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Scientific diaspora — a unique asset for post-war recovery of Ukraine

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Abbreviations

GDP – Gross Domestic Product

R&D – Research and Development

ERA – European Research Area

EU – European Union

HEI – Higher Education Institution

IMF – International Monetary Fund

MFA of Ukraine – Ministry of Foreign Affairs of Ukraine

IOM – International Organization for Migration

MoES of Ukraine – Ministry of Education and Science of Ukraine

NAS of Ukraine – National Academy of Sciences of Ukraine

S&T – Science and Technology

NTSh – Shevchenko Scientific Society

NRFU – National Research Foundation of Ukraine

SDGs – Sustainable Development Goals

VAT – Value Added Tax

UkrISTEI – Ukrainian Institute of Scientific and Technical Expertise and Information

Executive summary

The issue of scientific personnel in Ukraine has never been as acute as it is today. Over the years of independence, a range of factors has led to a brain drain, typically of young and highly qualified professionals, from Ukrainian science abroad and the formation of the Ukrainian scientific diaspora. The full-scale invasion of Russia into Ukraine on February 24, 2022, triggered a new large wave of migration of scientists.

At the same time, scientists can play a crucial role in addressing numerous challenges arising during and after, including security and defense capabilities, energy, environmental consequences of war, natural resources management, healthcare for military personnel and the population, psychological rehabilitation, etc.

This White Paper addresses the issue of the scientific diaspora — a vital intellectual and human capital owned by Ukraine. Despite its readiness and openness for close cooperation, this potential has remained largely unnoticed by the state for many years. However, the experience of numerous countries worldwide, especially those with a large scientific diaspora (such as China, India, Mexico, and

others), underscores the importance of their involvement in science for economic growth and transforming brain drain into brain circulation. In particular, the highly skilled diaspora has played a crucial role in the post-war recovery of countries that have experienced wars on their territories (Germany, Japan, South Korea, countries of the former Yugoslavia, Israel).

The analysis of the situation with the Ukrainian scientific diaspora has revealed their readiness for closer cooperation, as well as the motivation of a significant number of expatriates to return to Ukraine after the war. At the same time, a number of prerequisites and necessary measures critical for enabling both processes have been identified, thus the following proposals are suggested:

- Strengthen institutional support for cooperation with the diaspora, including the scientific one;
- Ensure compliance with academic mobility provisions during wartime and post-war;
- Improve the legal framework for involving foreign scientists and the scientific diaspora in employment in research institutions and higher education institutions;
- Develop pilot programs to facilitate the return of valuable Ukrainian scientists

working abroad focusing on priority scientific areas;

- Conduct a comprehensive set of measures to map the Ukrainian scientific diaspora, establish and develop networks and institutions of the scientific diaspora in EU countries and worldwide, and establish connections with the Ukrainian scientific diaspora;
- Initiate a dialogue with international organizations promoting the repatriation of scientists to develop programs for the return of Ukrainian scientists — who are forced migrants;
- Develop proposals for the establishment of a Diaspora Foundation — a non-governmental organization that could accumulate funds from the diaspora, business, international donors, to support

programs for the return of Ukrainian scientists, and projects of Ukrainian scientists.

Utilizing the potential of the Ukrainian scientific diaspora presents an opportunity to make a sort of **leapfrogging** in scientific personnel management, accelerating the recovery process in Ukrainian science and various sectors of the country's economy.

*Leapfrogging — a concept used in many spheres of economics and business, the main idea of which is that the implementation of radical innovations, policies allows skipping certain stages of development, accepted in traditional approaches or strategies, thereby bypassing a number of associated problems.

Introduction

The experience of many countries that underwent post-war reconstruction demonstrates the importance of educated and highly qualified professionals, including scientists, as valuable resources. Japan, for instance, a nation lacking in natural resources, successfully emerged as one of the world's economic leaders over several decades after the war, largely due to effective utilization of human capital, science, and innovation [1]. Similarly, the “economic miracles” of Germany, South Korea, and Taiwan can be attributed in large part to highly skilled personnel, with the diaspora playing a significant role in bringing money, business connections, and knowledge.

However, in today's globalized world, developing countries face significant challenges in retaining human resources and receiving benefits from them. Talented youth and scientific personnel quickly “diffuse” to countries offering more favorable conditions for work, study, and business creation. Without proactive measures, the brain drain phenomenon can severely undermine a country's scientific, innovative, and economic potential.

Unfortunately, Ukraine serves as a vivid example of such inaction. Over 30 years of independence, the number of researchers in Ukraine working in science has decreased almost sixfold: from 295,000 (in 1991) to 52,400 (in 2022) individuals [2–3]. Some have left science altogether, while others have transitioned to related industries. However, a significant portion (thousands of Ukrainian scientists) have found themselves in universities and research centers abroad. The full-scale invasion of Russia into Ukraine on February 24, 2022, caused another major wave of migration of Ukrainians, including over 6,000 employees of the scientific sphere who left the country. This has contributed to the numerical Ukrainian scientific diaspora and deepening the personnel crisis in Ukrainian science [4].

The purpose of this book is to analyze the potential for engaging the Ukrainian scientific diaspora in cooperation with Ukrainian scientists, particularly in the context of post-war reconstruction, and creating prerequisites to transform brain drain into brain circulation in Ukraine.

In this study, we consider the concept of the scientific diaspora in a broad context, relying on the definition of the diaspora provided by the International Organization for Migration (IOM) [5]: “The diaspora consists of individuals and members of networks, associations, and communities who have left the country of origin but maintain ties with their homeland. This concept encompasses both more settled immigrant communities, temporary labor migrants living abroad, and emigrants with the citizenship of the host country, individuals with dual citizenship, and emigrants of the second/third generation” — and we highlight the part of this community engaged in scientific activities, including the category of scientists—forced migrants [6].

Historically, the Ukrainian scientific diaspora received little attention from the Ukrainian government and the research institutions, including the National and sectoral academies of sciences, as well as institutions of higher education (IHEs). And only now the situation is gradually beginning to change. After all, the

post-war recovery of Ukraine and Ukrainian science requires not only large investments, infrastructure restoration, and institutional changes. There is a critical demand for highly qualified personnel who possess modern methodological approaches, have experience in organizing work and obtaining competitive funding in high-competition conditions abroad, as well as a considerable network of contacts among colleagues and business representatives worldwide. And today, thanks to the involvement of the scientific diaspora, Ukraine can significantly accelerate the processes of recovery both in its science and in many sectors of the country’s economy.

The insights presented in this White Paper were developed by the “Science at Risk” project. They are also partially featured in the White Paper **“Ukrainian Scientists in Post-War Recovery”**, which covers a wider range of issues related to the role of scientific capital in post-war reconstruction of Ukraine and was also prepared within this project (by a wider authorship team).

Research Methodology

To comprehensively gather insights about Ukrainian scientists abroad, their involvement in cooperation with Ukrainian colleagues, readiness to assist in post-war reconstruction of Ukraine, and motivation to return to Ukraine, the authors undertook a multifaceted research approach encompassing desk research, as well as surveys and in-depth interviews.

Specifically, as a part of desk research, an extensive examination of literature sources pertaining to the Ukrainian scientific diaspora was conducted. Additionally, an analysis of institutional framework governing migration in Ukraine, along with an exploration of organizations, either founded by the scientific diaspora or closely linked to its activities was undertaken. Drawing upon international experience and best practices of engaging the scientific diaspora were studied, including countries with large diasporas (such as China, India, the Philippines, Mexico, Chile), as well as countries that suffered from armed conflict in the past (Bosnia and Herzegovina, Croatia, Moldova, Georgia).

A pivotal aspect of this research endeavor was the administration of a survey to nearly 400 representatives of the scientific diaspora

spanning 38 countries worldwide. The survey elicited important data concerning the respondents' career positions, collaboration with research institutions and higher education institutions (HEIs) in Ukraine, as well as their aspirations and considerations regarding a potential return to Ukraine after the war, including prerequisites for such return. The obtained data provide a nuanced portrayal of the Ukrainian scientific diaspora, important for understanding the tools that can strengthen interaction with diaspora scientists in the present context.

Survey data were complemented with qualitative analysis methods. In particular, 19 in-depth interviews were conducted with representatives of the scientific diaspora from eight countries, spanning different age groups, career positions, and durations of residence abroad. Additionally, experts were interviewed including representatives from scientific diaspora associations, researchers specializing on migration issues of scientists, and stakeholders from Ukrainian institutions interested in collaboration with the diaspora. The interviews covered a comprehensive questionnaire consisting of 24 questions, divided into four sections: general questions,

cooperation with Ukraine, vision of post-war recovery of Ukrainian science and the country at large. Furthermore, a focus group session was convened with seven participants to explore opportunities for enhancing cooperation, the role of scientific diaspora organizations, and post-war challenges for Ukrainian science. Corresponding questions were prepared for each section of the focus group scenario.

The utilization of the diverse methods in the research facilitated a thorough evaluation of the current engagement of the scientific diaspora in Ukrainian science, their vision on the future of Ukrainian science and post-war

reconstruction of Ukraine, and an assessment of the motivations of various diaspora subcategories to return to Ukraine for scientific and teaching work. Drawing from this analysis, a series of recommendations were formulated for various stakeholders delineating opportunities to strengthen cooperation with the scientific diaspora for their involvement in post-war reconstruction of Ukraine.

The White Paper was prepared using information from open sources available as of the end of October 2023; information and data emerging thereafter were not considered in the research.

