements, there were breaks on power lines, tree trunks and branches were felled.	https://meteo.crimea.ru/?page_id=3220

Date	Phenomenon	Consequences and scope	Links
February 18–20	Heavy precipitation	Due to very heavy snow, traffic was stopped on the Crimean Bridge and the Tavrida Highway. On February 19–20, avalanches with a volume of 8–10 cubic meters were observed on AI-Petri in the Reserve on the southern slopes of the mountains with access to the roadway of the Bakhchysarai – Yalta Highway. Traffic was suspended, and road services were involved in clearing the road.	https://meteo.crimea.ru/?page_id=3220
May 29	Heavy precipitation	Due to heavy and very heavy rain on some sections of highways of the city of. Simferopol was flooded, in some areas of the city dry trees were felled. In the city of Dzhankoi flooded houses and adjacent plots of the private sector. On the territory of the village of Petrivka Krasnohvardiiske district in the orchard of Crimean Fruit Company JSC fell a large hail with a diameter of 20 mm. Apple and cherry fruits were damaged, tree leaves were torn and punctured. Damage was caused on an area of 80 hectares.	https://meteo.crimea.ru/?page_id=3220
June 7	Heavy precipitation	As a result of precipitation, water overflowed through the dam to the village of Pryozerne with subsequent flooding of 18 adjacent territories and households, in which 35 people live, including 10 children. Also, as a result of heavy rain, 30 meters of the Tavrida highway section were flooded.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya – informaciya/4482208
June 17	Heavy precipitation	In Kerch, 82 mm fell in 12 hours, which caused significant losses. The last time 100 mm fell in Kerch was in 1903. From heavy rain that fell in the city of Kerch, several streets and more than 230 private and apartment buildings, a city hospital were flooded. In the village of Pryozerne, Kirovske district, 18 residential buildings were flooded, and 40 people were evacuated.	https://meteo.crimea.ru/?page_id=3220

Date	Phenomenon	Consequences and scope	Links
June 18	Heavy precipitation	In Yalta, 133 mm (315 % of the norm) fell during the day, in Al-Petri – 294.8 mm (245 % of the norm), in the Nikitskyi Botanical Garden – 134 mm (313 % of the norm). Very heavy rains that took place on the south coast, led to catastrophic losses. In the city of Yalta there were numerous cases of flooding of basements and basements (elevator shafts, underground passages), removal of soil on highways. Small objects were demolished by water flows, cars were overturned, and traffic was obstructed. On the territory of the Nikitskyi Botanical Garden, vineyards were washed out, houses and adjacent territories were flooded. On the Al-Petri plateau, some sections of the roadway were flooded, stones fell on the roadway on the descent from the 50th to the 56th km of the Bakhchysarai highway, and traffic was stopped.	https://meteo.crimea.ru/?page_id=3220
June 16–22	Heavy precipitation	As a result of precipitation in the period from June 16 to June 22, 2021, 426 adjacent territories were flooded, including 356 households and 18 socially significant objects. 1783 people were evacuated from the flood zone, including 325 children.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya – informaciya/4495060
July 3–4	Heavy precipitation	Significant losses from heavy rains were recorded in the Bakhchysarai district. In the village of Kuibyshev with more than 50 private houses were flooded. A mudflow descended on the roadway. They overflowed the banks of the Belbek and Kokozka rivers.	https://meteo.crimea.ru/?page_id=2948
July 13	Hail	On the territory of the village of Krasna Poliana of Krasnohvardiiske district in the orchard of JSC "Crimean Fruit Company" a large hail with a diameter of 20–25 mm fell. Apple fruits were damaged and damage was caused on an area of 148 hectares.	https://meteo.crimea.ru/?page_id=3220
August 4	Heavy precipitation	As a result of heavy rain, the Cosmo-Damian monastery was flooded. There was also a partial collapse of the retaining wall of a mountain road and a rainwater drainage channel, a partial collapse of an economic one-story structure for storing firewood, and the territory of the monastery was silted up.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya – informaciya/4530434

Date	Phenomenon	Consequences and scope	Links
August 11	Heavy precipitation	As a result of the overflow of a natural reservoir, water drains onto the highway between the villages of Krasnolissia and the village of Dobre. Traffic is difficult.The territory of a one-story residential apartment building and the territory of 2 private households were flooded.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/4535028
August 12–13	Heavy precipitation	In the eastern regions of Crimea, there were very heavy thunderstorms. In Vladislavovka, 36 mm of precipitation fell in 50 minutes. Traffic on the Tavrida highway was stopped, 25 households in Kirovske district were flooded. In Kerch, the amount of precipitation that fell during the day was 78 mm, dozens of houses, a stadium, a market, a Zatoka plant were flooded, and public transport routes were changed.Private households and adjacent territories in the village Krasnohirka, Leninske district were flooded. 8 km of the Tavryda highway section was also flooded.	https://meteo.crimea.ru/?page_id=3220 http://82.rospotrebnadzor.ru/epidemiologic_situation/148946/
November 27–30	Heavy precip-itation,strong wind	Due to very strong winds in the southern, central and eastern regions of Crimea, electricity supply was disrupted (10 thousand people were left without electricity). Trees, fences, billboards were felled, and the roofs of houses were damaged. 200 vessels were waiting to cross the Kerch Strait due to the storm. As a result of a very strong (hurricane-force) wind on Mount AI-Petri, a radio relay station and an antenna feeder system were damaged on the territory of a military unit.	https://meteo.crimea.ru/?page_id=3220
December 1	Heavy precipitation	Mixed precipitation in the form of rain and sleet led to a partial shutdown of subscribers in 7 municipalities. There was a fall of trees, 10 of them are associated with falling by car in the city district of Yalta. Traffic is restricted on highways.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/4621283

Date	Phenomenon	Consequences and scope	Links
December 24–25	Heavy precipitation	As a result of intense precipitation, the Bakhchysarai Highway (AI-Petri mountain area) was covered with snow, and traffic was suspended. In the city of Yalta, there were numerous cases of leaks in residential buildings, power supply was disrupted, the movement of trucks was suspended, and several public transport routes were removed.On December 25, in the area of AI-Petri Mountain, an avalanche of about 40 cubic meters descended on the roadway of the Bakhchysarai – Yalta Highway (51 km).	https://meteo.crimea.ru/?page_id=3220
2020			
January 1–10	Prolonged precipitation	Residential buildings, outbuildings, and a road on Sydelnykova Street in the village of Verkhorichchia, Bakhchysarai district, were flooded.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2020 / Simferopol, 2021 https://crimea–news.com/incident/2020/01/24/599809.html
February 11–12	Heavy precipitation in the form of rain and snow	On the south coast, due to very heavy wet snow, traffic was suspended, near the coast of the city of Yalta due to a strong wind of 19 M/S and a wave height of 2–3 meters, the yacht sank. In the area of the city of Feodosia naginny phenomena blurred the road. In the Leninske district and in the city of Kerch due to strong winds, power lines were cut off, tree branches were broken.	https://meteo.crimea.ru/?page_id=3220
February 24–25	Strong wind	On the south coast and in the eastern regions of the peninsula, due to very strong winds, trees were broken, roofs of houses were partially torn off, power lines and gas pipelines were damaged.	https://meteo.crimea.ru/?page_id=3220

