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International Legal Problems of the Climate Change Effects on the Environment (on the Examples of Biological Diversity Degradation and Chemicals and Waste Management)

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***Abstract*:** Climate change is an existential threat to humanity: scientific data shows that every year the average temperature on Earth is getting higher and higher. Within the framework of international law, a set of measures is being taken to mitigate and adapt to the effects of climate change. Given the comprehensive nature of climate change impacts on the environment, detailed legal measures are required in various areas of international cooperation. In this study the authors examined the complexities of legal regulation in two areas of climate change impacts: management of chemicals and waste, as well as preservation of biological diversity and genetic resources. The conducted study identified achievements and problems of international legal regulation in these areas and also showed that for the purposes of synergy of international treaties in the studied areas various decisions are made at periodic conferences of the parties to these international treaties.

***Keywords*:** international environmental law; climate change; United Nations Framework Convention on Climate Change (UNFCCC); Paris Agreement; biological diversity; chemicals and waste; Sustainable Development Goals (SDGs)

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I. Introduction

Today the problems related to climate change have come to the fore and are a matter of concern to the international community. In accordance with the Paris Agreement under the United Nations Framework Convention on Climate Change 2015 (Paris Agreement), the countries agreed "to keep the long-term average global surface temperature below 2 °C compared to pre-industrial levels and to make efforts to limit it to 1.5 °C"[1] by the end of the 21st century. Warming by more than 1.5 °C can lead to serious consequences of climate change and extreme weather conditions. However, we can already see that the situation cannot be kept under control. "June 2024 became the hottest month since records began and the thirteenth month in a row

[1] The Paris Agreement adopted on 12 December 2015, Art. 2. Available at: https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf [Accessed 10.08.2024].

to set a temperature record. For 12 months in a row, the average global temperature has been around 1.5 °C higher than in the pre-industrial levels. The average sea surface temperature in June was 20.85 °C, which is also the highest value on record."[2]

According to the latest report of the UN Secretary-General on the progress towards the Sustainable Development Goals (SDGs), "despite some reductions in greenhouse gas emissions in developed countries, greenhouse concentrations hit record highs in 2022, with real-time data in 2023 indicating a continued rise. Carbon dioxide levels have surged to 150 % above pre-industrial levels. Public funding for oil, coal, and gas production and consumption more than doubled from 2021 to 2022 and tripled since 2015, hindering progress towards a net-zero transition (Para. 4)."[3]

There is a growing awareness in the world today that climate change increases the risks of natural disasters. "In 2023, 129 countries reported the adoption and implementation of national disaster risk reduction strategies, increasing from 55 countries in 2015. Among these countries, 122 countries have reported promoting policy coherence and compliance with the SDGs and the Paris Agreement as a key element in the strategy."[4]

Greenhouse gases contributing to climate change are also among the most significant atmospheric pollutants that seriously affect human health.[5] "In 2019, air pollution, including greenhouse gases, has caused 4 to 5 million premature deaths (Fuller and Landrigan, 2022, p. 536).

[2] UN News, Climate and Environment "Earth's hottest June on record," 8 July 2024. Available at: https://news.un.org/en/story/2024/07/1151841 [Accessed 10.08.2024].

[3] Report of the UN Secretary-General "Progress towards the Sustainable Development Goals," 2 May 2024, Para. 4. Available at: https://unstats.un.org/sdgs/files/report/2024/SG-SDG-Progress-Report-2024-advanced-unedited-version.pdf [Accessed 10.08.2024].

[4] Report of the UN Secretary-General "Progress towards the Sustainable Development Goals," Para. 30.

[5] The World Health Organization (WHO). Atmospheric air pollution (outdoor air): basic facts. 12 December 2022. Available at: https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health?gad_source=1&gclid=EAIaIQobChMIgrq01MbJhwMVzBeiAx0aJSlJEAAYASAAEgJ3RPD_BwE[Accessed 10.08.2024].

Malnutrition, malaria and temperature variation caused by the impact of climate change on the food, water and sanitation situation are expected to additional 250,000 deaths per year between 2030 and 2050. The direct damage costs to health as a result of climate change, mainly in developing countries, is estimated to be between $ 2–4 billion per year by 2030."[6]

It should not be forgotten that the main responsibility lies with the industrialized countries, which have taken on the obligation to help developing countries. "The amount of climate finance provided by the parties to the United Nations Framework Convention on Climate Change listed in Annex I, as support provided to developing countries, increased by 5 % from 2015 to 2020, amounting to $ 41 billion. Although there is a range of estimates and a lack of an agreed accounting methodology on the $ 100 billion per year goal, the goal was not yet met as of 2021. However, recent progress made in the provision and mobilization of climate finance amounted to $ 89.6 billion in 2021."[7] The Organisation for Economic Co-operation and Development (OECD) reports that the commitment was met for the first time in 2022 and reached $ 115.9 billion.[8] But even this amount is like a drop in the ocean, considering that "the UN Framework Convention on Climate Change estimates that nearly $ 6 trillion is needed for developing countries' climate action plans by 2030, underscoring the need to massively scale up finance."[9]

[6] The World Health Organization (WHO). Climate change. Available at: www.who.int/health-topics/climate-change#tab=tab_1 [Accessed 10.08.2024].