SECTION 1. DIASPORA: ITS ROLE AND THE UKRAINIAN SCIENTIFIC DIASPORA

1.1. The Role of Diaspora in Social and Economic Development of a Country

The term “diaspora” originates from ancient Greek and in modern interpretation refers to a group of people who have migrated from their place of origin to a new country while maintaining a certain connection with their homeland [7]. An important characteristic is also a certain level of awareness among diaspora members of their own identity regarding their homeland and members of other regions or communities [8].

Over the last quarter century, due to unprecedented levels of migration and forced displacement, the size of the diaspora worldwide has significantly increased [9]. At the same time, diaspora communities become a powerful source of external assistance for countries of origin. In 2018 alone, the level of remittances to low- and middle-income countries from their diasporas reached \$529 billion [10].

However, the assistance provided by the diaspora is not limited to financial support (remittances and donations) but takes many other forms including partnerships (especially in business), education and transfer of knowledge and skills, advisory and mentoring support, various forms of diplomacy (cultural, scientific) aimed at representing and promoting the interests of the country of origin [11]. Furthermore, the role of diaspora in social and economic development of countries, poverty reduction, and prosperity enhancement is crucial. Moreover, in recent years, the contribution of diaspora communities to the sustainable development of their countries of origin has been recognized at the level of global initiatives, including the 2030 Agenda for Sustainable Development, the New York Declaration on Refugees and Migrants, and Global Forum on Migration and Development summits [12].

1.2. Who Can Be Considered Scientific Diaspora?

The question of defining membership in the scientific diaspora is still the subject of lively debate [13]. In this study, the concept of the scientific diaspora is considered in a broad context and relies on the definition of diaspora proposed by the International Organization for Migration (IOM): “Diaspora — individuals and members of networks, associations and communities who have left the country of origin but maintain ties with their homeland. This concept encompasses both settled immigrant communities, temporary labor migrants, immigrants with citizenship of the host country, individuals with dual citizenship, and second/third generation immigrants” [5].

This definition aligns closely with the formulation proposed by domestic researchers: “The Ukrainian scientific diaspora is a rather informal and dynamic entity, which, in addition to scientists who have permanently migrated, i.e., emigrants, involves graduate students, doctoral students, scholarship holders of various funds, participants in international projects, researchers working under contract, as well as some students” [14].

It is important to note that in this study, the category of scientists who are forced migrants but continue to be citizens of Ukraine and often have refugee status (see Section 3.3.1) is included in the scientific diaspora.

Key criteria for attributing a person to the scientific diaspora include:

- maintaining connections with colleagues, scientific institutions, HEIs, or organizations working in the field of science in the country of origin;
- involvement in scientific research, organizational, teaching work at HEIs, research institutions, R&D departments of companies, or in analytical, consulting activities in the field of science in non-governmental organizations, analytical centers abroad.

And, undoubtedly, the scientist must identify himself as a representative of the Ukrainian diaspora, indicating a certain level of awareness of his own identity, as mentioned above.

1.3. The Ukrainian Scientific Diaspora Before the Full-Scale War of 2022

The Ukrainian scientific diaspora historically formed primarily as a result of major migration waves of Ukrainians in the 19th, 20th, and early 21st centuries. Numerous eminent scientists of Ukrainian origin have made significant contributions to world science and culture, including Igor Sikorsky, an aviation designer; economist Bogdan Havrylyshyn; Steve Wozniak, the co-founder of Apple; Nobel laureate in physics Petro Kapitsa; and

Waldemar Haffkine, the inventor of vaccines against cholera and plague [15].

Due to socio-economic upheavals occurring in independent Ukraine, thousands of scientists left the country. Similar problems affected many other Eastern European countries. However, while most of them in the early 2000s, through reforms and the creation of favorable conditions for scientific development, were

able to significantly reduce the emigration of their scientists abroad, the situation in Ukraine did not improve. Despite the existence of a powerful scientific diaspora abroad, Ukraine lacks a comprehensive state policy addressing both diaspora in general and the scientific diaspora in particular. Therefore, the level of involvement of the intellectual potential of the scientific diaspora, its expertise, skills, and networks in Ukrainian R&D institutions is extremely low.

Until February 2022, engagement with the scientific diaspora was very limited, primarily characterized by sporadic initiatives undertaken by universities, the National Academy of Sciences of Ukraine, the Science Committee of the National Council for Science and Technology, the National Research Fund of Ukraine, several international projects, and joint forums. It is also worth mentioning the interaction of Ukrainian scientists and the diaspora within the framework of the Shevchenko Scientific Society and online communities, including “Ukrainian Scientists Worldwide,” which will be discussed in Section 3.4. It should be noted that since 2016, the German-Ukrainian Academic Society has been an active participant and partly an initiator of such joint initiatives [16].

In particular, in 1990, the Science and Culture Committee for Relations with Ukrainians Abroad was established at the National Academy of Sciences of Ukraine, later renamed the Ukrainian International Committee on Science and Culture at the NAS of Ukraine (UIC at NAS of Ukraine). Over the years of its activity, the UIC has implemented many important initiatives and projects directly related to the scientific diaspora: “Famous Names of Ukrainian Science,” research on “Ukrainian Scientists Abroad: Prospects for Cooperation and Return” (2000), the Forum of the Ukrainian Scientific Diaspora (2018), and others [17].

Since 2014, Ukraine has signed an Association Agreement with the European Union

(EU), thereby gaining access to existing EU instruments for promoting mobility of scientists and establishing direct cooperation with the diaspora. In 2016, following an independent audit of Ukraine’s research and innovation system by European experts, one of the recommendations was to “Deepen cooperation with the scientific diaspora to utilize its potential for the Ukrainian STI (science, technology, and innovation) system” [18].

Later, as part of the implementation of the recommendations of the independent audit, several esteemed Ukrainian scientists working abroad participated in the work of the Identification Committee – a temporary body established to develop a competitive procedure for forming the composition of the Science Committee of the National Council of Ukraine for Science and Technology Development. In addition, Ukrainian expatriate scientists participated as experts in assessing the performance of research institutions of the NAS of Ukraine from 2016 to 2022 [19].

Diaspora scientists were later involved in the assessment of international competitions of the National Research Fund of Ukraine, established in 2018 [20]. With the participation of diaspora representatives, the International Advisors Board of the NFRU, a permanent consultative advisory body, was established [21].

From 2017 to 2019, within the framework of the European Framework Programme FP7, Ukraine participated in International Network Cooperation on Science, Technology, and Innovation for Eastern Partnership Countries (EaP PLUS), one of the tasks of which was to establish cooperation with the scientific diaspora and create a database of the scientific diaspora for consistent and long-term engagement of expatriate scientists in cooperation [22-23].

In March 2018, by the decision of the Ministry of Education and Science of Ukraine, the

Roadmap for Ukraine's Integration into the European Research Area (ERA) was approved. One of the priorities was the free labor market for researchers, and among the measures was the development of academic mobility, internationalization of research, and support for "projects on working with the scientific diaspora" [24].

The importance of the collaboration with the scientific diaspora, and implementing prioritized and long-term measures to foster such collaboration, was also underscored in the analytical report of the National Institute for Strategic Studies in May 2021 [25].

1.4. Ukrainian Scientific Diaspora After the Onset of Full-Scale War

After Russia's full-scale invasion in February 2022, the diaspora issue once again came to the forefront, as over 6 million Ukrainians found themselves abroad, including over 6,000 scientists. At the same time, a significant amount of financial aid in the first months of the war came from representatives of the Ukrainian diaspora and its organizations [26-27]. Moreover, it was the Ukrainian scientific diaspora that, through "scientific diplomacy," contributed to advocating for Ukrainian interests in international organizations, which led to the exclusion of Russia and the suspension of funding for a significant portion of projects and publications by Russian scientists [28].

In the spring of 2023, the Council of Young Scientists under the Ministry of Education and Science of Ukraine, as part of the Scientist Support Office, presented the Ukrainian Science Diaspora initiative, aimed at promoting cooperation between representatives of the Ukrainian scientific diaspora and scientists from research institutions and higher education institutions in Ukraine [29]. To implement this initiative, an online platform is being developed, existing centers of the scientific diaspora are being mapped, and assistance is being provided in establishing such centers in Europe, as

well as seminars and other events are being organized. With the support of the initiative, centers of the Ukrainian scientific diaspora in Poland, France, Luxembourg, and Sweden have been established or are in the process of being established [30].

In June 2023, the President of Ukraine's Fund implemented a project to unite the Ukrainian scientific diaspora in Great Britain with the aim of creating a network of an academic community ready to contribute their knowledge and expertise to the reconstruction of Ukraine, including the development of science, education, and sports [31]. Currently, the Ukrainian-British scientific diaspora is undergoing institutionalization to obtain the legal status of a public organization.

In some countries, the consolidation of diaspora representatives into institutionalized centers occurs through grassroots initiatives. In particular, as of October 2023, such consolidation of Ukrainian scientists into a public organization is taking place in the Czech Republic [32].

The increased activity of the Ukrainian diaspora in general, and the scientific diaspora in particular, the establishment of new organizations, the emergence of new

platforms uniting diaspora representatives, as well as the reassessment of the diaspora's role by state institutions (the Ministry of Education and Science of Ukraine, the President of Ukraine's Fund, etc.) and the civil sector are positive indicators of ongoing changes. In the

future, these changes may result in closer and more productive cooperation between Ukrainian scientists abroad and in Ukraine, as well as in the pooling of efforts for Ukraine's reconstruction after the war.