Date	Phenomenon	Consequences and scope	Links
February 26–27	Strong wind	Due to strong and very strong winds on February 26 in the territory of 8 districts (the city of Feodosia, Leninske, Bakhchysarai, Rozdolne, Pervomaiske , Krasnoperekopsk, Kirovske, the city of Simferopol) there was a power supply failure in 18 localities. February 27 in the city of Simferopol two roofs were damaged, settlements in the Nyzhnohirskyi district were partially disconnected from power supply, tree trunks and branches were broken.	https://meteo.crimea.ru/?page_id=3220
March 15–22	Severe ground frost	As a result of severe ground frost in Krasnohvardiiske, Krasnoperekopsk, Nyzhnohirskyi districts on an area of more than 5500 hectares, crops of grain and industrial crops from 50 to 100 % of the Leaf apparatus were affected. In Dzhankoi, Kirovske, Krasnohvardiiske, Krasnoperekopsk, Rozdolne, Nyzhnohirskyi districts on an area of more than 700 hectares, damage to fruit trees (apricot, peach, cherry, cherry, plum, apple) was recorded from 20 to 100 % of flowers and fruit buds.	https://meteo.crimea.ru/?page_id=3220
April 1–6	Severe ground frost	As a result of severe frosts in Krasnoperekopsk, Nyzhnohirskyi, Rozdolne districts, grain and industrial crops were damaged on an area of more than 150 hectares, and 30 to 100 % of flowers and buds were damaged on fruit trees (apricot, peach, cherry, cherry, plum, apple).	https://meteo.crimea.ru/?page_id=3220
June 12	Heavy downpour	As a result of a heavy downpour in the city of Dzhankoi electrical panel was flooded, the roofs of three multi-storey buildings were leaking, and one private house was flooded.	https://meteo.crimea.ru/?page_id=3220
13–16 June	Heavy downpour	Cloudbursts that fell on June 13 and 16 in the village of Kovylne Dzhankoi district, caused flooding of 21 households, flooding of vegetable gardens, outbuildings, and basements. The water level in the yards reached 15–30 cm, on the streets – 30–50 cm.	https://meteo.crimea.ru/?page_id=2948

Date	Phenomenon	Consequences and scope	Links
June 16	Heavy precipitation	As a result of precipitation in the village of Kotovske, Rozdolne district, 37 houses were flooded, as well as farmland on an area of 800 m.2. In the flood zone there was a power line and a medium-pressure gas pipeline.In the city of Simferopol traffic was suspended.Private households were flooded in the Garden Association Nadezhda of the Perovsky rural settlement of the Simferopol District.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2020 / Simferopol, 2021 https://meteo.crimea.ru/?page_id=3220
June 18	Heavy precipitation	As a result of unfavorable weather conditions, residential buildings in the village of Viline, Bakhchysarai district, on Sverdlov, Traktorna, and Haharin streets were flooded due to rain.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2020 / Simferopol, 2021
June 19, 23, 28	Heavy downpour	In the village of Pervomaiske, Simferopol district 3 private households, 48 house plots and one apartment building were flooded. June 19 the territory of the village of Ulianovsk, Krasnohvardiiske district, experienced a heavy downpour with large hail with a diameter of 20 mm or more, which caused damage to agriculture: tomato fruits were beaten, potato and carrot tops were cut, greenhouses were broken. Large hail with a diameter of 20–25 mm on June 19 was beaten apple fruits on the territory of KFC JSC in the village of Zaliznychne of Bakhchysarai district and in the village of Petrivka, Krasnohvardiiske district.	https://meteo.crimea.ru/?page_id=3220 Report on the state and protection of the environment on the territory of the Republic of Crimea in 2020 / Simferopol, 2021 https://meteo.crimea.ru/?page_id=2948
June 20	Heavy precipitation	In the Garden Association Nadiezhda of Perovsky rural settlement of Simferopol district, private households were repeatedly flooded.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2020 / Simferopol, 2021

Date	Phenomenon	Consequences and scope	Links
June 24	Hail	On the territory of the village of Oleksandrivka Krasnohvardiiske district large hail with a diameter of 20 mm was observed. Apple tree fruits and tree leaves were damaged.	https://meteo.crimea.ru/?page_id=3220
July 6	Strong wind	Because of the very strong wind in the village of Zvizdne and the village of Leninske, Krasnohvardiiske district, the roofs of administrative buildings (slate was demolished, rafters collapsed) were destroyed. Pieces of slate are scattered at a distance of up to 20 m. Thick branches of trees up to 10 cm in diameter were broken. In the village of Krasnoznamenka, Krasnohvardiiske district, greenhouses of the greenhouse complex were damaged (wooden structures, floors were broken, the coating film was torn off), cucumber and tomato plants were damaged (uprooted, stems were broken).	https://meteo.crimea.ru/?page_id=3220
July 21	Heavy precipitation	As a result of very heavy rain, 7 private households on Richkova street, in the city of Bakhchysarai were flooded.	https://meteo.crimea.ru/?page_id=3220
July 26	Hail	On the territory of the village of Botenichne Rozdolne district large hail with a diameter of 20 mm or more was observed. Vegetable (tomatoes, vegetable peppers, eggplants, cucumbers) and melon (watermelon) crops were damaged in the fields with a total area of 9.0 hectares.	https://meteo.crimea.ru/?page_id=3220
July 26	Strong wind	On the territory of Dobrovsky rural settlement of Simferopol district, a squall with a maximum wind speed of 25 m/s or more was observed. Concrete pillars and fences were felled, roofs were torn off houses, trees were uprooted, and power lines were cut off.In the village of Poshtove, Bakhchysarai district, high-voltage power lines were damaged, the village of Pionerske, Simferopol district were disconnected from power supply.	https://meteo.crimea.ru/?page_id=3220 https://meteo.crimea.ru/?page_id=2948

Date	Phenomenon	Consequences and scope	Links
2019			
January 4	Heavy precipita-tion,strong wind	In the southern (mountainous) regions, five snow avalanches weighing 10, 12, 15, and 15.50 cubic meters with access to the roadway of the Bakhchysarai – Yalta Highway were observed. Dozens of cars and hundreds of people were trapped in the snow. As a result of ice deposits, power lines were damaged in Saky, Leninske, Chernomorsk districts, in the city of Yevpatoria. 19 localities were left without electricity. Billboards were torn down and tree branches were broken in Nikitskyi Botanical Garden.	https://meteo.crimea.ru/?page_id=3220 Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019
January 8	Heavy precipita-tion(snow)	Mass convergence of small wet avalanches with a volume of less than 20 cubic meters in the area of 50–55 km. Bakhchysarai – Yalta Highway. The passage of vehicles has been stopped.	https://meteo.crimea.ru/?page_id=3220 Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019
January 10	Heavy precipitation	The Bakhchysarai – Yalta highway in the mountainous part was covered with snow. The passage is closed to vehicles.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019
January 11	Heavy precipitation	A massive convergence of small wet avalanches blocked the passage of vehicles on the Bakhchysarai – Yalta Highway.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019

Date	Phenomenon	Consequences and scope	Links
March 1	Strong wind	In the city of Yalta some power lines were damaged by fallen trees; traffic was blocked on some sections of the south coast roads, billboards were knocked down in the villages of Greater Yalta, windows were broken, and roofs of buildings were damaged.	https://meteo.crimea.ru/?page_id=3220
May 19	Heavy precipitation	In Feodosia, automobile traffic was stopped, roads were flooded with water.	https://meteo.crimea.ru/?page_id=3220
May 24 –July 9	Wildfires	Extreme fire hazard (class 5). Grassroots fires in the forest fund (15 cases of fire) on the territory of the Yalta, Alushta, and Feodosia city districts – with a total area of about 6 hectares.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019
June 5	Hail	On the territory of the Simferopol district (Hresivskyi village, Molodizhne village, agrarian village), large hail fell, the diameter of which could reach 20–25 mm, and individual hailstones could reach a diameter of 30–40 mm; in Rozdolne and Saky districts, large hail fell, the diameter could reach 20–30 mm. Large hail caused significant damage: peas, barley, wheat were damaged on an area of 2055 hectares in Simferopol, Rozdolne and Saky districts; cucumbers, tomatoes, bell peppers were damaged in greenhouses. The degree of damage is 70–90 %. Hail hit numerous vehicles, smashed glass roofs of greenhouses. The amount of losses, according to preliminary estimates, amounted to 156 million rubles.	https://meteo.crimea.ru/?page_id=3220 Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019