[7] Report of the UN Secretary-General "Progress towards the Sustainable Development Goals," Para. 30.

[8] Organisation for Economic Co-operation and Development. Climate Finance Provided and Mobilised by Developed Countries in 2013–2022. 29 May 2024. Available at: https://www.oecd.org/en/publications/climate-finance-provided-and-mobilised-by-developed-countries-in-2013-2022_19150727-en.html [Accessed 10.08.2024].

It should be noted that at the 15th Conference of the Parties (COP15) of the UNFCCC in Copenhagen in 2009, developed countries committed themselves to achieve the collective goal of mobilizing 100 billion US dollars per year by 2020 for actions to combat climate change in developing countries in the context of meaningful mitigation actions and transparency.

[9] The Sustainable Development Goals Report 2024, p. 34. Available at: https://unstats.un.org/sdgs/report/2024/The-Sustainable-Development-Goals-Report-2024.pdf [Accessed 10.08.2024].

Without a doubt, as much legal research as possible is needed today to form an overall picture and to understand to what extent legal mechanisms help to cope with the negative effects of climate change, and to what extent adjustments are needed. This article focuses its analysis on two areas in detail: "chemicals, waste and climate change" and "biological diversity, genetic resources and climate change."

II. Chemicals, Waste and Climate Change

The chemical industry, which has received considerable attention in recent years from many states, is among the factors that are influencing climate change (Sharipova, 2022, p. 19). "The modern economy cannot do without chemical industry products, but at the same time, this sector ranks as the third most polluting industry."[10] According to studies, "this sector contributes about 7 % of global anthropogenic greenhouse gas (GHG) emissions, where CO_2 emissions account for 5.5 %."[11] "It accounts for 10 per cent of the global energy demand and 30 per cent of industrial energy demand; it emits 7 per cent of global greenhouse gases and 20 per cent of industrial greenhouse gases. Production of chemicals doubled between 2000 and 2017 and is expected to double again by 2030 and to triple by 2050, mostly in States that are not members of the Organisation for Economic Co-operation and Development (OECD)."[12]

[10] International Energy Agency. Why is the chemical sector important? Available at: www.iea.org/fuels-and-technologies/chemicals [Accessed 10.08.2024].

[11] The recent major study of the impact of the chemical industry on climate change was conducted in 2018. This is primarily due to the fact that it is difficult to track supply chains to the industry and, as a result, the lack of publicly available data on the movement of chemicals. There is an urgent need for a mass balanced and transparent report on the main movements of chemicals, so that reliable assessment can be carried out of the environmental impact of chemicals and climate change and conditions conducive to reducing emissions and reducing waste.

[12] Report of the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes "The toxic impacts of some proposed climate change solutions," 13 July 2023, Para. 14. Available at: https://www.ohchr.org/en/documents/thematic-reports/ahrc5425-toxic-impacts-some-proposed-climate-change-solutions-report [Accessed 10.08.2024].

"In 2022, 19 % of the global food production, totaling about 1.05 billion metric tons, was thrown away and wasted, where 60 % comes from households. These wastes lead to significant greenhouse gas emissions, which cost more than $ 1 trillion annually. It should be noted that states have yet to realise the direct link between food waste and climate change. Only 9 out of 193 countries have included food waste in their Nationally Determined Contributions (NDC) under the Paris Agreement as actions to combat climate change."[13]

"The overall NDC indicates that 99 % of the parties to the Paris Agreement have identified domestic climate change mitigation measures as key tools for achieving climate change mitigation targets in priority areas such as energy supply, transport, housing, industry, waste management."[14] With regard to industry, which is the second largest source of global GHG emissions and ranks second in terms of annual GHG emissions growth among priority areas, half of the Parties mentioned appropriate measures, which is less common than in other priority areas (77–93 %).

"The processes of climate change and the increase in emissions and waste from the chemical industry are closely interrelated: on the one hand, chemicals produced as a result of production have an impact on environmental degradation, and on the other hand, climate change significantly predetermines the release of chemicals and changes how toxic chemicals affect human health and the state of the environment."[15]

How does climate change affect chemicals? Firstly, "the increase in average temperature leads to the easier evaporation of certain chemicals and their breakdown into toxic products, which in turn has a negative impact on human health, specifically in the lungs" (Noyes, 2009). Secondly, "climate change increases the risk of air pollution, since volatile organic compounds released by chemical products

[13] The Sustainable Development Goals Report 2024, p. 32.

[14] United Nation Climate Change. Nationally determined contributions under the Paris Agreement. Synthesis report by the secretariat. 14 November 2023, p. 28. Available at: https://unfccc.int/sites/default/files/resource/cma2023_12.pdf [Accessed 10.08.2024].