SECTION 2. HOW TO TRANSFORM “BRAIN DRAIN” INTO “BRAIN CIRCULATION”

2.1. The Phenomenon of Brain Drain

The phenomenon of **brain drain**, particularly of educated and highly skilled professionals (scientists, doctors, engineers, teachers, etc.), first garnered attention in the 1960s during a significant wave of migration from Great Britain to the USA [33]. Later, the focus shifted to developing countries, and the concept of brain drain became predominant as a serious issue for young economies [1, 34].

Following the dissolution of the Soviet Union, amidst an unfavorable socio-economic situation in Ukraine, increasing problems in the field of science and technology, and later due to the intensification of global migration processes, thousands of scientists left Ukraine. Nevertheless, the phenomenon of brain drain is not unique to Ukraine. Many other Eastern European countries have faced similar situations [35]. However, while most of them managed to significantly improve the situation by creating favorable conditions for science in the early 2000s, reducing brain drain, and

creating conditions for brain circulation, Ukraine’s dynamics of scientist emigration abroad since the early 2000s have not changed for the better [23]. After Russia’s full-scale invasion of Ukraine on February 24, 2022, not only thousands of scientists but also tens of thousands of students migrated abroad, who could potentially choose a scientific career after completing their studies.

Generally, two types of factors leading to brain drain are identified: those that “push” individuals out of their homeland and those that “pull” them to another country [36]. Examples of the first type of factors include low quality of life, unsatisfactory working conditions, social or political instability, and uncertainty. On the other hand, opportunities for employment, achieving desired income levels, quality of life, political stability, and security are factors that “pull” individuals abroad. Both categories of factors operate simultaneously and influence an individual’s decision regarding migration.

However, in the case of each country, the ratio and significance of these factors may vary. *The more challenging the conditions within a country, especially in its scientific domain, the more significant the role of «push» factors.*

It is also important to note that besides the factors mentioned above, there are other factors that deter diaspora scientists from returning and whose influence should be minimized to facilitate brain circulation. These include the lack of leadership and

strategic vision in the field of science from the Government, limited ability to implement and support mobility programs, excessive bureaucracy, corruption, passivity of local government bodies, and others [37].

Unfortunately, for many years, practically all these factors have largely kept Ukrainian scientists abroad from both returning to Ukraine and engaging with Ukrainian science in general.

2.2. From “Brain Drain” to “Brain Circulation”

For developing countries, it is indeed challenging to retain highly skilled professionals and youth who migrate to other countries with better working, educational, and self-realization conditions [38]. And, as the experience of even economic giants like India and China shows, redirecting the “natural” flow of migration of highly skilled personnel without changes in the socio-economic situation and the creation of favorable conditions within the country is, if not futile, then at least an extremely expensive and slow process [39].

Simultaneously, with the deepening of globalization processes in the 1990s, an understanding emerged of the advantages that highly skilled migrants could bring to their country of origin in terms of knowledge exchange, technology transfer, and innovation creation [40]. **Brain circulation** involves the exchange of knowledge, technologies, skills, and experience among different countries and contributes to the creation of a unified “ocean of intellectual capital” with many interdependent and complementary currents. Examples of such “oceans” can be found in the highly skilled diasporas of India, China, and Taiwan in the USA, which have established a wide range of connections with their countries of origin — networks for exchanging information (about

technologies, jobs, and business opportunities), venture investments, mentoring programs, and consulting services for government officials in their countries. Moreover, members of these groups have created transnational businesses in developing regions such as Bangalore, Bombay, Taiwan, Beijing, and Shanghai [38].

Policies that stimulate brain circulation include support and development of international cooperation, stimulation of mobility of highly skilled personnel, creation of favorable working conditions for foreign experts, as well as development of programs and initiatives to attract (including the return of) their scientists working abroad (scientific diaspora). In conjunction with establishing and enhancing institutions for collaboration with the diaspora, and bolstering investment in the scientific and innovation sphere of the country, these actions foster the environment where scientists can move from one country to another, return to their homeland, and leave abroad multiple times during their careers. Moreover, the labor market in the country itself becomes open to highly skilled personnel from other countries of the world. The movement of both streams of human capital, especially if they are balanced, contributes to the creation of new networks for the transmission and exchange of knowledge,

technologies, and ideas, benefits the host countries, stimulates the economy of the diaspora's country of origin, and enhances its competitiveness on the international stage.

The official position of the European Commission also emphasizes that “the return of immigrants, even temporary or virtual, can play a useful role in promoting the transfer of knowledge and skills to developing countries, along with other forms of ‘brain circulation’”[41]

In general, transforming brain drain into brain circulation is a multifaceted phenomenon. After the end of the war in Ukraine, brain circulation will not automatically start, even considering that some scientists will return. On the contrary, there is a looming risk of a new surge of scientist migration once opportunities to relocate abroad reemerge. To avert this scenario (or at least to ensure that the number of migrants surpass returnees), comprehensive measures must be implemented without delay.

2.3. The Role of Institutions Regarding Diaspora Work

Until 1990, institutions addressing diaspora affairs were present in only 22 countries worldwide. However, since then, their proliferation has been remarkable: by 2000, over 40 states had established such institutions, and by 2015, 118 out of 193 UN member states (about 61%) had some form of institutions dedicated to diaspora matters [42].

Most countries that prioritized diaspora engagement have established dedicated

national-level institutions to address diaspora issues. They include ministries (India, Serbia, Syria, Armenia), “hybrid” ministries (Lebanon, Mali), special offices (Brazil, Mexico, Chile, Peru, Romania, Ethiopia, etc.), as well as innovative institutions (such as foundations). There are also countries (China, the Philippines) that work with the diaspora by involving various government structures. Furthermore, diaspora outreach often extends to the regional (local) level and through the consular network, serving a crucial link in diaspora relations [43].

2.3.1. Ministries, «Hybrid» Ministries

Since 2000 the prevailing trend has been the establishment of dedicated ministries or “hybrid” ministries focussing on diaspora affairs. This approach is commonly observed in countries with a large, usually highly educated and/or financially endowed diaspora abroad (either in absolute terms or as a percentage of the population), such as India, Serbia, Syria, and Armenia. These ministries are tasked with fostering stronger economic

connections with the diaspora, primarily by encouraging the transfer of financial and/or human capital [44]. For example, the Ministry of Indian Affairs overseas, established in 2004 to address the issue of fragmented state migration policies, implements programs targeting the Indian diaspora, particularly the youth demographic. As of 2009, nearly 1 million Indians resided abroad.

Some countries adopt more flexible institutional structures at the ministry level.

Instead of creating a standalone diaspora ministry, they integrate other sectors, such as labor, tourism, or foreign affairs, to form a “hybrid” ministry. For example, in 2000, Mali (Ministry of Malians Abroad and African Integration) and Lebanon (Ministry of Foreign Affairs and Emigrants) established hybrid ministries.

The establishment of high-level institutions dedicated to diaspora affairs, whether diaspora ministries or hybrid ministries, facilitate continuous government support and budget allocation of their activities. It enables top-level coordination of efforts, and signals to diaspora representatives that the state prioritized the engagement with them on the highest political level [44].

2.3.2. Offices

Many countries have established specialized offices, often housed within the Ministry of Labor and/or Foreign Affairs. Examples of such countries include Brazil, Mexico, Peru, the Philippines, Romania, Ethiopia, etc. An interesting case is the Overseas Chinese Affairs Office, which holds a unique position within the central government of China. Essentially, this is an administrative

office under the State Council – the highest executive body of the country (which includes the Prime Minister and ministers, among others). The office’s work aims to create databases in each city, district, and province so that Chinese living abroad can find their ancestors’ roots, homes, and property. Additionally, this institution facilitates the work of two institutes dedicated to studying the Chinese diaspora [43].

2.3.3. Parliamentary Committees

Some countries have special committees within the legislative branch of government to address diaspora affairs. For example, Poland formed the Commission for the Polish Diaspora in the lower house of parliament, China instituted the Committee on Overseas Chinese Affairs, and

the Philippines established the Committee on Overseas Workers’ Affairs. The experience of those nations demonstrates that the presence of committees overseeing diaspora affairs significantly facilitates and speeds up the adoption of legislation necessary to address the needs and interests of the diaspora [43].

2.3.4. Innovative Institutions

In certain instances, countries may establish independent quasi-governmental (innovative) institutions for diaspora engagement, primarily foundations and advisory councils.

An example of the former is the Overseas Korean Foundation, a non-profit organization established

in 1997 and affiliated with the Ministry of Foreign Affairs and Trade. Establishing of this foundation served dual purpose for Korean government: it helped to avoid increasing the state apparatus and mitigate potential conflicts or misunderstandings at the official level with countries where the diaspora resides (such as China and Japan), while also facilitated closer collaboration with the diaspora [44–45].

A comparable scenario observed with the Hassan II Foundation, established in 1990 in Morocco. Officially designated as an independent civil organization (a “non-profit institution with a social purpose, endowed with moral personality and financial autonomy”), however, the Moroccan government significantly influences its functioning [46].

In contrast, the Higher Council of Malians Abroad, exemplifies the latter type of institution. Comprising diaspora representatives elected in various countries where Malians reside, the Council serves as a conduit between the diaspora and the Malian government. It plays a crucial role in safeguarding the rights of Malians abroad, attracting potential investors, and bolstering Mali’s positive image [43].