Date	Phenomenon	Consequences and scope	Links
June 7–8	Heavy precipitation	Due to bad weather in the city of Sevastopol 6 power supply lines were damaged. Damaged streets (descent of soil from slopes, destruction of asphalt pavement) of Hohol, Industrialna, Fedorivska, Oktiabyrska Revoliutsii Avenue (near the Haharin administration building), Ochakivtsi, the square near the checkpoint in Cossack Bay, streets near the bus station and in Artbukhta, Kotovskyi descent (suffered the greatest damage). Garages were damaged, and 37 garages were under threat of collapse. In the city of Simferopol flooded yards of private households, felled trees.	https://meteo.crimea.ru/?page_id=3220
June 13	Strong wind	In the city of Simferopol tree branches were broken, billboards were torn down.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019
June 23	Heavy precipitation, strong wind	In the Nikitskyi Botanical Garden, vineyards were washed out, tree branches were partially broken off, mudflows descended on the roads in some places, which made it difficult for vehicles to move; during a cloudbursts, visibility on the roads worsened to 1500 m. On the territory of the village of Skhid of the eastern rural settlement of Krasnohvardiiske district, a tornado was observed. The wind strength reached 25–28 m/s. The wind was accompanied by a heavy downpour. As a result of the tornado, the slate roof of a house of 127 square meters was torn off, 24 sheets of slate of another house were torn off; the slate was broken into fragments, carried away by the wind at a distance of 30–50 m; the roof of the Rus shopping center was damaged — slate was torn and broken; about 50 large trees were broken; power line wires were torn, half of the village was de-energized.	https://meteo.crimea.ru/?page_id=3220

Date	Phenomenon	Consequences and scope	Links
June 24	Heavy precipitation	In Bakhchysarai district, vineyards were washed out, tree branches were partially broken off, mudflows descended on the roads in some places, which made it difficult for vehicles to move.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019
July 3	Strong wind	In the village of Ivanivka and the village of Zarichchia of the Ivanivske rural settlement of the Nyzhnohirskyi district, a squall, gusts of which reached 25–30 m/s was observed. The wind was accompanied by heavy rain, thunderstorms, hail with a diameter of 3–5 mm. Roofs were partially torn off, roofs were opened, slate was torn off, beams and rafters were damaged and turned out; several double-glazed windows were broken with pieces of Slate and the facade of the kindergarten building was damaged. In the village of Zvizdne, Leninske rural settlement, Krasnohvardiiske district, a squall was observed. The wind strength reached 25–28 m/s. The wind was accompanied by a downpour. The structure of the seedling nursery was destroyed – support posts and tree seedlings were broken, the slate roof of the tractor crew building was torn off.	https://meteo.crimea.ru/?page_id=3220
July 12 – August 5	Drought	In the northern regions of Crimea (Dzhankoi, Rozdolne, and Krasnoperekopsk) soil drought. In plants during daytime hours, there was a loss of leaf turgor, weak formation of reproductive organs.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019

Date	Phenomenon	Consequences and scope	Links
July 12	Strong wind,heavy precipitation	On the territory of the campsite Olenivka Village (Chernomorsk district), two wooden houses for tourists were turned over on the roof, the fence was torn, the toilet was turned over.	https://meteo.crimea.ru/?page_id=3220 Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019
July 26 – August 3	Wildfires	In the central and eastern regions of the peninsula, there is an extreme fire danger (class 5). Grassroots fires (20 fires) and a flash of dry vegetation on an area of about 6 hectares.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019
August 4	Heavy precipita-tion,strong wind	In the Leninske district and the city of Kerch there were emergency shutdowns of electricity and water. More than a dozen trees were felled and billboards were torn down. The operation of the Kerch ferry stopped, and the movement of vessels through the Kerch Strait stopped.	https://meteo.crimea.ru/?page_id=3220
August 15 – October 11	Wildfires	There is an extreme fire hazard (class 5) throughout the Republic of Crimea. Fire of grass and forest floor (about 100 cases) in Bakhchysarai and Simferopol districts, on the territory of the cities of Alushta, Yevpatoria, Feodosia, Sudak, Sevastopol, Yalta Mountain Wildlife sanctuary with a total area of more than 100 hectares.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019
October 9–10	Ground frost	In steppe and foothill areas, ground frost occurs on the soil surface and in the air. Some vegetable crops in private plots were damaged.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019

Date	Phenomenon	Consequences and scope	Links
October 11–31	Drought	Soil drought in Dzhankoi, Nyzhnohirskyi, and Bakhchysarai districts. There was a delay in germination of winter crops, liquefaction of crops.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019
October 24 – November 29	Wildfires	In the central, eastern and southern regions of Crimea, fires were observed in dry grass and vegetation, forest floor in Bakhchysarai, Simferopol, Krasnohvardiiske districts, in districts of Yalta and Yevpatoria – on a total area of about 27 hectares.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019
November 21	Strong wind	In the eastern regions of Crimea, 42 settlements were left without electricity, roofs were torn off individual buildings, trees were felled; in the city of Kerch a fallen tree damaged a street gas pipeline; the ferry service was stopped.	https://meteo.crimea.ru/?page_id=3220 Report on the state and protection of the environment on the territory of the Republic of Crimea in 2019
2018			
February 28 – March 1	Heavy precipitation	The disaster left 28 settlements of Dzhankoi, Bilohirsk, Leninske, and Simferopol districts without electricity. Heavy snow caused numerous accidents and traffic jams on the roads.	https://meteo.crimea.ru/?page_id=2948
March 3	Heavy precipitation	In Yalta, due to heavy spring precipitation, the Uchan-Su River in its lower reaches overflowed its banks and partially flooded nearby houses on Lenin Street.	https://meteo.crimea.ru/?page_id=2948

Date	Phenomenon	Consequences and scope	Links
March 21–22	Strong wind	Power line breaks, short-term power outages in Simferopol, Leninske, Nyzhnohirskyi, Kirovske districts, the city of Sudak. Trees were felled in the Saky and Chernomorsk districts, Sevastopol. In the city of Sevastopol ferry traffic was suspended. Roofs of houses were partially damaged, billboards were knocked down.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2018
July 13	Strong wind	A tornado in the village of Novomykilske Krasnohvardiiske district destroyed a house and a fence around a water tower, knocked down 6 power poles, broke wires, and uprooted about 20 trees.	https://meteo.crimea.ru/?page_id=2948
July 14	Heavy precipitation	Streets and households were flooded in Bilohirsk, Dzhankoi, Krasnohvardiiske and Bakhchysarai districts; mud flows and traffic jams were observed; soil was removed to the embankment in Yalta.	https://meteo.crimea.ru/?page_id=2948
July 16	Hail	In the settlements of Morske, Voron, Vesele, and Hromivka of Sudak City District, vineyards on an area of 294 hectares were hit by hail. The total amount of financial damage amounted to 24 million rubles.	https://meteo.crimea.ru/?page_id=2948
July 18–19	Heavy precipitation	In Kirovske and Simferopol districts, streets and underground passages were partially flooded, private households were flooded, cars were beaten by hail, trees were broken and felled. Electricity was temporarily cut off in some localities.	https://meteo.crimea.ru/?page_id=2948

Date	Phenomenon	Consequences and scope	Links
July 28	Strong wind, heavy precipitation	On the territory of the village of Nyva Saky district a squall of more than 25 m/s, accompanied by heavy rain and thunderstorms was observed. Roofs on residential buildings and utility rooms were destroyed, residential buildings and basements were flooded, and trees were broken.	https://meteo.crimea.ru/?page_id=2948
August 4–31	Wildfires	In Crimea, there was an extreme fire danger. In the city districts of Yalta, Alushta, Yevpatoria, in Simferopol, Bilohirsk, Bakhchysarai and Kirovske districts there was a fire of dry vegetation and forest litter with a total area of just over 20 hectares, on the territory of the Yalta mountain and Forest wildlife sanctuary 3 forest fires on an area of 0.93 hectares, a forest fire was recorded in the Kirovsky district on the territory of Ostaninsky settlement (on an area of 0.005 hectares).	https://meteo.crimea.ru/?page_id=2948
September 6	Heavy precipitation	In Yalta, 5 underground passages were flooded, the basements of the historical and Literary Museum and school No. 12 were flooded; in Feodosia, 35 courtyards and 14 houses were flooded, tiles were broken by water flows on the roads, asphalt was destroyed, and traffic was stopped.	https://meteo.crimea.ru/?page_id=2948
September 27	Ground frost	In Krasnohvardiiske, Dzhankoi, Nyzhnohirskyi, Bilohirsk, Bakhchysarai districts, ground frost was observed on the soil surface.	https://meteo.crimea.ru/?page_id=2948