[15] Chemicals, Wastes and Climate Change Interlinkages and Potential For Coordinated Action, p. 15. Available at: https://mercuryconvention.org/sites/default/files/documents/2021-07/Climate_Change_Interlinkages.pdf [Accessed 10.08.2024].

contribute to the smog formation" (Sambayeva, 2021, p. 186), "which leads to an air quality deterioration — it can negatively affect the lungs or exacerbate respiratory diseases" (Zigler et al., 2018). Thirdly, "climate change increases the number of extreme events (hurricanes, tornadoes, typhoons, fires, etc.), resulting in additional release of toxic chemicals into the air."[16] Fourthly, "there are a number of studies confirming the ability of toxic chemicals to disrupt the adaptation of living organisms (humans and animals) to climate change, since they impede the metabolic process in the human body and can negatively affect, for example, the endocrine system" (Koubassov, 2014, p. 106).

Due to the uncontrolled growth of dirty waste export and import transactions, which began in the 1970s, the international community adopted on 22 March 1989 the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.[17] This treaty "is aimed at protecting human health and the environment by reducing the generation of hazardous waste, maximizing the disposal of hazardous waste, preventing the transportation of hazardous waste to countries that do not have specialized enterprises and facilities for their safe processing, minimizing the transboundary movement of hazardous waste and finding ways to environmentally sound and efficient use of such waste. The list of categories of wastes to be controlled (waste steams) and wastes having as constituents subject to the Convention is set out in Annexes I and II."[18] "The procedure for the disposal or recycling of such waste is established by the national legislation of the States in accordance with the general requirements set out in Art. 4, 13 and Annex V A of the Convention."[19]

[16] Chemicals, Wastes and Climate Change Interlinkages and Potential For Coordinated Action, p. 31.

[17] Available at: http://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx [Accessed 10.08.2024].

[18] Annexes I and II of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal: adopted on 22 March 1989. Available at: http://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx [Accessed 10.08.2024].

[19] Annex V of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal: adopted on 22 March 1989. Available at: http://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx [Accessed 10.08.2024].

Thus, this treaty specifies requirements for management, reduction of the volume, disposal and transportation of hazardous wastes, including those that can potentially have harmful effects on climate change. As a result, proper implementation of the provisions of the Convention (to date, 190 states are parties to it, all UN member states except the USA, San Marino and Haiti)[20] can reduce the impact of chemical waste on climate change.

Another convention regulating the use of chemicals is the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, which was adopted on 10 September 1998.[21] "It promotes common responsibility and joint efforts of the Parties in international trade in hazardous chemicals and pesticides through a more open exchange of information about their properties, establishes certain packaging requirements and labeling for a number of chemicals, requires assistance in their environmentally sound use and safe regulation, and also requires States to inform consumers and the Convention Secretariat in a timely manner of any restrictions or prohibitions on such chemicals and pesticides in order to protect the environment and public health from their potentially harmful effects."[22] Unlike the Basel Convention, the Rotterdam Convention primarily regulates the movement of hazardous chemicals and pesticides rather than their impact on climate change.

The Stockholm Convention on Persistent Organic Pollutants (POPs) adopted on 22 May 2001[23] protects human health and the environment from persistent organic pollutants, "which are organic compounds characterized as toxic substances that accumulate in the environment

[20] Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Available at: http://www.basel.int/Countries/StatusofRatifications/PartiesSignatories/tabid/4499/Default.aspx [Accessed 10.08.2024].

[21] Available at: https://unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.33/2013/mtg1/RC_Convention_Russian.pdf [Accessed 10.08.2024].

[22] Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade: adopted on 10 September 1998. Art 1, 5, 11, 13.

[23] Available at: https://chm.pops.int/Portals/0/sc10/files/a/stockholm_convention_text_r.pdf [Accessed 10.08.2024].

(water, soil, air, biological objects) with a high level of migration" (Mayorova, 2021). "Such pollutants include pesticides and industrial chemicals that are formed as by-products during some chemical processes or during combustion, and the sound management of POPs is one of the main environmental problems of our time" (Nebytov, 2017).

According to the report "Climate Change and POPs: Predicting the Impacts" "climate change will lead to an increase in the transfer of persistent organic pollutants to the Arctic and other remote regions; will increase the adverse effects of POPs in regions where ambient temperature and salinity levels rise; will lead to a change in the distribution of pollutants, in particular including POPs, in the environment; persistent organic pollutants will interact with physiological, behavioral and environmental adaptation to climate change and, thereby, affect the ability of organisms, populations, communities and ecosystems to withstand and/or adequately adapt to climate change."[24]

In order to "protect the environment, including combating climate change, the Convention defines and approves a list of POPs that must be eliminated and cannot be imported or exported (Annex A 'Elimination'), such substances are subject to a total ban on their use worldwide and are subject to certain time limits for their complete phase-out."[25] Annex B "Restriction," in turn, sets out a list of "substances whose use is authorised for restricted purposes,"[26] while Annex C "Unintentional Production" lists substances that are generated by production processes and for which measures must be taken to reduce and eliminate their emissions (Khamidulina and Vinogradova, 2017).