2.3.5. Regional Level Institutions

Involving the diaspora extends beyond national level. Research indicates that diaspora representatives are inclined to cooperate at the local level, usually in their region or place of origin, where they are familiar with the local context and often still have family ties. This trend is particularly notable in large and multinational countries such as China and

India. For instance, China demonstrates one of the most extensive networks of representations of the local diaspora. The Overseas Chinese Affairs Office, mentioned earlier, is present in 30 provinces, as well as in some cities and towns in China. While those local diaspora representations receive general policy guidance from the central government office, they also have relative autonomy allowing them to take initiative in attracting diaspora investments.

2.3.6. Consular Networks

Some countries actively leverage their consular institutions abroad, to engage the diaspora. While consulates primarily remain responsible for providing basic consular services, they can also implement cultural and educational programs and even assist in establishing economic ties.

Currently, there is no one-size-fits-all model for institutions working with diaspora affairs. The structure and responsibilities of such institution (or institutions) in particular country depend on many variables , such

as the size of the diaspora (in numerical and percentage terms of the country’s population), the strategic areas in which the state requires cooperation with the diaspora, available resources for cooperation, the degree of consolidation of the diaspora itself abroad, and so on. Moreover, any diaspora institution must constantly assess its services and programs, making adjustments as needed . Nevertheless, many researchers argue, the establishing (or re-establishing) of high-level institutions dedicated to diaspora affairs is a crucial step for countries seeking to improve communication, policy coordination, and collaboration with the diaspora [44].

2.4. Establishment of Information and Cooperation Networks of the Diaspora

Developing platforms and networks for cooperation with the diaspora communities constitutes a significant part of the strategies adopted by many countries. Regardless of the geographic distances between participants, such networks integrate them into a unified information system, facilitating faster collaboration, promoting academic mobility, enabling knowledge transfer and production, and so forth [38].

Overall, two different approaches to mobilizing highly skilled diaspora through networks have been observed in various countries. The first, so-called “bottom-up” approach, is based on already established informal networks, initiatives of existing diaspora organizations abroad. An example of such an approach is New Zealand, where “long-standing networks and connections” with expatriates were institutionalized through government policies and programs directly supported by the government and involved in setting strategic goals, mediating connections between domestic institutions and individuals or entities abroad [40].

Contrarily, the “top-down” approach to creating diaspora networks and engaging them involves proactive governmental interventions. Anticipating the negative consequences of brain drain, the government initiates the coordination of diaspora strategy/policy development, creates and coordinates diaspora centers, and uses various mechanisms to attract expatriate professionals. An example of such proactive actions is China, whose government has organized associations of Chinese scientists abroad in 38 countries, established 52 education bureaus at embassies and consulates, which helped create over 2,000 foreign student associations and over 300 professional associations for overseas scientists. Additionally, China’s Ministry of Education has established special service centers in most major Chinese cities, which send “recruitment delegations” to encourage the return of overseas graduates. As a result of such Ministry of Education policy, there has been a significant surge in the repatriation of students to China, from 9,000 in 2000 to 25,000 in 2004 [47].

2.5. Development of Repatriation Programs and Research Support Schemes

Repatriation policy for scientists from abroad is most often used by states among other tools to combat brain drain [48]. Such programs can vary from long-term initiatives (aimed at the scientist returning for an extended period or permanently) to short-term arrangements, which offer only temporary visits for diaspora scientists.

Examples of the long-term programs include repatriation schemes implemented by Taiwan in the 1960s and China in the 1990s [44]. The programs included employment with salaries at foreign levels, housing subsidies, education for children, as well as a working environment with state-of-the-art equipment.

Short-term initiatives include projects like the “Reverse Brain Drain” project in Thailand, where diaspora specialists are engaged to conduct lectures and seminars in Thailand, and the India’s “Vaishvik Bhartiya Vaigyanik” program, which provides scholarships to Indian scientists from living abroad who collaborate with Indian institutions and spend one to two months in India each year [44, 49]. It’s important to note that long-term repatriation programs are effective only when used in conjunction with other instruments, such as creating favorable conditions for scientists’ work and investing in science, implementing incentive systems and fostering career opportunities, among others.

For example, the Mexican program of the National Council for Science and Technology, which repatriates young Ph.D. holders, combined with an initiative to increase salaries of “productive” scientists to encourage them to remain in the country. During the 1990s, 2,093 scientists became repatriates, costing the Mexican government \$56.95 million [33]. From 2005 to 2017, the Polish Science Foundation allocated 258 reintegration grants to encourage foreign scientists — leaders in their fields (not only Poles by nationality) — to work in Poland [50]. This initiative elevated the level of Polish science overall through the influx of leading scientific personnel and attracting many representatives of the diaspora who wanted to return to their homeland, while maintaining global research opportunities [51]. Notably, the Polish Ministry of Finance introduced a “Polish deal” in 2022, exempting certain returning migrants from income taxes for the first four years after their repatriation [52].

Social support in repatriation programs also plays an important role. In particular, researchers highlight that one of the biggest problems faced by diaspora members regardless of the duration of their return is finding affordable and suitable housing [44]. For example, social support programs for scientists in China include the right to a housing rental discount of up to 20%, assistance in employing spouses, the creation of specialized schools for children’s education, and facilitating their integration [40].

It is important to acknowledge that repatriation programs (especially long-term ones), despite their obvious advantages (such as the influx of high-level professionals, along with knowledge and technology), also have certain drawbacks. In particular, the experience of Latin American countries has shown that:

1. Repatriation of scientists alone does not guarantee scientific and technological development without concurrent investments in science and innovation;
2. The most talent individuals may opt to remain abroad rather than return;
3. Some emigrants will still stay abroad for personal reasons;
4. Promoting the return of scientists from abroad by creating “special conditions” may cause resistance and dissatisfaction among scientists working in the country.

Thus, researchers argue that the repatriation policy for diaspora scientists should not serve the main strategy for promoting brain circulation. Instead they should be supplemented by other policies and measures [53].

2.6. International Organizations Facilitating the Repatriation of Scientists

A number of international organizations also make efforts to balance migration flows by implementing international programs aimed at supporting the return (temporary or permanent) of highly skilled migrants from certain countries to their homeland. Among them are the “Return of Qualified Nationals” (RQN) and “Temporary Return of Qualified Nationals” (TRQN) programs implemented by IOM, as well as the UN program “Transfer of Knowledge through Expatriate Nationals” (TOKTEN). These programs provide significant financial assistance to participants either

directly or in the form of support to institutions tasked with “absorbing” the returning human capital [33]. Over 16 years (from 1983 to 1997), IOM repatriated over 2,000 expatriates to 11 African countries through skilled personnel return programs [44].

The assistance of these mentioned organizations to Ukraine in repatriating at least a portion of Ukrainian scientists after the war could be highly relevant. However, initiating dialogue and negotiating conditions for this possibility should begin now.

2.7. Creating Favorable Conditions and Increasing Investments in Science

Countries adopted e various strategies and tools to create favorable conditions for the development of science within their borders: increasing overall financial support for science (from both the government and businesses), establishing centers of excellence, modern scientific institutions, and their targeted support, deregulation of legislative restrictions in certain sectors. Such measures, supplemented by programs for the return of the scientific diaspora, the development of diaspora networks and institutions, effectively allow for the engagement of highly qualified personnel in science.

Following its independence in 1991, the Republic of Moldova faced significant economic deterioration and political instability due to a lack of full control over its entire territory after the self-proclamation of Transnistria’s independence. As a result,

Moldova’s scientific potential declined by 83% over 15 years, and human capital decreased from 30,000 scientific researchers in the early 1990s to less than 5,000 in 2004 [54]. However, in 2004, the Moldovan Parliament ratified the Science and Innovation Code and adopted a Partnership Agreement between the government and the Moldovan Academy of Sciences (MAS), aimed at providing continuous support for science and related research and development activities and creating better conditions for scientists. As a result, state investments in science and technology systematically increased, reaching 0.74% of GDP in 2008. Additionally, MAS initiated targeted engagement with Moldovan scientists abroad in 2008, including a temporary return program for Moldovan scientists and young researchers within the EU-Moldova Mobility Partnership and a research project on studying the migration of Moldovan scientists (country of residence,

demographic characteristics, field, etc.). Both programs not only improved the situation by reducing the brain drain but also significantly contributed to the country's integration into the ERA [55].

States' efforts to support domestic science are extremely important. However, they do not necessarily have to manifest in financing science in general. By delineating strategic priority areas, governments can selectively bolster the most critical ones and use various methods to attract business funds.

The establishment of an advanced and competitive Mediterranean Institute of Life Sciences, in which the Croatian government invested over \$2 million, is an example of prioritizing certain directions of scientific research by the state. Thanks to the favorable financial conditions created by the state, this research center can offer attractive job opportunities for both Croatian scientists from the diaspora and foreign researchers, as well as for competitive scientists within Croatia itself [56].

In Chile, the government collaborated with businesses to create international centers of excellence in materials science, astrophysics, mathematical modeling, oceanography, etc. These centers were characterized by both excellent equipment and 50% co-financing from businesses. These centers were mainly led and managed by representatives of the scientific diaspora, and accordingly, the research teams of international centers were largely formed by returning emigrant scientists [57].

It is worth mentioning that sometimes the state can engage businesses and the scientific diaspora indirectly (e.g., through competitions for co-financing) but by simplifying regulatory policies in certain areas. For example, the Indian government took measures to adjust legislation, including patent law, to facilitate the ability of its pharmaceutical companies to develop research divisions. This more liberal approach catalyzed rapid development of India's pharmaceutical sector, leading to approximately a 10% growth of the domestic market in the 1970s to 60–70% in the early 2000s, and increasing its presence in the international market. Indian companies hired scientists and pharmaceutical engineers of Indian origin residing in the United States, as this increased their productivity [58].