Date	Phenomenon	Consequences and scope	Links
November 30	Strong wind, heavy precipitation	In three districts of Crimea (Simferopol, Saky, Leninske), in the city districts of Kerch and Feodosia, as well as due to very strong winds in five settlements on the Kerch Peninsula, emergency power outages occurred; in the cities of Simferopol and Sevastopol, several trees and billboards fell. Due to ice in Simferopol and Bilohirsk, traffic was suspended. As a result of strong and very strong winds, the Kerch ferry stopped working for two days, the movement of vessels through the Kerch Strait stopped; one vessel ran aground in the Kerch Strait. Lots of broken trees.	https://meteo.crimea.ru/?page_id=2948
December 11–12	Heavy precipitation	Due to strong winds and wet snow deposits, more than a hundred settlements of Dzhankoi, Krasnohvardiiske, Nyzhnohirskyi, and Simferopol districts were left without electricity; trees were felled, branches were broken. Heavy and very heavy precipitation made it difficult for vehicles to move.	https://meteo.crimea.ru/?page_id=2948
December 24–25	Strong wind	As a result of difficult weather conditions, emergency power outages occurred in 9 villages of Leninske, Sovetsky, and Dzhankoi districts.	https://meteo.crimea.ru/?page_id=2948
2017			
April 27 – May 3	Ground frost	Due to the deterioration of weather conditions (ground frost up to –2–6°C) there was damage to the crop (plum, peach, cherry, grape, apple, apricot) on an area of 997.48 hectares in the territory of Kistochkivka and Zhemchuzhyna rural settlements of the Nyzhnohirskyi district. On May 3, due to the deterioration of weather conditions (ground frost up to –2.3°C), the crop (apples, cherries, cherries, strawberries and pears) was damaged on an area of 907.14 hectares in the territory of Oleksandrivka and Petrivka rural settlements of Krasnohvardiiske district. Ground frost also caused damage to farms in Pervomaiske district.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2017

Date	Phenomenon	Consequences and scope	Links
May 22	Heavy precipitation	In Simferopol, traffic was stopped in almost all districts of the city. Significant damage was caused to orchards of the Simferopol District, where hail damaged the leaves and fruits of apple trees, plums, cherries and peaches, as well as damaged grain crops.	https://meteo.crimea.ru/?page_id=2948
June 10	Heavy precipitation	In the city of Simferopol, due to very heavy rain (48 mm), traffic was stopped. Cars were flooded on the roof, pedestrians were moving waist-deep in water. Crosswalks were flooded, houses near the railway station were flooded.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2017
August 18–19	Heavy precipitation, SEL, floods	In Alushta, due to a heavy downpour, streets were flooded, traffic was stopped, individual cars were washed off the highway into vineyards, residential buildings were flooded. In Sudak, due to very heavy rain, an intense mudflow led to a traffic stop on the Sudak – the village of Dachne was washed away by asphalt, cars were lifted by water and taken to the side of the road, private households were flooded. Large hail damaged vegetable crops in four farms of Bilohirsk District, damaged apple fruits in the farms of the Krasnohvardiiske district; power grids were cut off.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2017

Date	Phenomenon	Consequences and scope	Links
August 18–19	Heavy precipitation, SEL, floods	In two days on August 18–19, 41 households were flooded (in the districts of the village of Dachne, the city of Sudak, Mount Alchak), 7 streets of the city of Sudak-Urozhaina, Zarichna, Desantnykiv, Zelena, Yubileina, Vysotskyi (total 189 yards), the village of Yarke Pole, the village of Zolote Pole and the village of Pryvitne, Kirovske district. Due to the deterioration of weather conditions and a large amount of precipitation on the Simferopol – Sudak highway on the road towards S. Krasnokamianka a stream of dirty water from the roadway washed away several cars, resulting in a traffic jam. Transport in the traffic jam was partially flooded by mud flow (15 cars failed as a result of a water hammer). About 400 hectares of vineyards of the Massandra plant were damaged. In total, more than 160 hectares were damaged in the Sudak branch, mudslides damaged about 42 hectares of vineyards, 15 of which were completely washed away, and another 120 hectares were immediately affected by hail. In the village of Morske hail damaged about 250 hectares. As a result of intensive flushing of clastic material from grape plantations located on a floodplain 8.6–11 km from the mouth, a mudflow formed on this section of the Taraktash River, which carried a concrete tray to the right of the Hrushivka – Sudak road by one third with clastic material and completely clogged the rectangular opening of the road bridge 8.6 km from the mouth with mudflow deposits. From the lower part of the bridge, a 20–meter-long, 10–meter-wide and 1.5-meter-high extension cone was formed in the riverbed. As a result, flood waters flowed across the Hrushivka – Sudak Road in a layer of up to 0.6 m, metal road bumpers and concrete storm trays along the road were destroyed. In the upper reaches of the Taraktash and Otuz rivers, as a result of heavy rains, significant floods were formed, artificially enhanced by the breakthrough of ponds. Water levels in the basins of these rivers increased by 172–220 cm. Sudak and Koktebel were most affected by the cloudbursts. From the slopes of the mountains, the water shaft tore off stones and soil, as a result of which a mudflow was formed, which caused significant damage.	https://meteo.crimea.ru/?page_id=2948

Date	Phenomenon	Consequences and scope	Links
September 23	Heavy precipitation	In the southern and eastern regions of Crimea, heavy rains (15–17 mm), in the Nikitskyi Botanical Garden – very heavy rain (58 mm), as a result of which vineyards were washed out and damaged, roads were silted up.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2017
At the end of September	Strong wind	A strong wind caused the Kerch ferry crossing to stop (within 5 days), trees were felled, power lines were damaged, 6 settlements in Sovietskyi, Leninske, Dzhankoi, Bakhchysarai, and Saky districts were de-energized, and power lines in Simferopol were partially cut. Dozens of cars were damaged by fallen trees, branches and fruits of chestnuts.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2017
October 1–4	Ground frost	In the steppe and foothill areas, ground frost was observed – 1... –6°C, which damaged vegetable crops in Rozdolne district.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2017
2016			
April 20	Fire in the natural ecosystem	A fire broke out on an area of 3 hectares (a flash of dry vegetation) 7 kilometers from the village of Zaprudne, Alushta City District.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya

Date	Phenomenon	Consequences and scope	Links
April 21	Strong wind	In Saky district, very strong winds tore electrical wires, damaged power line poles, cut off the power supply to 17 settlements, opened roofs, broken windows, and felled and broken trees.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2016
May 13	Earthquake	The epicenter of the earthquake was located in the Black Sea 10 kilometers from the city of Alushta at a depth of 12 kilometers. The magnitude at the epicenter was 3 points.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye –sobytiya
June 4	Heavy precipitation	On the territory of the city of Dzhankoi and Dzhankoi district (the villages of Maslove, Kindratove, and Myrnivka), the territories of private households were partially flooded.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye –sobytiya
June 29	Heavy precipitation	In Dzhankoi district, farmsteads were flooded, roads, vegetable gardens, fields were flooded, and household plots were washed away in some localities.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2016
September 20	Heavy precipitation	In Chornomorske and Saky districts, household plots and residential buildings were flooded, and residents of these areas were disconnected from power supply.	Report on the state and protection of the environment on the territory of the Republic of Crimea in 2016