The Minamata Convention on Mercury, adopted on 10 October 2013, is the most recent international agreement governing the management

[24] Guidance on how to assess the possible impact of climate change on the work of the Persistent Organic Pollutants Review Committee: POPRC-9/8, 25 February 2014, Para. 35. Available at: https://chm.pops.int/Portals/0/download.aspx?d=UNEP-POPS-POPRC.9-POPRC-9-8.Russian.pdf [Accessed 10.08.2024].

[25] Annex A of the Stockholm Convention on Persistent Organic Pollutants: adopted on 22 May 2001. Available at: https://chm.pops.int/Portals/0/sc10/files/a/stockholm_convention_text_r.pdf [Accessed 10.08.2024].

[26] Annex B of the Stockholm Convention on Persistent Organic Pollutants: adopted on 22 May 2001. Available at: https://chm.pops.int/Portals/0/sc10/files/a/stockholm_convention_text_r.pdf [Accessed 10.08.2024].

of chemicals and waste.[27] According to the review prepared by the Arctic Monitoring and Assessment Program in 2021, "climate change affects the behavior of mercury in the Arctic, although great uncertainties remain regarding the long-term effects of mercury exposure on wildlife and humans. The most obvious evidence of the impact of climate change is associated with the release of mercury as a result of melting permafrost and melting glaciers, its subsequent entry into the aquatic environment and through the food chain into the body of marine animals, and then into the human body."[28]

The Convention contains a number of provisions to reduce mercury emissions, wastes and use in industrial processes that can also contribute to climate change. Article 5 of the Convention regulates the process of phasing out the use of mercury and its compounds in certain production processes, Para. 1 Art. 8 of the Convention regulates the process of controlling and reducing emissions of mercury and its compounds in atmosphere, water and soil, however, such a reduction has been established only for 5 sources, Art. 11 of the Convention deals with the problem of environmentally sound management of mercury wastes. Coordinated implementation of the obligations deriving from the provisions of the Convention will lead to an overall reduction in mercury levels in the environment over time, and thereby reduce its impact on climate change.

The process of drafting a convention to combat plastic pollution is currently underway (Wang, 2023; Tessnow-von Wysocki and Le Billon, 2019). The UN Environment Assembly (UNEA) in 2022 resolved to end plastic pollution by adopting the resolution 5/14,[29] which established an Intergovernmental Negotiating Committee (INC) to work towards a treaty. The INC has met five times since 2022 (INC-1, INC-2, INC-3,

[27] Available at: https://www.mercuryconvention.org/sites/default/files/2021-06/Minamata-Convention-booklet-rus-full.pdf [Accessed 10.08.2024].

[28] AMAP Assessment 2021: Mercury in the Arctic, p. 92. Available at: https://www.amap.no/documents/download/6888/inline [Accessed 10.08.2024].

[29] Resolution adopted by the United Nations Environment Assembly on 2 March 2022, 5/14. End plastic pollution: towards an international legally binding instrument. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/39812/OEWG_PP_1_INF_1_UNEA%20resolution.pdf [Accessed 10.08.2024].

INC-4 and INC-5),[30] managing to overcome initial procedural challenges and initiating text-based negotiations on a compilation draft text of the future agreement. At the last meeting in 2025, it is planned to adopt the final draft of the convention. There is a number of issues involved in drafting such a convention: environmental (recycling of plastic waste, finding alternatives to plastics), industrial (types of plastics states are ready to limit or ban in the near and distant future), and, of course, climatic issues (plastics' contribution to climate change throughout their entire life cycle, including through greenhouse gas emissions during their production and after emission, when they are exposed to solar radiation or disposed of by open burning). In the ocean, plastic waste releases methane and ethylene and breaks down into plastic microparticles that negatively affect marine organisms such as plankton that absorb carbon dioxide. According to the UNEP report "From Pollution to Solution: a global assessment of marine litter and plastic pollution," published in 2021, "the level of greenhouse gas emissions associated with the production, use and disposal of conventional fossil fuel-based plastics is forecast to grow to approximately 2.1 gigatons of carbon dioxide equivalent (GtCO2e) by 2040, or 19 per cent of the global carbon budget (the total annual emissions budget allowed while limiting global warming to 1.5 °C, despite the fact that in 2021 this figure was 3 %)."[31]

Thus, "despite the presence of international legal instruments, binding and recommendatory, regulating the issues of reducing emissions and reducing waste from the chemical industry, attention to this issue continues to grow, as the average temperature on our planet increases every year" (Arts and Gupta, 2004). The approaches to addressing climate change and managing chemicals and waste should be interrelated and include efforts to reduce greenhouse gas emissions, promote proper disposal and recycling of chemicals, compounds and

[30] Intergovernmental Negotiating Committee on Plastic Pollution. Available at: https://www.unep.org/inc-plastic-pollution [Accessed 10.08.2024].