Transforming brain drain into brain circulation is a complex and multi-dimensional process that requires both the establishment of institutions capable of efficiently executing state policies. It necessitates the determination of state priorities, mapping and developing diaspora networks, establishing repatriation programs, and increasing investments in science (either overall or selectively in priority areas). At the same time, it is important to mitigate the influence of "push" factors and factors that hinder the return of diaspora scientists. As evidenced by the experience of several countries, only a holistic approach can effectively transform the country's brain drain dynamics toward brain circulation.

SECTION 3. OPPORTUNITIES FOR ENGAGING THE SCIENTIFIC DIASPORA IN POST-WAR RECONSTRUCTION

Throughout Ukraine's years of independence, thousands of scientists have emigrated abroad and built scientific careers there, contributing to the advancement of the quality of life in the countries they reside in through their discoveries. Today, many of these scientists are proficient in modern methodological approaches, adept at utilizing the most sophisticated equipment, possess essential "soft skills", and have successful experience in interacting with businesses, obtaining competitive funding, and managing scientific projects. But most importantly, the majority of them maintain close ties (both scientific and familial) with Ukraine, support volunteer movements, and have a high level of motivation to help Ukrainian science. Therefore, engaging the scientific diaspora in post-war reconstruction is an opportunity to overcome many challenges at once, including the interdisciplinary nature of tasks, establishing interaction with various stakeholders (government, business, society), organizing productive teamwork of scientific

teams, international cooperation, and many others.

This does not mean that Ukraine does not require scientists who continue to work here despite Russia's full-scale invasion and incredibly challenging conditions, or that foreign scientists should not be attracted on a competitive basis to Ukrainian science. Rather, it underscores that the Ukrainian scientific diaspora, given the reasons mentioned above, can significantly and quickly strengthen the country's scientific potential and achieve a kind of "personnel leapfrogging" in many scientific fields. However, this is only possible under the condition of creating appropriate favorable conditions focused on long-term support of the science and innovation system by the state, including its personnel potential, research infrastructure, and institutions.

Most countries regard their scientific diaspora as a powerful resource for socio-economic development and mutually beneficial

cooperation with developed countries, and therefore implement various measures to reduce brain drain on the one hand, and promote brain circulation on the other. Among the main measures are the formation of institutions for working with the diaspora, the creation and support of information-cooperation networks of the scientific diaspora, the introduction of return programs, the creation of a favorable climate for science, and the stimulation of scientific and innovative

activities of domestic scientists within the country as a whole.

However, it is important to emphasize that the effectiveness of all the mentioned measures are based on preliminary groundwork: defining the main goals and objectives for engaging the scientific diaspora, mapping it (knowing its geography, needs, professional and age composition, etc.).

3.1. Defining the main goals of engaging the Ukrainian scientific diaspora

Before the war with Russia, Ukrainian science suffered from the burden of Soviet heritage, weak links between science, education, and business, distrust among key stakeholders, and, most importantly, a lack of both a coordinated development strategy and state capacity to implement necessary changes [59].

Yuriy Gogotsi, Professor, Director of the A.J. Drexel Nanomaterials Institute (USA): *«First of all, even before the war, Ukrainian science was in a very, very poor state. [...] Therefore, we should not return to what was before the war, but build something different. We need to ask: what kind of science does Ukraine need? [...] Countries like Germany and the USA engage in all areas of science because they can afford it. Ukraine does not have that much money. Therefore, it is important to understand where the potential lies.»*

Engaging scientists is necessary to address many challenges of post-war reconstruction, such as security and defense capability, environmental consequences of war and the state of natural resources, rapid infrastructure restoration, population health recovery, strengthening of the financial and economic

system, innovation development, and transitioning production to a new technological basis. The pivotal role of science in post-war reconstruction is elaborated upon in the White Paper **«Transforming the Science and Innovation System for Post-War Recovery»**.

Among the priority sectors identified for Ukraine's post-war recovery, as highlighted in in-depth interviews by experts and diaspora representatives: information technology, materials science, biomedicine, energy, and chemistry. Furthermore, many interviews also emphasized the importance of enhancing the quality of education in Ukraine to cultivate the next generation of scientists.

Are there enough specialists in Ukraine to respond to the challenges ahead? Unfortunately, we must acknowledge that in many cases, no. This means that either we need to use the services of foreign experts or wait for the Ukrainian education system to train its own specialists who will stay in Ukraine. Another option is to actively involve scientists from the scientific diaspora in critical sectors, providing all the necessary conditions for their involvement.

3.2. Studying the scientific diaspora

Mapping the scientific diaspora is an important initial stage that involves collecting as much information as possible about the location of the diaspora, their skills and experience, motivation, proposals from diaspora scientists (what exactly they are willing to offer), and their expectations from the government. Moreover, it is important to initiate a dialogue between the government and diaspora organizations/associations (institutionalized and informal) to understand the interests and motives of diverse diaspora groups based on age, migration time, field, family status, and career position.

It should be noted that over the years of independence, with rare exceptions, very little attention has been paid to studying the Ukrainian scientific diaspora and establishing a dialogue with it. Among such attempts, the research conducted within the framework of the UIC at NAS of Ukraine in 2000, “Ukrainian Scientists Abroad: Scientific Achievements, Cooperation Prospects, and Return” [60].

This study involved a survey of about 3,000 individuals, including senior university students in Ukraine, young scientists of the NAS of Ukraine, heads of departments of research institutions, experts, and representatives of the Ukrainian scientific diaspora. The survey showed that the majority of respondents, who represented natural science specialties, are actively engaged in scientific work, 50% of the respondents cooperate with scientists in Ukraine, more often at the level of scientific contacts than joint grants, and have a desire to continue such cooperation. 70% of scientists planned to return to Ukraine when the economic situation improves [61].

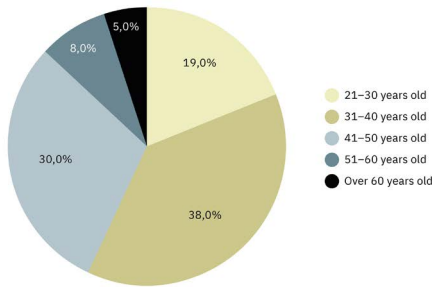
Additionally, over the past decade, a series of activities have been implemented to

enhance interaction between the diaspora and Ukrainian science: the conference on German-Ukrainian academic cooperation “German-Ukrainian Academic Cooperation: Best Practice, Challenges & Opportunities” (2016), where representatives of the scientific diaspora in Germany established the Ukrainian Academic International Network (The Ukrainian Academic International Network), “Science Connects: strengthening the Interaction between Researchers in Ukraine and Scientific Diaspora” under the European FP7 framework program in the project “International Networking Cooperation on Science, Technology, Innovation (HTI) for Eastern Partnership Countries” (2017), the Ukrainian Scientific Diaspora Forum (2018) “Advancing Science through International Cooperation” [23, 62–63].

Between 2022 and 2023, important steps in mapping the Ukrainian scientific diaspora were taken by the Young Scientists Council under the Ministry of Education and Science of Ukraine within the initiative “Ukrainian Science Diaspora”, as outlined in Section 1.4.

In this study, in the pursuit of understanding the Ukrainian scientific diaspora, elucidating its needs and openness to cooperation, we conducted a survey of Ukrainian scientists abroad. Overall, 398 respondents from 38 countries participated in the survey. Notably, the majority of respondents were women (67%), 44% of respondents were married and had children, the most numerous age groups were 31–40 years old (38%) and 41–50 years old (30%) (Fig. 3.2.1). Moreover, 81% of the survey participants held a scientific degree, with the majority representing natural sciences (see Appendix 1).

Age structure:



Marital status:

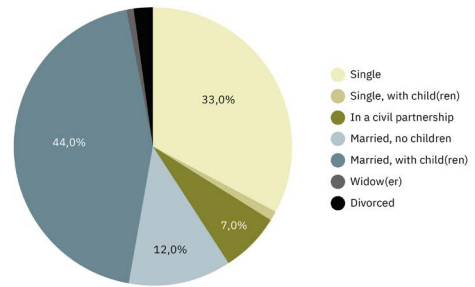


Figure 3.2.1. Demographic characteristics (age and marital status) of survey participants (N=398), %

Before relocating abroad, almost half of the respondents (49%) were employed in higher education institutions, while a third worked in institutions of the National Academy of Sciences of Ukraine (30%). The rest were either students (9%), worked in non-governmental organizations (8%), the R&D sector (8%), or other structures (5%), or worked in one of the national branch academies of sciences of Ukraine (3%). Notably, approximately 57% of respondents left the country after the full-scale invasion by Russia on February 24, 2022.

After leaving abroad, the main places of work for the respondents were universities (61%), academic institutions (19%), private companies (7%), for some respondents, their current place of work is not related to science (5%), and some of them became unemployed (3%). It should be noted that only 35% of scientists hold permanent positions, the rest are temporary (62%) or unemployed (3%). Almost half of the respondents (47%) have affiliations in Ukraine.

As our survey of diaspora scientists has shown, the most significant “push” factor for the majority (52%) was the full-scale invasion by Russia into Ukraine in 2022. Other “push” factors include low wages (36%), lack of research infrastructure (28%), and career growth prospects (27%), difficult economic situation (22%). At the same time, among the main “pull” factors abroad are better funding (33%), a high level of research infrastructure (28%), prospects for career growth (27%), greater freedom in choosing research topics abroad (19%) (see Appendix 2). The survey data is supported by interviews with representatives of the scientific diaspora who left the country either before or after February 24, 2022.