Date	Phenomenon	Consequences and scope	Links
December 30–31	Heavy precipitation, strong wind	Due to adverse weather conditions (strong wind, snow) in the Republic of Crimea, 37 settlements were without electricity, 18 of them partially. The population is 8197. Most of the disconnected settlements were located in Simferopol, Leninske, and Saky districts	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya
2015			
February 2	Strong wind	In Krasnohvardiiske district, 4 settlements were left without electricity. In total, in Crimea, due to strong winds, power supply is partially cut off in 39 localities.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya
February 11	Strong wind	As a result of the deterioration of weather conditions (strengthening of the north-easterly wind to 28 M/s), power lines were damaged, as a result of which there was a partial power outage in 1 settlement of Chornomorske region and 11 settlements of Simferopol District.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya
March 17	Strong wind	Due to the deterioration of weather conditions in Crimea, 13 settlements are de – energized, 4 of them partially. About 18 thousand people were left without electricity. Most of the disconnected localities are located in Kerch and Leninske district.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya

Date	Phenomenon	Consequences and scope	Links
May 27–29	Heavy precipitation	As a result of adverse weather conditions (heavy rain) and oversaturation of the soil cover with water, 17 private farmsteads were flooded in the city of Dzhankoi. Floods were observed on the Salhir, Burulcha, Kacha, Alma, and Belbek rivers, which led to significant losses.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya Report on the state and protection of the environment on the territory of the Republic of Crimea in 2015
June 17	Strong wind	In the village of Belinsky, Leninske district, as a result of wind gusts, the roofs of nine private houses were damaged, 3 of them completely and 6 partially.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya
June 25	Heavy precipitation, strong wind	Due to the deterioration of weather conditions in the territory of Crimea, emergency power outages occurred in 22 settlements. 4752 private houses with 14,786 residents were left without electricity.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya
September 7	Heavy precipitation, offset	It is established that as a result of waterlogging of the soil during rain, the earth cover shifted from vineyards to 2 lanes of the roadway h-19 Yalta – Sevastopol (the width of the blocked section is 20 x 8, the height of the soil cover is up to 0.3 m).	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya

Date	Phenomenon	Consequences and scope	Links
October 12	Heavy precipitation, strong wind	Due to bad weather, 20 settlements were left without electricity, 10 of them partially (a total of 6859 people), in Simferopol, Bakhchysarai, Krasnohvardiiske, Chornomorske, Leninske and Saky districts.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya
November 16	Heavy precipitation, strong wind	Due to difficult weather conditions (strong wind, rain), 17 settlements (7 of them partially) of the Republic of Crimea were disconnected from electricity. In total, 8996 people were left without electricity in Chornomorske, Dzhankoi, Krasnoperekopsk, and Krasnohvardiiske districts of Crimea.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya
June 18	Heavy precipitation	As a result of heavy rain in the village of Chapaieve, Krasnohvardiiske district, 8 private households on Sverdlov Street were flooded. The number of people who live there is 30 people.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya
June 21	Heavy precipitation	As a result of a cloudburst, the yards of 15 private yards in the city of Sudak, 6 houses in the village of Vladyslavivka Kirovske district, 3 houses in the village of Koktebel and 5 houses in the village of Berehove of the city of Feodosia were flooded.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya
September 25	Strong wind	In 138 settlements of Crimean peninsula, power supply was completely cut off due to unfavorable conditions.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya

Date	Phenomenon	Consequences and scope	Links
October 24	Strong wind	14 settlements in Chornomorske (3 localities, 1 of them partially), Rozdolne (8 localities), and Leninske districts (3 localities) were disconnected from the power supply.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya
December 29	Heavy precipitation, strong wind	As a result of the deterioration of weather conditions, 36 settlements were de – energized, 18 of them partially, mainly in Bakhchysarai, Chornomorske, Bilohirsk, and Leninske districts.	https://82.mchs.gov.ru/deyatelnost/press–centr/operativnaya–informaciya/operativnye–sobytiya

Table 2. Main ecological and economic characteristics of the Crimean regions

Region	Area, thousand hectares	Quantity localities	Population, thousand people	Emissions of pollutants into the atmosphere from stationary sources in 2020, tons/year	Total amount of municipal solid waste, thousand tons / year	Types of management
Bilohirsk region (central part)	190	80	60	600	23	The region is characterized by an agricultural and industrial type of territory development with a significant predominance of Agriculture with a relatively low share of industry. The industry is mainly represented by enterprises of the extractive industry. The main danger to the environment of the region is the activities of enterprises of the agro-industrial complex and the extractive industry. The largest enterprises that affect the natural environment of the region include Ulyanovsk Limestones LLC, Bilohirsk Limestones, Bilohirsk quarry management, Bilohirsk plant of building materials.
Bakhchysarai region (south-western part)	158	85	88	2400	33	The region is characterized by an agricultural and industrial type of territory development with a slight predominance of Agriculture with a relatively high share of industry. The main danger to the region's environment is the activities of Industrial Enterprises, Housing and communal services enterprises, and motor transport. The largest enterprises that affect the natural environment of the region include the Alminskyi plant of building materials and the Bakhchysarai plant Budindustria.

Dzhankoi region (northern part)	266	114	103	2000	39	The region is characterized by an agricultural and industrial type of territory development with a significant predominance of Agriculture with a relatively high share of industry. The main danger to the environment of the region is the activities of Housing and communal services enterprises and motor transport. Category I facilities that negatively affect the environment include the Druzhba Narodiv Nova poultry farm and Chernomorneftegaz production facilities. Potentially dangerous objects in the region include the oil products production site of the Elif Company Enterprise, the fuel and lubricants warehouse of the Dzhankoi station, the Dzhankoi substation and high-voltage lines of the Simferopol main electric networks, hydraulic structures of the North Crimean canal and the dune gas filling station.
Kirovske region (eastern part)	120	40	51	360	18	The region is characterized by an agricultural and industrial type of territory development with a sharp predominance of employment in agricultural production. The main danger to the region's environment is the activities of agro-industrial enterprises, housing and communal services enterprises, and motor transport. Potentially dangerous objects in the region include hydroelectric facilities of the Feodosia, Lhovske, and Starokrymske reservoirs, hydraulic structures of the North Crimean canal and the Enterprise Starokrymske Quarry.
Krasnohvar-diiske region (central part)	176	84	84	800	31	The region is characterized by an agricultural and industrial type of territory development with a significant predominance of Agriculture with a relatively low share of industry. The main danger to the region's environment is the activities of agro-industrial enterprises, housing and communal services enterprises, and motor transport.

Krasnopere-kopsk region (northern part)	123	40	80	8000	41	The region is characterized by an agricultural and industrial type of territory development with a slight predominance of Agriculture with a relatively high share of industry. The main danger to the region's environment is the activities of chemical industry Enterprises, Housing and communal services enterprises, and motor transport. The largest enterprises that affect the natural environment of the region include Brom JSC, Crimean Soda Plant, and the Armenian branch of the Enterprise Titanium Investments, Heat Networks.
Leninske region (eastern part)	302	69	209	2100	126	The region is characterized by an industrial-agricultural type of territory development with a predominance of industry with a relatively high share of Agriculture. From the point of view of environmental impact, Leninske region is divided into two large zones: the city of Kerch, where the city's industrial enterprises are concentrated, and the territory of Leninske district, specializing in the production of agricultural products. The main danger to the region's environment is the activities of Industrial enterprises, housing and communal services enterprises, and motor transport. The largest enterprises that affect the natural environment of the region include Teplokommunenergo, Kerch metallurgical plant, Kamysh-Burun CHPP, and Zatoka ship-building yard.
Nizhnegorsk region (north-eastern part)	121.2	59	44	150	16	The region is characterized by an agricultural and industrial type of territory development with a sharp predominance of employment in agricultural production. The main danger to the region's environment is the activities of agro-industrial enterprises, housing and communal services enterprises, and motor transport. The largest enterprises include Nyzhnohirskyi Cannery, Krymekolife LLC, and Nizhnefarm. Potentially dangerous objects in the region include hydraulic structures of the North Crimean canal.