[31] Report of the UN Environment Programme "From Pollution to Solution: A global assessment of marine litter and plastic pollution," 21 October 2021, p. 62. Available at: https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution [Accessed 10.08.2024].

their waste, apply low-carbon emitting technologies and eliminate illegal trade in hazardous waste. An analysis of the main treaties that deal with the management of chemicals has shown that universal international agreements regulate only certain stages of the life cycle of a chemical, with the exception of the Minamata Convention on Mercury. The Basel, Rotterdam and Stockholm Conventions do not contain provisions prohibiting or restricting the production, trade and use of large quantities of chemicals in production processes or products. The Minamata Convention, in turn, is imperfect, since it does not set thresholds for mercury waste, mercury emissions are regulated with respect to only five sources (coal-fired power plants; coal-fired industrial boilers; smelting and roasting processes used in the production of non-ferrous metals; waste incineration facilities; cement clinker production facilities). The lack of appropriate international legal regulation leads to the formation of 7 % of global anthropogenic greenhouse gas emissions, which have an impact on climate change.

III. Biological Diversity, Genetic Resources and Climate Change

Biodiversity, as a life-support system for humanity, is of exceptional importance. "Biodiversity and climate change are closely linked, and each of them affects each other: biodiversity is threatened by anthropogenic climate change, but biodiversity resources can also mitigate the effects of climate change on people and ecosystems" (Fitzmaurice, 2021).

"The risk of species extinction continues to worsen, as evidenced by a 12 % deterioration in the aggregate Red Book index between 1993 and 2024 (and 4 % since 2015). Recently, a comprehensive reassessment of the risk of extinction of amphibian species was carried out, which showed that for amphibians, the most serious drivers increasing the risk of extinction are the effects of climate change, habitat conversion and invasive fungal disease."[32]

It was not so long ago that scholars doubted the possibility of legal regulation of relations related to climate change and the conservation

[32] Report of the UN Secretary-General "Progress towards the Sustainable Development Goals," Para. 129.

of biological diversity, pointing out to the following arguments: the legal regime of climate change and the legal regime of biodiversity operate in different directions, which do not allow linking the policy of biodiversity and climate change with the decision-making process (Scheffers and Pecl, 2019); as a result of overlapping legal regimes, there is a significant risk that climate change policies will be incompatible with biodiversity conservation goals and that biodiversity policies may interfere with the achievement of climate change policy goals (Hodas, 2008). However, we see today that "soft law instruments regulating relations in the field of climate change and conservation of biological diversity are being adopted at the universal level of the COP Convention on Biological Diversity" (Trouwborst, 2022) in more detail year after year. Thus, at COP-5, "the risks of climate change were highlighted, in particular for coral reefs and forest ecosystems, at COP-7, States were urged to manage ecosystems in order to increase their resilience to extreme climatic events, helping to adapt to climate change, then, in 2006, COP-8 emphasized the importance of integrating biodiversity issues into all relevant national policies, programmes and plans in response to climate change."[33] The authors posit that the important phenomenon of interdisciplinarity, synergy, and interconnection between conventions, which through the cumulative effect, will be able to increase the effectiveness of joint solutions to the problem of climate and biodiversity. "COP-8 noted the need to organize complementary activities to be carried out by the secretariats of the "three Rio Conventions" (The United Nations Framework Convention on Climate Change 1992 (UNFCCC), The United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD) and The Convention on Biological Diversity (CBD)), Parties and relevant organizations" (McDonald and McCormack, 2021).

"Today, the extreme climate situation is increasingly causing irreversible losses of natural ecosystems and biodiversity. Half of the biological species studied to date have moved to colder areas, hundreds

[33] COP Decisions. Biodiversity and Climate Change Decisions. Available at: https://www.cbd.int/climate/decision.shtml [Accessed 10.08.2024].

of other species are on the verge of extinction due to the retreat of glaciers, melting permafrost, ocean oxidation, sea level rise, reduced precipitation, desertification and land degradation. Over the last century, fifty percent of the world's wetlands have been destroyed."[34] It is extremely important to restore wetlands, given the ability of wetlands "to contribute to ecosystem-based adaptation to climate change and to sequester and store carbon as important responses for climate change mitigation."[35] This scientific evidence is reflected in international instruments,[36] "including the resolutions of the COP of the Ramsar Convention (resolution XIV.17 "The protection, conservation, restoration, sustainable use and management of wetland ecosystems in addressing climate change,"[37] resolution XI.14 "Climate change and wetlands: implications for the Ramsar Convention on Wetlands,"[38] resolution XIII.14 "Promoting conservation, restoration and sustainable

[34] Intergovernmental Panel on Climate Change. AR6 Synthesis Report (SYR), Longer report, 19 March 2023, p. 84. Available at: https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf [Accessed 10.08.2024].

[35] 14th Meeting of the Conference of the Contracting Parties to the Ramsar Convention on Wetlands "Wetlands Action for People and Nature" (Wuhan, China, and Geneva, Switzerland 5–13 November 2022). Resolution XIV.17 "The protection, conservation, restoration, sustainable use and management of wetland ecosystems in addressing climate change." Available at: https://www.ramsar.org/sites/default/files/documents/library/xiv.17_climate_change_e.pdf [Accessed 10.08.2024].