The conducted research allows us to see a certain cross-section of the Ukrainian scientific diaspora by various characteristics (age, marital status, presence/absence of a scientific degree, field/specialty, and place of work) and correlate this with the level of motivation for cooperation with Ukrainian science and the desire to return to Ukraine.

3.3. Providing legislative and institutional support for the diaspora in Ukraine

Engaging with the scientific diaspora is based on the legislative framework and is supported by various national institutions.

3.3.1. Legislation. Ukraine officially recognizes its diaspora as an “integral part of the world Ukrainian community”. However, this recognition doesn’t automatically grant diaspora representatives a status equal to that of Ukrainian citizens, as it derives from national legislation and Ukraine’s international legal obligations. Notably, according to official statistics, over 6 million Ukrainians have become internally displaced persons due to the war and are residing outside the country. While these individuals continue to be Ukrainian citizens, they can also be considered part of the Ukrainian diaspora according to the definition of the International Organization for Migration (IOM) and several researchers [6, 14]. Though distinctions exist between “voluntary” and forced (refugee) migrants in legal terms, within the diaspora concept, they represent just two different pathways of its formation [64-65]. Nevertheless, diaspora representatives born abroad can attain a special status very close to acquiring Ukrainian citizenship – the status of a foreign Ukrainian.

The Law of Ukraine “On Foreign Ukrainians” was adopted in 2004 [66]. According to Article 1 of this Law, “a foreign Ukrainian is a person who is a citizen of another state or a stateless person, and also has Ukrainian ethnic origin or originates from Ukraine.” Both individuals with Ukrainian ethnic origin and those of other nationalities who originate from Ukraine can obtain the status of a foreign Ukrainian [67]. This status can be granted by the National Commission on Foreign Ukrainians, established under the Ministry of

Foreign Affairs of Ukraine (MFA). Key benefits of this status include:

- the right to obtain a multi-entry visa to Ukraine free of charge, valid for five years based on a foreign Ukrainian certificate;
- the opportunity for permanent residency in Ukraine. This can happen provided that the person receives permission for immigration for permanent residence outside the immigration quotas, as established by law. The provisions extends to the spouse and children of the foreign Ukrainian in case of their joint entry and stay in Ukraine;
- meeting the national-cultural and linguistic needs of foreign Ukrainians and protecting their rights as national minorities in other countries;
- annually established quotas for admission to higher education institutions in Ukraine under state-funded programs for foreign Ukrainians;
- a foreign Ukrainian who is legally present in Ukraine enjoys the same rights and freedoms, as well as bears the same duties, as a Ukrainian citizen, except as provided for by the Constitution, laws of Ukraine, or international treaties ratified by the Verkhovna Rada of Ukraine. A person who has acquired the status of a foreign Ukrainian has the right to work in enterprises, institutions, and organizations or engage in other employment in accordance with the established for Ukrainian citizens;
- the right to acquire Ukrainian citizenship as outlined in the Law of Ukraine “On Citizenship of Ukraine”.

The adoption of this law in 2004 was a significant milestone in the evolution of Ukraine's relations with the diaspora. However, its impact on fostering the deeper connections between Ukraine and diaspora through special status has been limited. As of the end of September 2021 (i.e., over 17 years), 11,636 individuals from 86 countries worldwide had acquired the status of a foreign Ukrainian [68].

There is no official information on how many of them were scientists. However, it can be assumed that this number is very small.

Experts assert that the current version of the Law requires significant improvement to align with modern norms of European and international law [69].

3.3.2. Institutions. From April 1993 to March 1996, Ukraine had the Ministry of Ukraine for Nationalities and Migration Affairs, which was responsible for developing and implementing state policy in the field of national relations and migration. However, in 1996, this Ministry underwent reorganization into the State Committee of Ukraine for Nationalities and Migration Affairs, with some of its functions reassigned to other ministries.

Prior to the full-scale invasion on February 24, 2022, several institutions in Ukraine were involved in addressing migration issues and facilitating interactions with diaspora. These included: the aforementioned State Committee of Ukraine for Nationalities and Migration Affairs; the Ministry of Foreign Affairs (MFA), which operates the National Commission for Foreign Ukrainians; the Ministry of Culture and Tourism of Ukraine; the Ministry of Economic Development, Trade and Agriculture of Ukraine; the Ministry of Education and Science of Ukraine; and the State Migration Service.

Concerning diaspora institutions, prominent organizations included: the World Congress of Ukrainians [70], the European Congress of Ukrainians [71], and several institutions of the scientific diaspora, such as the Shevchenko Scientific Society in the USA, Canada, and Europe [72-74], and the German-Ukrainian Academic Society [16].

In April 2022, following the Decree of the President of Ukraine, a working group dedicated

to the return of temporarily displaced citizens, including those resided abroad, and their integration into the socio-economic life of the country was established within the National Council for Recovery of Ukraine from the Consequences of War [75]. One of its primary objectives is to “promote the rapid recognition of professional qualifications using the EU’s ‘Talent Pool’ pilot initiative for Ukrainian citizens temporarily residing in the territory of EU member states and other states.” In January 2023, the establishment of a separate institution, the National Agency for the Protection of Rights and Freedoms of Ukrainian Citizens who have received temporary asylum in the territories of EU member states and other states, was planned.

This agency potentially can be a positive step in improving the coordination of the scientific diaspora and key stakeholders in Ukraine. However, the agency primarily focuses on Ukrainian citizens who have temporarily emigrated abroad since the start of the war. Although it encompasses over 6 million individuals, the Ukrainian diaspora is much larger — estimates range from 11 to 20 million, including approximately 6 million labor migrants who were abroad before the war began [76]. Consequently, there arises a need for an institution that addresses **a broader spectrum of Ukrainians currently residing abroad: war migrants, labor migrants, and the diaspora — all those who potentially may return to Ukraine after the war.** Moreover, as underscored by CEDOS's experts, a solution to

a much wider range of migration policy issues is needed, such as the involvement of citizens of other countries in Ukraine's reconstruction and the encouragement of foreigners with needed qualifications to work in Ukraine [77].

Ultimately, the creation of effective mechanisms for engaging the scientific

diaspora necessitates concerted efforts among the various institutions responsible for diaspora affairs and migration. Collaboration is essential not only among these domestic entities but also with existing scientific diaspora organizations abroad, as well as institutions within countries hosting the diaspora.

3.4. Establishment of Information and Cooperation Networks and Collaboration

Currently, the lack of unified information or organizational network encompassing all Ukrainian scientists abroad. However, there are several networks that cover various groups of Ukrainian scientists, including those working abroad. Some networks are institutionalized entities, while others are informal associations; the history of some networks spans many decades, while others emerged only after Russia's full-scale invasion of Ukraine in 2022; some are just beginning to form now.

The oldest and most venerable network of Ukrainian scientists abroad is the **Shevchenko Scientific Society (NTSh)**. Originated in Lviv in December 1873 as the Literary Society named after T. Shevchenko was banned by Polish and Soviet authorities in the 1920s-1930s. NTSh was restored in 1947 in Western Europe (France) and the USA, where it became known as the Shevchenko Scientific Society. Over the years, generations of NTSh activists have made significant contributions to the development of Ukrainian studies in various fields such as history, language, literary studies, ethnography, folklore, geography, anthropology, and others. Today, the Society is represented in the USA, Canada, and Europe.

Among the newer and, unlike NTSh, "non-institutionalized" platforms that

unite Ukrainian scientists, it is worth noting the online community "Ukrainian Scientists Worldwide," which currently has a corresponding group on Facebook. The "Ukrainian Scientists Worldwide" network emerged among Ukrainian graduate students in Germany in the early 2000s with the aim of facilitating cooperation. It currently unites over 31,000 scientists from Ukraine and abroad.

Another notable network with a nearly seven-year history is the **Ukrainian Academic International Network** (The UKRAINIAN Academic International Network), which served as a foundation for the establishment of the German-Ukrainian Academic Society. Through its website (ukrainet.eu) and newsletter "The UKRAINE Network Newsletter", the society disseminates information on scientific events related to Ukraine, opportunities for international cooperation between Ukrainian and foreign universities and research institutions. Moreover, The UKRAINE Network actively participates in events related to scientific cooperation and contributes to the reform of Ukrainian science and its integration into the European Research Area. Its views are largely outlined in the White Paper "Ideas and Recommendations for Advancing Ukrainian Science: The View of the Ukrainian Scientific Diaspora" [78].

In response to Russia's full-scale invasion of Ukraine on February 24, 2022, a number of other initiatives and networks have emerged, bringing together Ukrainian scientists, including those residing abroad. Among them:

#ScienceForUkraine stands as an initiative of a community of volunteer scientists and students, many with Ukrainian heritage. Since August 2, 2023, it has been institutionalized as a non-governmental organization in Latvia [79]. The organization's mission is to support the Ukrainian academic community during the war, promote continuity in Ukrainian science, and strengthen its presence on the international scientific stage. The organization collects and disseminates information about opportunities to support Ukrainian researchers and students; raises awareness among the international academic community, national governments, financial institutions, and international organizations about the need to support Ukrainian scientists and students; establishes partnerships with Ukrainian and international academic institutions, research organizations, and initiatives.

«**Ukrainian Science Diaspora**» is an initiative launched in 2022 and presented in the spring of 2023 by the Council of Young Scientists under the Ministry of Education and Science of Ukraine (details were discussed in Section 1.4).