Pervomaiske region (north-western part)	147.4	42	31	200	11	The region is characterized by an agricultural and industrial type of territory development with a sharp predominance of employment in agricultural production. The main danger to the region's environment is the activities of agro-industrial enterprises, housing and communal services enterprises, and motor transport. Potentially dangerous objects in the region include the Ostrovskaya substation of the Dzhankoi main electric networks.
Rozdolne region (north-west)	123	41	30	450	10	The region is characterized by an agricultural and industrial type of territory development with a sharp predominance of employment in agricultural production. The main danger to the region's environment is the activities of agro-industrial enterprises, housing and communal services enterprises, and motor transport. The main enterprises that affect the natural environment of the region include agricultural enterprises and food industry enterprises.
Saky region (western part)	232	81	222	4100	147	The region is characterized by an agricultural and industrial type of territory development with a slight predominance of Agriculture with a relatively high share of the industry. The main danger to the region's environment is represented by housing and communal services enterprises and motor transport. Enterprises that negatively affect the natural environment of the region should include, first of all, enterprises of public utilities and the agro-industrial complex.
Simferopol region (central part)	186	110	524	6800	82	The region is characterized by an industrial-agricultural type of territory development with a predominance of industry with a relatively high share of Agriculture. The main danger to the region's environment is the activities of industrial enterprises, housing and communal services enterprises, and motor transport. The largest enterprises that affect the natural environment of the region include the Fiolent plant and the Simferopol Cannery named after S. M. Kirov, Simferopol Machine-Building Plant Prohres, Simferopolsilmash plant, beer and non-alcohol plant Crimea.

Sovietskyi region (eastern part)	108	38	31	300	19	The region is characterized by an agricultural and industrial type of territory development with a sharp predominance of employment in agricultural production. The main danger to the region's environment is the activities of agro-industrial enterprises, housing and communal services enterprises, and motor transport. Potentially dangerous objects in the region include hydraulic structures of the North Crimean canal.
Chornomorske region (extreme west)	151	34	30	1200	9	The region is characterized by an agricultural and industrial type of territory development with a significant predominance of Agriculture with a relatively high share of industry. The main danger to the region's environment is the activities of agro-industrial enterprises, housing and communal services enterprises, and motor transport.
Alushta region (the South Coast)	60	26	52			The region is characterized by a recreational, agricultural and industrial type of territory development. The main danger to the region's environment is the activities of Industrial Enterprises, Housing and communal services enterprises, and motor transport. The largest enterprises that significantly affect the natural environment of the region include the Sharkhinsky quarry, a branch of Krymteplokommunenergo the city of Alushta, sewage treatment plant of the city of Alushta, sewage treatment plant Utes.
Sevastopol region (south-western part)	86.4	46	510	7000	360	The region is characterized by an industrial-agricultural type of territory development with a predominance of the industry with a small share of agriculture. The main danger to the region's environment is the activities of Industrial Enterprises, Housing and communal services enterprises, and motor transport. The largest enterprises that affect the natural environment of the region include LLC Technopromexport PJSC, Improvement of the City of Sevastopol, Sevteploenergo, Vodokanal, Mobile GTEs JSC, Chernomorneftegaz.

Sudak region (south-eastern part)	54	16	32	200	22	The region is characterized by a recreational, agricultural and industrial type of territory development. The main danger to the region's environment is the activities of Industrial Enterprises, Housing and communal services enterprises, and motor transport. The largest enterprises that affect the natural environment of the region should include public utilities.
Feodosia region (east coast)	35	18	100	650	35	The region is characterized by an industrial, agricultural and recreational type of territory development. The main danger to the region's environment is the activities of Industrial Enterprises, Housing and communal services enterprises, and motor transport. The largest enterprises of the region are the Feodosia ship mechanical plant and the ship-building yard More.
Yalta region (South Coast)	28.3	32	140	600	100	The region is characterized by a recreational and industrial type of territory development. The main danger to the region's environment is the activities of Industrial Enterprises, Housing and communal services enterprises, and motor transport. The largest enterprises that affect the natural environment of the region include the Massandra plant, the Yalta meat factory, the Yalta heating networks, and Krymteplokommunenergo in the city of Yalta, Krymenergo, Yalta, Vodokanal of the south coast, Krymgazmerezhi, the city of Yalta.

Table 3. Cases of violation of environmental legislation in Crimea

Date	Region	Type of violations	Description of violations	Links
1	2	3	4	5
2015.03.27	Bilohirsk	Violations in the field of protection, use and reproduction of plant world objects	On the territory of the State Nature Reserve Kubalach Tract, the fact of illegal felling of trees (fluffy oak, common hornbeam) by unidentified persons was revealed.	https://meco.rk.gov.ru/ru/article/show/347
2015.05.28	Simferopol	Violations in the use and protection of water bodies	The fact of sewage discharge from the storm collector in the area Mark Donskyi street in the city of Simferopol was recorded.	https://meco.rk.gov.ru/ru/article/show/3945
2015.07.10	Simferopol	Violations in the field of industrial and household waste management	Places of unauthorized storage of manure by residents of the village of Mykolaivka on land plots that are not objects entered in the State Register of waste disposal facilities, and are not equipped in accordance with the requirements of legislation in the field of environmental protection were found.	https://meco.rk.gov.ru/ru/article/show/607
2015.07.20	Bakhchysarai	Violations in the use and protection of water bodies	Illegal placement of temporary structures in the coastal protection zone of a water body (the Churuk-Su River in the city of Bakhchysarai) in the absence of structures that prevent contamination, clogging and siltation of water.	https://meco.rk.gov.ru/ru/article/show/1277

2015.07.29	Sudak	Violation of the water protection system legislation	The fact of restriction of free access of citizens to a public water body and its coastal strip – the Karagach River.	https://meco.rk.gov.ru/ru/article/show/1280
2015.08.28	Sovietskyi	Violations in the use and protection of water bodies	The fact of illegal extraction of water resources from a water body (the Sudzhilka River in Sovietskyi district) for irrigation of agricultural land.	https://meco.rk.gov.ru/ru/article/show/1366
2015.09.03	Simferopol	Violations in the field of protection, use and reproduction of wildlife objects	The facts of illegal maintenance of 11 turtles in 8 aquariums in the Hall of a restaurant located in the Southern Gallery Shopping Center in Simferopol have been established.	https://meco.rk.gov.ru/ru/article/show/1464
2015.09.10	Simferopol	Violations in the use and protection of water bodies	Economic objects located within the water protection zone that are not equipped with structures that protect the water body from pollution, clogging, siltation and water depletion were identified.	https://meco.rk.gov.ru/ru/article/show/1163
2015.09.16	Krasnohvardiiske	Violations in the use and protection of water bodies	Illegally equipped retaining structures were found in the Salgir riverbed on the territory of Rovnovsky, Pyatikhatsky and Poltava rural settlements of Krasnohvardiiske district.	https://meco.rk.gov.ru/ru/article/show/3930
2015.09.18	Bilohirsk	Violations in the field of industrial and household waste management. Violations in the field of atmospheric air protection	On the territory of the city of Bilohirsk, the facts of violations of the requirements of environmental legislation in the field of industrial waste management and emissions of harmful substances into the atmospheric air without a special permit were revealed	https://meco.rk.gov.ru/ru/article/show/1210

2015.10.06	Kerch	Violations in the field of industrial and household waste management	Violations of the requirements of environmental legislation in the field of solid waste management of hazard classes 4–5 were revealed.	https://meco.rk.gov.ru/ru/article/show/1219
2015.10.06	Central	Violations in the field of industrial and household waste management	The fact of violation of the requirements of environmental legislation in the field of industrial waste management was recorded.	https://meco.rk.gov.ru/ru/article/show/2164
2015.10.12	Nyzhnohirskyi	Violations in the field of industrial and household waste management	On the territory of the Mikhailovsky rural settlement of the Nyzhnohirskyi district, the fact of dumping liquid waste from the territory of the "duck farm" into the open ground was revealed.	https://meco.rk.gov.ru/ru/article/show/1227
2015.10.13	Simferopol	Violations in the field of industrial and household waste management. Violations in the field of atmospheric air protection	The facts of violations of the requirements of environmental legislation on industrial waste management and in the field of atmospheric air protection were revealed.	https://meco.rk.gov.ru/ru/article/show/1137
2015.10.23	Rozdolne	Violations in the field of industrial and household waste management	On the territory of Berezovske and Slovianske rural settlements of Rozdolne district, places of illegal storage of waste were identified.	https://meco.rk.gov.ru/ru/article/show/819
2015.12.03	Krasnopere-kopsk	Violations in the field of industrial and household waste management	Illegal waste storage sites have been identified on the territory of Sovkhoznensky rural settlement.	https://meco.rk.gov.ru/ru/article/show/819