[36] Moreover, it is argued that peatlands may become the main terrestrial ecosystems capable of absorbing carbon dioxide from the atmosphere in the near future. This will happen due to the fact that forests, traditional CO2 storage sites on our planet, are rapidly losing a similar function. "Long-term research by the international team of researchers have convincingly proved that wetlands have a more significant climate-regulating function compared to forests. Peatlands contain twice as much carbon as all terrestrial forest ecosystems in the world. They cover only 3 % of the planet's surface, but store one-third of soil carbon that is accumulated on the land of our planet," the Siberian scientists noted in the study.

[37] 14th Meeting of the Conference of the Contracting Parties to the Ramsar Convention on Wetlands "Wetlands Action for People and Nature" (Wuhan, China, and Geneva, Switzerland 5–13 November 2022). Resolution XIV.17.

[38] 11th Meeting of the Conference of the Parties (Bucharest Romania, 6–13 July 2012). Resolution XI.14 "Climate change and wetlands: implications for the Ramsar Convention on Wetlands." Available at: https://www.ramsar.org/meeting/11th-meeting-conference-parties [Accessed 10.08.2024].

management of coastal blue-carbon ecosystems,"[39] emphasizing the value of certain types of wetlands as natural carbon sinks), as well as in the 4th Ramsar Strategic Plan 2016–2024, which recognizes the important ecosystem services that provide wetlands to contribute to halting biodiversity loss, food security, healthy living, water quality and supply, water security, disaster risk reduction, adaptation and mitigation of climate change.[40]

As part of the overall NDC, it was indicated that the number of parties to the Paris Agreement that identified synergies between adaptation and mitigation, especially in the sectors of terrestrial and marine ecosystems and biodiversity, agriculture, energy, water resources and health, amounted to 27 %. "Examples of synergistic effects include increasing the sustainability of mangroves and algae (environmental solutions) to reduce flooding and increase carbon uptake; enhancing carbon stocks in forests through the restoration and conservation of local forest species; introducing climate-smart agriculture and agroforestry practices to diversify crops, promote soil conservation, and control diversification and increased carbon sequestration; using renewable energy sources; improving reservoir systems and pumped storage facilities to ensure water safety; reusing treated wastewater to promote conservation of freshwater resources; and reducing respiratory diseases by decreasing the use of fossil fuels."[41]

The current practice in the field of access to genetic resources and the fair and equitable sharing of benefits from their use (hereinafter referred to as "ABS") indicates the need for systematization of the regulatory framework and institutionalization. We have analyzed the

[39] 13th Meeting of the Conference of the Parties (Dubai United Arab Emirates, 21–29 Oct. 2018). Resolution XIII.14 "Promoting conservation, restoration and sustainable management of coastal blue-carbon ecosystems." Available at: https://www.ramsar.org/meeting/13th-meeting-conference-parties [Accessed 10.08.2024].

[40] Available at: https://www.ramsar.org/sites/default/files/hb2_5ed_strategic_plan_2016_24_e.pdf [Accessed 10.08.2024].

[41] Nationally determined contributions under the Paris Agreement, 14 October 2023, p. 167. Available at: https://unfccc.int/documents/632334 [Accessed 10.08.2024].

existing international legal mechanisms for regulating access to genetic resources for food production and agriculture that play a crucial role in adapting to climate change, as confirmed by particular international instruments, mechanisms and practices. The issues raised above correspond to the SDGs, since all the goals are directly or indirectly related to climate change and the use of genetic resources.

"Countries continue to make progress in ratifying and implementing access to genetic resources and benefit-sharing instruments. By July 2024, 101 States had reported on their legislative, administrative or policy measures under the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits from their utilization to the Convention on Biological Diversity."[42]

Food security and climate change remain among the most serious challenges facing the global community (Abashidze and Solntsev, 2019), and these two issues are directly interconnected. To date, between 702 and 828 million people have experienced food shortages.[43] "The number of extreme weather events (abnormally hot weather, droughts, floods or storms) that pose a threat to human health and life over the period 2015–2020 appeared in 52 % of states, such climatic phenomena have a significant impact on food security, increase the burden on agro-food systems."[44] The maintenance of food production in such conditions has already been reflected in such universal documents as the UNFCCC[45] and the Paris Agreement, which also recognizes "the fundamental priority of safeguarding food security and ending hunger, and the particular

[42] CBD website. National report analyzer. Available at: https://absch.cbd.int/en/reports/analyzer [Accessed 10.08.2024].

[43] The State of Food Security and Nutrition in the World — 2022. Repurposing food and agricultural policies to make healthy diets more affordable, FAO, IFAD, UNICEF, WFP and WHO, Rome, 2022. Available at: https://openknowledge.fao.org/server/api/core/bitstreams/67b1e9c7-1a7f-4dc6-a19e-f6472a4ea83a/content [Accessed 10.08.2024].