Finally, in the context of information and cooperation networks, it is worth mentioning the associations of Ukrainian scientists that have recently formed and are undergoing institutionalization in 2023 in Poland, France, Luxembourg, Sweden, the United Kingdom, and the Czech Republic.

It is necessary to highlight that engagement of Ukrainian scientists in public organizations and associations remains very modest. Thus, the results of our survey showed that less than a third of respondents are currently members of Ukrainian (28%) and foreign (29%) public organizations. Moreover, the majority of members of foreign public organizations

are engaged in assisting Ukraine (including volunteering, humanitarian aid, etc.) (58%), while members of Ukrainian public organizations are mainly involved in “near-scientific” activities (including educational and promotional activities, etc.) (40%) (Appendix 3).

According to insights gleaned from focus groups conducted, without organizations of the scientific diaspora, the reconstruction of science is possible, however, most of them noted that these organizations could perform a number of useful auxiliary functions, such as:

1. uniting the scientific diaspora and providing assistance to Ukrainian scientists abroad;
2. communicating with the Government of Ukraine and institutions (Ministry of Education and Science, National Academy of Sciences of Ukraine, and national sectoral academies), to facilitating reforms in the scientific sphere;
3. offering external expertise;
4. engaging with Ukrainian society and business to promote science popularization and attracting funds for science;
5. developing of scientific and educational programs;
6. lobbying for Ukrainian science abroad and representing its interests in countries with a scientific diaspora, as well as in international scientific organizations.

International cooperation. Creating and expanding networks of scientists, including expatriates, is one of the important instruments for developing scientific cooperation. It is worth noting that even before the pandemic, the activity of scientific and technical cooperation between research institutions and universities under intergovernmental agreements significantly increased. Thus, in 2019, Ukrainian scientists engaged in 119 bilateral projects jointly with scientists from 12 EU countries, as well as India, China, the USA, Belarus, South Korea, which is almost a quarter more compared to 2018 [80-81].

Since 2016, Ukraine has been entirely associated with the EU programs “Horizon 2020” and “Erasmus” for research and education (2014-2020). Within “Horizon 2020,” Ukraine participated in 230 projects involving 323 participants and financing of 45.5 million euros. Ukraine was particularly strong in researcher mobility (MSCA), energy, climate, and transport [82].

The survey of scientists unveiled that before the full-scale invasion, 60% of scientists of the scientific diaspora cooperated with research institutions and universities in Ukraine, and in almost a third (19%) of respondents, cooperation was interrupted due to the war. At the same time, about 40% of respondents do not engage in such cooperation at all. The main limiting factors include, in particular, the war (41%), lack of time due to busy schedule at the main place of work (39%), lack of requests from the Ukrainian side (35%), administrative and organizational problems (20%).

Post-war, respondents identified various avenues for collaboration with research institutions and universities. Predominant among these were joint international projects (77%), organization of scientific exchanges and internships (58%), consulting/mentoring activities (48%), expert activities, including reviewing national research grants in Ukraine (42%), creation of joint training programs (39%), assistance in creating and promoting Ukrainian scientific innovations (34%), expert activities, including participation in the evaluation of research institutions/universities (32%). Furthermore, interviews and focus groups also demonstrated the respondents' interest in closer post-war cooperation with scientists in Ukraine. Only 4% of survey participants reported being unwilling to cooperate with scientists in Ukraine after the war.

International cooperation has the potential to scale up even during the war: a significant number of Ukrainian scientists have received grants from the European Federation of Academies of Sciences and Humanities (ALLEA), the National Academy of Sciences of the USA (NAS), and scientific organizations of other countries, as well as through EU funding programs, including “Horizon Europe,” COST, “Eurizon.” However, the non-systematic nature of this phenomenon in the pre-war period has led to personal and institutional barriers. The results of the “UA Science Reload” survey in 2022 showed that 59% of surveyed scientists and university professors did not participate in internal and international projects over the past three years [83].

However, despite the increasing opportunities, attention should also be paid to existing limitations. In particular, according to the Decree of the President of Ukraine dated February 24, 2022, No. 64/2022 “On the Introduction of Martial Law in Ukraine,” during the period of martial law, the departure abroad of male scientists of conscription age is significantly complicated [84].

The formation of new networks and the expansion of the activities of existing associations of Ukrainian scientists abroad is undoubtedly a positive phenomenon, which in perspective will significantly bolster international cooperation. Equally crucial is the institutionalization of associations of Ukrainian scientists in the diaspora. However, to transform these initiatives into effective instruments for representing the interests of the scientific diaspora, strengthening cooperation with Ukrainian scientists, and influencing the reform of science in Ukraine, necessitates more time and resources.

3.5. Development of repatriation programs and schemes for engaging diaspora scientists

Currently, Ukraine lacks established programs for the repatriation of its scientists. The main reasons for this are the absence of a cohesive state strategy regarding key scientific areas that could ensure its economic development, coupled with the understanding of the value that diaspora scientists can bring and who among them should be returned. Moreover, before the full-scale war began, despite the increasingly critical situation with scientific personnel, lack of funds, outdated management and funding systems, and imperfect legislation practically made it impossible to implement such programs.

Furthermore, except the absence of programs for the scientific diaspora repatriation to Ukraine, the process of employment of foreigners in scientific institutions is significantly complicated and bureaucratized. Institutions are required to secure special permits from employment centers, furnish numerous certificates subjected to translation and certification by the Ministry of Foreign Affairs, with employment contracts typically limited to a maximum duration of one year [85-87]. Olga Harashchuk, Professor, President of the German-Ukrainian Academic Society (Germany): *«Ukrainian money should not be spent on internships. Funds for this can easily be found abroad in interested countries... Ukrainian funds should be spent on robust repatriation programs. [...] Currently, bachelor's students are leaving universities (abroad). Of course, all PhD students will be accepted, most postdocs will be accepted, but they simply cannot accept everyone for a professorship. And those people who stay [...], they are very eager to return. They may not be the best in the world in terms of quality, but they are at a very solid level, we have seen this. And these people need to be attracted. And this requires funds from our state.»*

In the first 19 days of the war, approximately 6,300 scientists left Ukraine and went abroad [88-89]. According to the “UA Science Reload” survey, which pulled over 2,000 employees of the scientific sphere, about 15% of respondents were abroad at the time of the survey [90].

In May 2022, the Cabinet of Ministers of Ukraine issued resolution No. 599, aimed at addressing academic mobility for scientists who left Ukraine [91]. This resolution stipulated provisions for the retention of their positions at their primary workplaces for up to two years. However, in interviews, scientists residing abroad and experts note that in some universities and research institutions, employees residing abroad are already being dismissed, despite their desire to maintain affiliation even without salary. While such actions may be justified in some cases, they lead to the breakdown of ties with Ukrainian science for scientists who have left.

Some of the scientists, classified as refugees from Ukraine, have utilized the opportunity over the two years of the war to enhance their language proficiency, accrue professional experience, access social support, and the opportunity to integrate into the host countries' societies. Consequently, facilitating the return of these forced migrant scientists to Ukraine, necessitates implementing measures that facilitate their professional activities and social reintegration.

As of March 2022, only 20% of Ukrainians intended to stay abroad, but data collected in 2023 show that already 30-37% of migrants do not plan to return [92-93]. It can be assumed that due to the prolongation of the war, the number of emigrant scientists who will want to stay will increase due to better

working conditions, significantly higher living standards, better material and technical support in other countries, powerful social support in some countries for families with children, especially with special needs. All this poses a risk of non-return for a significant part of scientists who, essentially, form a new segment of the scientific diaspora.

According to the results of our survey, only 20% of respondents exhibit an unwillingness to return to Ukraine under any circumstances. Conversely, over a third of respondents express readiness to return (38%), with some not tied to the end of the war (12%), slightly fewer scientists are ready to return immediately after the end of the war (11%) and within a year after the end of the war (10%), there are also those who are ready to return in a few years after the end of the war (5%). However, the largest group, representing a significant field of potential, comprises respondents who are ready to return under certain conditions (42%) (Figure 3.5.1).

Readiness of respondents — representatives of the Ukrainian scientific diaspora — to return to Ukraine

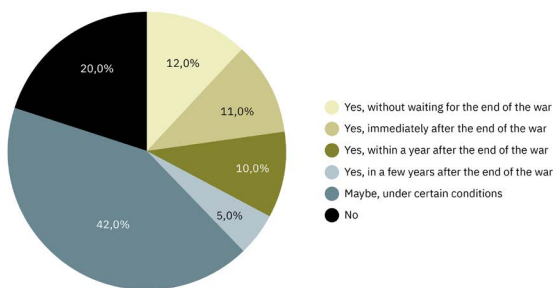


Figure 3.5.1. Readiness of respondents — representatives of the Ukrainian scientific diaspora — to return to Ukraine, N=398, %

Based on respondents’ answers to the question “Are you ready to return to Ukraine?»: «I have several conditions: firstly, the end of the war with our victory, Ukraine’s accession to the EU (freedom of movement in Europe), a place to return to because I have nowhere to return to, and a job with a salary that would

cover the rent of an apartment, basic needs (food, medicine, cosmetics), leisure (going to the movies, cafes, at least one vacation a year). In other words, not 6,000 hryvnias — as far as I heard, such a salary for PhD students. In Poland, I have the opportunity, in addition to the main scholarship, to receive funding from grants, and additional contracts for work; as a PhD student (graduate student), I am currently earning very well.»