2015.12.04	Bilohirsk	Violations in the use and protection of water bodies	The fact of unauthorized discharge of wastewater into a water body was revealed.	https://meco.rk.gov.ru/ru/article/show/2172
2015.12.15	Simferopol	Violations in the field of industrial and household waste management	On the territory of the village of Lozove Dobrovske rural settlement, unauthorized storage of solid municipal waste was established on a land plot of 35.85 sq. m.	https://meco.rk.gov.ru/ru/article/show/2468
2016.03.11	Bilohirsk District	Violations in the field of industrial and household waste management. Complex violation of environmental legislation	On the territories of zoological parks of regional significance Skazka and Safari Park Taigan, violations of the requirements of environmental legislation were found, namely:	https://meco.rk.gov.ru/ru/article/show/3580
			– in the field of industrial waste management (first of all, unauthorized storage and incineration of waste);	
			– in the field of use and protection of water bodies (first of all, the lack of accounting for the intake of water resources from water bodies);	
			– in the field of atmospheric air protection (first of all, the lack of accounting for objects that negatively affect the environment);	
			– in the field of meeting the requirements of land legislation in a part of unauthorized removal and movement of the fertile soil layer;	

			– in the field of protection and use of specially protected natural areas (in a part of unauthorized earthmoving operations);	
			– in the field of protection, reproduction and use of wildlife objects and their habitat (lack of permits for the maintenance and breeding of wildlife objects, in particular Red Book ones)	
2016.02.08	Bilohirsk	Violations in the sphere of compliance with the requirements of land legislation. Violations in the field of supervision of sustainable use and protection of mineral resources	The fact of work on removing the fertile soil layer, as well as illegal sand extraction, was established.	https://meco.rk.gov.ru/ru/article/show/2513
2016.03.04	Yalta	Violations in the use and protection of water bodies	The fact of illegal water intake from the Derekoika River was established.	https://meco.rk.gov.ru/ru/article/show/949
2016.03.15	Leninske district	Violations in the sphere of compliance with the requirements of land legislation	Near the village of Kurortne unauthorized storage of soil after earthmoving operations was detected.	https://meco.rk.gov.ru/ru/article/show/3661
2016.03.25	Simferopol	Violations in the field of industrial and household waste management	On the territory of Trudovsky rural settlement, the fact of unauthorized storage of waste from construction and repair work and used automobile tires was established.	https://meco.rk.gov.ru/ru/article/show/2517

2016.04.18	Simferopol	Violations in the field of industrial and household waste management	The facts of violations of environmental legislation in the field of industrial waste management were revealed.	https://meco.rk.gov.ru/ru/article/show/1127
2016.04.22	Sudak	Violations in the field of industrial and household waste management	The fact of unauthorized waste disposal was revealed.	https://meco.rk.gov.ru/ru/article/show/2069
2016.05.05	Kerch	Violations in the field of industrial and household waste management	The facts of violations of environmental legislation in the field of industrial waste management was established.	https://meco.rk.gov.ru/ru/article/show/617
2016.05.10	Sovietskyi	Violations in the use and protection of water bodies	The fact of unregulated discharge of wastewater into a water body was established.	https://meco.rk.gov.ru/ru/article/show/2651
2016.05.10	Krasnopere-kopsk	Violations in the field of industrial and household waste management	In the village of Voinka, facts of unauthorized storage of industrial and household waste were revealed.	https://meco.rk.gov.ru/ru/article/show/2443
2016.05.18	Simferopol	Violations in the sphere of compliance with the requirements of land legislation	The fact of unauthorized storage of soil seized during earthmoving operations (with an area of 400 square meters) on a land plot located on the territory of the Luhove-2 microdistrict was established.	https://meco.rk.gov.ru/ru/article/show/2481
2016.05.23	Kras-noperekopsk	Violations in the field of industrial and household waste management	On the territory of the shop rural settlement, places of unauthorized storage of waste were found.	https://meco.rk.gov.ru/ru/article/show/1099

2016.05.31	Simferopol	Violations in the field of protection of protected areas	On the territory of the State Nature Reserve Steppe Plot in the Village of Shkilne revealed the location of vehicles and the fact of haymaking.	https://meco.rk.gov.ru/ru/article/show/3931
2016.07.15	Simferopol	Violations in the field of industrial and household waste management	The fact of unauthorized storage of industrial waste (chicken droppings), which led to land pollution, was revealed.	https://meco.rk.gov.ru/ru/article/show/1369
2016.07.20	Alushta	Violations in the field of industrial and household waste management	Two places of unauthorized storage of solid municipal waste were identified.	https://meco.rk.gov.ru
2016.07.22	Krasnohvardiiske	Violations in the field of protection of protected areas	On the territory of the state nature reserve of regional significance Virgin Steppe Near the Village of Hryhorivka, the fact of mowing vegetation with an area of 2 hectares was revealed.	https://meco.rk.gov.ru/ru/article/show/756
2016.07.22	Dzhankoi	Violations in the use and protection of water bodies	The fact of plowing land within the coastal protective strip of the Sivash River on the territory of Zavito-Leninske rural settlement was revealed.	https://meco.rk.gov.ru/ru/article/show/700
2016.09.20	Simferopol	Violations in the field of supervision of rational use and protection of mineral resources	Illegal extraction of Solid Minerals was established.	https://meco.rk.gov.ru/ru/article/show/4366
2016.09.21	Saky	Violations in the field of industrial and household waste management	The fact of unauthorized storage of waste on the street was revealed on Chapaieva street in the city of Yevpatoria.	https://meco.rk.gov.ru/ru/article/show/3627

2017.02.22	Krasnohvardiiske	Violations in the field of industrial and household waste management	In the village of Krasnohvardiiske, facts of unauthorized waste disposal were revealed.	https://meco.rk.gov.ru/ru/article/show/1262
2017.08.01	Sovietskyi	Violations in the field of industrial and household waste management	In the village of Lokhivka, facts of unauthorized waste disposal were revealed.	https://meco.rk.gov.ru/ru/article/show/1262
2017.08.16	Bilohirsk	Violations in the field of protection, use and reproduction of wildlife objects	A case of illegal wolf hunting has been identified on the territory of the hunting ground.	https://meco.rk.gov.ru/ru/article/show/3750
2017.09.12	Bilohirsk	Violations in the field of protection, use and reproduction of plant world objects	The fact of illegal harvesting of wood was revealed.	https://meco.rk.gov.ru/ru/article/show/3745
2017.10.05	Krasnopere-kopsk	Violations in the use and protection of water bodies	On the territory of Novopavlivka rural settlement, the fact of restricting free access of citizens to the Chatyrlyk River was revealed.	https://meco.rk.gov.ru
2017.10.06	Nyzhnohirskyi	Violations in the field of supervision of rational use and protection of mineral resources	The fact of illegal extraction of underground water on the territory of the Okhotske rural settlement has been established.	https://meco.rk.gov.ru/ru/article/show/3873
2017.10.09	Sudak	Violations in the field of industrial and household waste management	Near the rural settlement of Morske, the fact of illegal disposal of livestock waste was revealed.	https://meco.rk.gov.ru/ru/article/show/728