[44] The State of Food Security and Nutrition in the World — 2022. Repurposing food and agricultural policies to make healthy diets more affordable, FAO, IFAD, UNICEF, WFP and WHO, Rome, 2022.

[45] The United Nations Framework Convention on Climate Change (UNFCCC): adopted on 9 May 1992, Art. 7. Available at: https://www.un.org/ru/documents/decl_conv/conventions/climate_framework_conv.shtml [Accessed 10.08.2024].

vulnerabilities of food production systems to the adverse impacts of climate change."[46]

Agricultural and food systems have a special role to play in combating climate change. Transformations are needed in these systems at the global, regional and national levels, including crops, livestock, forestry, fisheries, aquaculture, food supply chains and biodiversity. "The Food and Agriculture Organisation of the United Nations (FAO) and the Commission on Genetic Resources for Food and Agriculture (GRFA)... established in 1983 within this organisation, play a special role in the context of the development of documents, mechanisms, measures and procedures to support research and development on genetic resources for food and agriculture."[47]

It is worth highlighting the FAO study "The role of genetic resources for food and agriculture in adaptation to and mitigation of climate change,"[48] the main findings of which testify that "that in all sectors it is necessary to use GRFA wisely to promote adaptation to climate change and mitigate its consequences and also that the potential for the use of GRFA remains largely untapped."[49]

It should be noted, in order to develop adaptation methods, the risks posed by climate change to food and agriculture. The main risks among them are the following: 1) temperature increase can lead to infection and

[46] Preamble of the Paris Agreement and The United Nations Framework Convention on Climate Change (UNFCCC).

[47] The Commission on Genetic Resources for Food and Agriculture. Available at: https://www.fao.org/cgrfa/en/ [Accessed 10.08.2024].

For more information on FAO's work, see FAO's Work on Climate Change, FAO's Work on Climate Change. CGRFA/WG-AnGR-12/23/7 Inf.1. Commission On Genetic Resources for Food and Agriculture. Intergovernmental Technical Working Group on Animal Genetic Resources for Food and Agriculture, Twelfth Session, Rome, 18–20 January 2023. Available at: https://www.fao.org/3/cc3852en/cc3852en.pdf [Accessed 10.08.2024].

[48] The Role of Genetic Resources for Food and Agriculture in Adaptation to and Mitigation of Climate Change. FAO Commission on Genetic Resources for Food and Agriculture. FAO, 23 May 2022, p. 107. Available at: https://www.fao.org/3/cb9570en/cb9570en.pdf [Accessed 10.08.2024].

[49] Report of The Commission on Genetic Resources for Food and Agriculture. CGRFA-18/21/Report. P. 17. Eighteenth Regular Session of the Commission on Genetic Resources for Food and Agriculture 27 September — 1 October 2021. Available at: https://www.fao.org/3/nh331en/nh331en.pdf [Accessed 10.08.2024].

spread of diseases among livestock, plants, and to microbial growth); 2) temperature increase, changes in precipitation patterns, and drought have a negative impact on crop yields, as well as nutrient content of plant resources has a negative impact on the fight against hunger; lack of necessary resources leads to population reduction of certain species or complete disappearance, reduction of biota; 3) changes in ecosystem lead to the disappearance of sedentary organisms that can only live in a certain area and ecosystem (for example, corals) and a change in the habitat of mobile organisms (for example, migration of certain fish species with increasing water temperature); 4) the increasing burden on agri-food systems leads to the fact that states, agro-industrial enterprises and farmers need to optimize production, which implies additional costs and expenses, labor costs (individual states are already facing insufficient drinking water or food, climate change only increases the volume of necessary products, such limited access or complete lack of access to individual types of resources can lead to an increase in prices and the corresponding availability of necessary resources for the population); 5) new climatic conditions make some breeds and varieties unsuitable for the regions, forcing optimization of food value chains, making it more difficult to maintain biodiversity and implement the ABS measures.

In addition to the above-mentioned documents, international legal framework has already been developed to solve the problems under consideration: the 1992 Convention on Biological Diversity,[50] the 2010 Nagoya Protocol on Access to Genetic Resources and Benefit-Sharing,[51] the 2000 Cartagena Protocol on Biosafety,[52] that govern legal relations

[50] Convention on Biological Diversity: adopted on 5 June 1992. Available at: https://www.un.org/ru/documents/decl_conv/conventions/biodiv.shtml [Accessed 10.08.2024].

[51] The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization: adopted on 29 October 2010. Available at: https://www.cbd.int/abs/doc/protocol/nagoya-protocol-ru.pdf [Accessed 10.08.2024].

[52] Cartagena Protocol on Biosafety to the Convention on Biological Diversity: adopted on 29 January 2000. Available at: https://www.un.org/ru/documents/decl_conv/conventions/pdf/cartagena.pdf [Accessed 10.08.2024].

related to biological diversity and use of genetic resources at the universal level.

"FAO has also developed an international legal framework for adaptation to climate change the International Treaty on Plant Genetic Resources for Food and Agriculture 2001,"[53] "the Second Global Action Plan on Animal Genetic Resources FAO 2011,"[54] "Voluntary Guidelines to Support the Integration of Genetic Diversity into National Climate Change Adaptation Planning 2015,"[55] "FAO Resolution No. 7/2022 'Farmers' rights' 2022,"[56] etc.

The objectives of the 2001 International Treaty on Plant Genetic Resources for Food and Agriculture are "the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security." In accordance with Para. 2 Art. 10, this Treaty "establishes a multilateral system, which is efficient, effective, and transparent, both to facilitate access to plant genetic resources for food and agriculture, and to share, in a fair and equitable way, the benefits arising from the utilization of these resources, on a complementary and mutually reinforcing basis." It can be noted that the key documents related to genetic resources aim at the sustainable use of resources, which would be a measure for adaptation to climate change.

It is also worth noting that for nearly twenty years the UN has been actively engaged in the drafting of an instrument to "promote the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction. Thus, on 19 June 2023, the

[53] Available at: https://www.wipo.int/wipolex/ru/text/195806 [Accessed 10.08.2024].

[54] Available at: https://www.fao.org/3/i2624r/i2624r00.pdf [Accessed 10.08.2024].

[55] Voluntary Guidelines to Support the Integration of Genetic Diversity into National Climate Change Adaptation Planning. Commission on Genetic Resources for Food and Agriculture, Food and Agriculture Organization of the United Nations, 24 November 2015. Available at: https://www.fao.org/3/i4940r/i4940r.pdf [Accessed 10.08.2024].

[56] Available at: https://www.fao.org/3/nk242ru/nk242ru.pdf [Accessed 10.08.2024].

Intergovernmental Conference on an international legally binding instrument based on the UN Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity in Areas beyond National Jurisdiction was held in New York. It adopted the Agreement based on the UN Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity in Areas beyond National Jurisdiction."[57] The Agreement was opened for signing on 20 September 2023.

Thus, it can be observed that now there is a sufficient number of legally binding mechanisms in the area of climate change adaptation that emphasize the special role of genetic resources for food and agriculture, but one should also keep in mind their "vulnerability" in case of incorrect and inefficient use of such resources.

The international community and individual states can effectively use already available tools and methods related to GRFA in order to adapt to climate change. These include 1) national and international programs for the development of early warning systems, exchange of information on characteristics and assessment; 2) breeding programs (distribution of drought-resistant, disease-resistant breeds, crossing of locally adapted and exotic species); 3) conservation, protection, restoration of ecosystems (marine ecosystems as carbon sinks, forests); 4) optimization of production, breeding, public-private partnership, farm support; 5) introduction of conservation agriculture, reduction of the use of inorganic fertilizers and pesticides; 6) ensuring the implementation of the ABS regime in accordance with the requirements of international law, taking into account possible risks, so as to avoid the recurrence of such phenomenon as "Columbian exchange;" 7) maintaining indigenous peoples and their traditional knowledge related to genetic resources, as it is indigenous peoples in many regions, such as Latin America and the Caribbean, who play a key role in preserving habitat conditions.

Thus, it can be noted that the international community has already developed a fairly broad legal framework and certain mechanisms for the use of GRFA as a tool for adaptation to climate change, but

[57] Available at: https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXI-10&chapter=21&clang=_en#EndDec [Accessed 10.08.2024].

its application remains insufficiently effective due to the increasing agricultural burden arising from climate change, as well as the lack of clear goals, guidelines, and national implementation mechanisms, especially in developing countries.

IV. Conclusion

Today, the negative effects of climate change are reflected in various spheres of life: from increased disaster risks to people's ill-health caused by excessive heat and burning forests. In these circumstances, legal professionals and researchers engaged in natural sciences should jointly develop and propose legal mechanisms that will be able to link climate issues with other aspects at the international and national levels. This article shows how the processes of gradual expansion of regulation of the subject of international treaties occur by taking separate measures at periodic conferences of the parties to these treaties. The authors emphasize that international co-operation of states in this sphere will be further developed precisely within the framework of synergistic action of various international treaties, SDGs, and various soft law instruments. As stated in the UNEP resolution 6/4, adopted on 1 March 2024, it is necessary to "enhance synergies, cooperation or collaboration, as appropriate, when implementing their respective obligations and commitments under Multilateral Environmental Agreements and other relevant environmental instruments, while respecting their individual mandates, thereby contributing to the effective implementation of national environment policies and actions, delivering global environmental benefits, contributing to the achievement of 2030 Agenda for Sustainable Development and the Sustainable Development Goals, considering the best available science, indigenous knowledge, traditional knowledge, and local knowledge."[58]

[58] Resolution 6/4 "On promoting synergies, cooperation or collaboration for national implementation of multilateral environmental agreements and other relevant environmental instruments": adopted 1 March 2024. Available at: https://www.unep.org/environmentassembly/unea6/outcomes [Accessed 10.08.2024].

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