2018.01.23	Simferopol	Violations in the field of atmospheric air protection	Violations of environmental legislation in the field of atmospheric air protection in the operation of the gas station network were revealed in the city of Simferopol and Simferopol district.	https://meco.rk.gov.ru/ru/article/show/3631
2018.01.30	Simferopol	Violations in the field of industrial and household waste management. Violations in the field of atmospheric air protection	Violations of the requirements of environmental legislation on waste storage and the lack of a permit for the release of pollutants into the atmospheric air were revealed in the city of Simferopol.	https://meco.rk.gov.ru/ru/article/show/2637
2018.02.07	Dzhankoi	Violations in the field of industrial and household waste management	In the village of Yarke, fact of unauthorized disposal of industrial and household waste was clearly revealed.	https://meco.rk.gov.ru/ru/article/show/3771
2018.02.19	Alushta	Violations in the field of protection, use and reproduction of wildlife objects	On the territory of the State nature reserve of regional significance Khaphalskyi, when providing photo services, two facts of keeping and using birds of prey listed in the Red Book were revealed.	https://meco.rk.gov.ru/ru/article/show/1361
2018.02.20	Simferopol	Violations in the field of atmospheric air protection	The fact of emissions of untreated pollutants was recorded.	https://meco.rk.gov.ru/ru/article/show/3904
2018.04.18	Pervomaiske	Violations in the field of protection, use and reproduction of plant world objects	The fact of illegal cutting of a tree of the genus Hledychiia in a forest belt near the village of Oktiabyrske was recorded.	https://meco.rk.gov.ru/ru/article/show/4058

2018.04.23	Chornomorske	Violations in the field of industrial and household waste management	The fact of dumping construction waste into the water area of Lake Donuzlav was established.	https://meco.rk.gov.ru/ru/article/show/3550
2018.05.03	Yalta	Violations in the field of protection, use and reproduction of plant world objects	On the territory of the park-monument of landscape art Massandra, cutting down of trees of valuable species was recorded.	https://meco.rk.gov.ru/ru/article/show/510
2018.05.17	Simferopol	Violations in the field of industrial and household waste management	The fact of dumping livestock waste on a land plot located near the village of Kostiantynivka Perovske rural settlement.	https://meco.rk.gov.ru/ru/article/show/632
2018.06.28	Yalta	Violations in the field of protection, use and reproduction of plant world objects	In the area of Tsarska stezhka, the fact of illegal felling of 28 trees was revealed.	https://meco.rk.gov.ru/ru/article/show/830
2018.07.26	Sovietskyi	Violations in the use and protection of water bodies	The facts of illegal extraction of water resources from the Sudzhylka river for irrigation of agricultural land were revealed.	https://meco.rk.gov.ru/ru/article/show/1366
2019.11.12	Leninske district	Violations in the field of industrial and household waste management	The fact of unauthorized storage of construction waste was revealed in the vicinity of the village Oktiabrske.	https://meco.rk.gov.ru/ru/article/show/3606

2019.11.22	Leninske district	Illegal placement waste	On the territory of the village of Hornostaivka, the fact of illegal storage of solid municipal waste has been established.	https://meco.rk.gov.ru/ru/article/show/811
2019.12.09	Leninske district	Violations in the field of industrial and household waste management	On the territory of Cape Zmiinyi, the facts of placement of solid municipal waste by citizens were recorded.	https://meco.rk.gov.ru/ru/article/show/755
2019.12.13	Leninske district	Violations in the field of industrial and household waste management	The fact of unauthorized storage of construction waste near the village of Baherove was established.	https://meco.rk.gov.ru/ru/article/show/3612
2019.12.25	Sovietskyi	Violations in the field of industrial and household waste management	In the village of Illicheve, illegal disposal of construction waste on the territory of the Kolobok kindergarten was revealed.	https://meco.rk.gov.ru/ru/article/show/2836
2019.12.28	Yalta	Violations in the field of protection, use and reproduction of plant world objects	In the area of Soniachna stezhka in the village of Haspra, a barbaric clearing of Juniper was carried out.	https://meco.rk.gov.ru/ru/article/show/2025
2020.01.24	Nyzhnohirskyi	Violations in the field of supervision of rational use and protection of mineral resources	The fact of illegal extraction of underground water has been established.	https://meco.rk.gov.ru/ru/article/show/2151
2020.03.25	Kras-noperekopsk	Violations in the use and protection of water bodies	The fact of illegal withdrawal of water resources from the Chatyrlyk river for the purpose of irrigation of agricultural land has been established.	https://meco.rk.gov.ru/ru/article/show/3933

2020.04.02	Yalta	Violations in the field of industrial and household waste management	Unauthorized waste disposal was detected.	https://meco.rk.gov.ru/ru/article/show/1976
2020.04.15	Sovietskyi	Violations in the field of industrial and household waste management	On the territory of the village of Pushkine places of unauthorized storage of municipal waste and animal husbandry waste were discovered.	https://meco.rk.gov.ru/ru/article/show/945
2020.07.15	Krasnopere-kopsk	Violations in the field of supervision of rational use and protection of mineral resources	On the territory of Voinske and Krasnoarmiiske rural settlements, 6 facts of illegal extraction of underground water were revealed.	https://meco.rk.gov.ru/ru/article/show/3880
2020.07.16	Leninske district	Violations in the field of protection of protected areas	On the territory of the State Nature Reserve Osovynskyi Steppe, the fact of unauthorized excavation of burials from the Great Patriotic War was established, as a result of which unauthorized removal of the fertile soil layer was carried out, followed by its unauthorized storage.	https://meco.rk.gov.ru/ru/article/show/3874
2020.07.21	Saky	Violations in the field of industrial and household waste management	In the area of Zahorodnyi dead end of the city of Yevpatoria revealed the fact of unauthorized disposal of solid municipal waste, construction waste and plant residues with a total area of 504 square meters	https://meco.rk.gov.ru/ru/article/show/1704
2020.08.07	Dzhankoi	Violations in the field of supervision of rational use and protection of mineral resources	On the territory of the Zarichne rural settlement, the fact of illegal extraction of underground water was revealed.	https://meco.rk.gov.ru/ru/article/show/2773

2020.08.21	Leninske district	Violations in the field of industrial and household waste management	On the territory of the village of Baherove, the fact of illegal disposal of solid municipal waste was recorded.	https://meco.rk.gov.ru/ru/article/show/854
2020.08.24	Nyzhnohirskyi	Violations in the field of industrial and household waste management	Three unauthorized waste dumps with a total area of 3960 square meters were found on the territory of Zheliabivka rural settlement.	https://meco.rk.gov.ru/ru/article/show/2676
2020.08.26	Rozdolne	Violations in the field of supervision of rational use and protection of mineral resources	On the territory of Botanichne rural settlement, the fact of illegal extraction of underground water for municipal water supply and technological water supply to agricultural facilities, in particular land irrigation, was established.	https://meco.rk.gov.ru/ru/article/show/2708
2020.09.04	Simferopol	Violations in the sphere of compliance with the requirements of land legislation	The fact of sewage spillage on the terrain (soil) is established near the city of Simferopol.	https://meco.rk.gov.ru/ru/article/show/4050
2020.12.09	Sovietskyi	Violations in the field of industrial and household waste management	On the territory of the village of Rovenky Dmytrove rural settlement places of unauthorized storage of waste were revealed.	https://meco.rk.gov.ru/ru/article/show/778
2020.12.10	Kerch	Violations in the field of industrial and household waste management	The fact of unauthorized storage of construction waste within the water protection zone of the Melek-Chesme River of was established.	https://meco.rk.gov.ru/ru/article/show/4051

2020.12.16	Kerch	Violations in the field of industrial and household waste management	The fact of unauthorized disposal of waste (construction, solid municipal waste, plant residues) in the area of the territory of the monument of fortification construction of the 19th-century fortress Kerch was revealed.	https://meco.rk.gov.ru/ru/article/show/1128
2021.08.11	Yalta	Violations in the field of industrial and household waste management	Unauthorized waste disposal with a total area of 6.0 square meters was detected in the urban-type settlement of Nikita.	https://meco.rk.gov.ru/ru/article/show/1467

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Distributed free of charge
Crimean Tatar Resource Center

ISBN 978-617-95190-2-4

Publisher: NGO "Crimean Tatar Resource Center"

Certificate of registration of the subject of the publishing business in the State Register of Publishers, Manufacturers and Distributors of Publishing Products: Series ДК No 7367 from 22.06.2021

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