Approximately half of the respondents are willing to continue working in research institutions (52%), universities (51%), or the R&D sector (46%) after returning to Ukraine. Some are willing to work in education and science management structures (24%), analytical centers (20%) (see Appendix 4).

Despite about 80% of respondents declaring their readiness to return to Ukraine after the war, based on these results, caution is advised against overly optimistic forecasts. A previous study on the Polish scientific diaspora almost three-quarters of respondents reported considering the possibility of returning to Poland but did not take practical steps. The main obstacles to return were: relatively low salaries (53%), the inability to conduct research in Poland at a sufficiently high level (38%), difficulties in finding employment for a spouse/partner and a suitable school for children (about 34%) [94]. It should be understood that similar obstacles will await Ukrainian expatriates. Moreover, they will be supplemented by other factors, so when developing return programs, it is critically important to take them into account and minimize them as much as possible. Currently, the most important precondition for returning to Ukraine, as defined by the vast majority of respondents in our study, is security (67%). Diaspora representatives also mentioned this during in-depth interviews.

Among the factors that will stimulate the repatriation of Ukrainians are financial ones (about 24% of respondents indicated a salary of at least 1,000 euros, and 31% indicated a

salary of at least 2,000 euros), the possibility of professional realization (63%), the presence of necessary research infrastructure (55%), and the possibility of career growth (47%) (see Appendix 5). Changes in the scientific ecosystem are also important: increased basic funding for research (70%), reform of the science management system (63%), the presence of necessary research infrastructure and sufficient consumables (62%), increased opportunities for competitive funding (58%), renewal of the leadership of higher education institutions / research institutions (53%), formation of a system to support science-based innovations (42%) (see Appendix 6).

In particular, Maria Rybak, a postdoctoral fellow at the University of Texas (USA), outlines: *«Having worked in conditions where you are limited only by your ideas, it is very difficult to return to a science where your ideas are limited by equipment.»*

Victor Khanzhyn, a lecturer in economic theory and associate professor of economics at the University of Nebraska (USA), emphasizes: *«Science requires finances. ... So the production of knowledge, the production of new information, is the same production process that requires resources, just like any other production process. And therefore, if there is not enough research infrastructure for this, then, of course, scientific activity is just as impossible as any other production activity.»*

The human factor, family reunification, staying or returning to Ukraine by relatives (33%), friends (21%), colleagues (15%) are also important for some respondents.

Ihor Lyman, a professor at Berdyansk State Pedagogical University and co-founder of the digital platform “Ukrainian Science Diaspora,” states: *«It’s also worth looking at the situation with ‘broken families,’ when a scientist stays in Ukraine or a scientist has left. How will the family reunite after the war? Two options: either the scientist will leave*

Ukraine for abroad, or will return. And this will greatly influence the dynamics of migration.» Regarding housing provision, 63% of respondents do not need it, and only 33% indicated that they need at least a room (1%), a one-room apartment (15%), or a two-room apartment (17%). Some of those surveyed note that the decisive factor for them is the size of the salary: *«If by housing it is meant that the receiving party in Ukraine should provide it, then I consider it inappropriate. It would be more reasonable to provide a salary sufficient for renting or buying (in the future) own housing.»*

Focus group participants and interviewees underscores the thesis that a high salary (equivalent to those in the USA or EU, i.e., 2–3 thousand dollars or euros) removes the issue of housing provision, as it can be rented.

Among other important factors that would contribute to returning to Ukraine, survey participants mentioned the success in combating corruption (68%), the socio-economic situation overall (65%), Ukraine’s accession to the EU (42%), and Ukraine’s accession to NATO (37%).

Survey results suggests that, the lack of implementation of state measures related to security, corruption fighting, and improvement of the socio-economic situation overall, could be a significant factor deterring the return of scientists from abroad to Ukraine, as well as limiting the possibilities of engaging foreign scientists in Ukrainian science, developing international cooperation, and creating conditions for “brain circulation” in Ukraine.

According to the OECD analytical note “Charting the path to economic recovery,” the key factor in reviving research and development activities is identified as the scientist [95]. The document emphasizes that special attention should be paid to creating conditions for the return of Ukrainian scientists. It will be impossible to bring back scientists who left abroad during the war

if they are not offered roughly equivalent opportunities for scientific development and corresponding living standards within the country.

Regarding human capital plans, proposals for the post-war recovery plan project, prepared by the working group “Education and Science” of the National Revival Council of Ukraine (July 2022), set goals for *«halting the outflow of young scientists, retaining scientists of the middle age group, and creating conditions for their return to Ukraine..., as well as... developing the human resources potential of*

the research and development sector to the average EU level (at least 10 scientists per 1,000 employed population aged 15–70)» (December 2032) [96].

Unfortunately, the prolonged nature of the war has prevented the achievement of the first goal. And since it is the basis for the implementation of the subsequent goals, meticulous and systematic work is needed, as well as investments both in Ukrainian science in general and in scientists, as will be discussed below.

3.6. Creating Favorable Conditions and Increasing Investments in Science

Over the past 30 years of Ukraine’s independence, there has been a constant deterioration in indicators of scientific potential – human capital, material-technical resources, level of commercialization of developments, and so on. While multiple factors contributed to this situation, the most significant was the insufficient funding of science with its progressive reduction: from 1.19% of GDP in 1997 to 1.07% of GDP in 2003 and to 0.41% of GDP in 2020 [59]. Meanwhile, in EU countries, science funding, on the contrary, has been constantly increasing, averaging 1.7% of GDP in 1997 and reaching 2.23% of GDP in 2021 [97].

In the aforementioned post-war recovery plan project for Ukraine, the National Revival Council of Ukraine (NRVUNV) envisages a phased increase in the volumes of budgetary funding for the scientific sphere to bring them closer to the norms of the Law of Ukraine “On Scientific and Scientific-Technical Activity”. This plan also aims to boost grant support for scientific and scientific-technical projects through the National Fund for Development of Ukraine. In particular, by December 2025, it is planned to increase state spending on science

to 0.6% of GDP and total spending on science (GERD) to 1%, and by 2032, to increase state spending on science to 1% of GDP; total spending on science (GERD) to 3% of GDP; and bring the share of grant funding through the National Fund for Development of Ukraine to at least 40% [96].

Attracting funds for post-war reconstruction in general, including in the field of research and development, is a critical aspect of the post-war recovery process [98]. According to an IMF report (July 2023), significant investments in Ukraine’s economy can be expected only by 2028 when their share will amount to 5.6% of GDP [99]. At the same time, economic growth rates will only partially compensate for the decline in GDP that occurred in 2022.

The challenge with attracting investments in science is compounded by the disconnect between the economy and the scientific sphere. According to data from UkrINTEI, innovation activity of industrial enterprises in Ukraine has critically decreased, particularly from 13.6% to 5.8% from 2012 to 2021 [100]. Results of surveys of industrial enterprises conducted by the Institute for Economic

Research and Political Consultations demonstrate that 18% of enterprises have never engaged in innovative activities, and for 31%, innovations are irrelevant under wartime conditions [101]. Ukraine has a poorly developed innovation culture, scientists and inventors have limited access to innovative infrastructure, and legislative gaps in the field of intellectual property, technology transfer, difficulties in creating spin-offs, and innovation financing models throughout the entire innovation life cycle are observed. The issues of attracting funds to Ukrainian R&D are further discussed in the White Paper «**Transforming the Scientific-Innovation System for Post-War Recovery.**»

Addressing the existing funding challenges in science requires comprehensive solutions

at various levels from many stakeholders. However, the experience of other countries (Section 2.7) demonstrated that increasing investments in science through the combination of direct investments from the state and business and reducing regulation across different science sectors.

Creating favorable conditions in the scientific sphere can attract youth, the diaspora, and foreign specialists to science, thereby mitigating the long-standing issue of the brain drain, experienced by Ukrainian science. In turn, active involvement of the scientific diaspora, thanks to its high qualifications and networks, can significantly bolster these processes through successful grant programs and attracting investor funds.

PROPOSALS AND RECOMMENDATIONS

The issue of the scientific diaspora is complex and multidimensional. Establishing and nurturing connections with the diaspora requires various activities, including network building, mapping, and assisting in the creation and institutionalization of the scientific diaspora organizations. To engage the diaspora in Ukraine's scientific landscape and foster cooperation, it's crucial to provide appropriate opportunities, including security, improving working conditions, and opportunities for professional realization in the scientific sphere in general. Additionally, both short- and long-term return programs should be made available. The state should outline a strategy and formulate appropriate policies regarding the scientific diaspora. Developing and implementing such policies will require interdepartmental coordination within the Government and collaboration among stakeholders in the scientific sector (such as the National Council for Science and Technology, the Ministry of Education and Science of Ukraine, the National and Sectoral Academies of Sciences of Ukraine, organizations of the scientific diaspora, scientific public organizations of Ukraine, etc.). This coordination presents one of the primary challenges. Effective implementation of these policies require sufficient resource allocation

and efficient actions. While some funds can be attracted from international partners, especially those interested in obtaining positive effects for their own scientific systems, some of the proposed initiatives can be implemented through horizontal civil initiatives. The key challenge for them is sustainable resource provision and coordination.

1. Establishment of the Ministry for Diaspora Affairs as the highest institution responsible for the formulating and implementing state policies related to the Ukrainian diaspora, including its scientific segment.

Establishing a dedicated ministry will consolidate the currently dispersed functions related to engaging with, Ukrainians abroad, encompassing representatives of the settled part of the diaspora, refugees, labor migrants. This aligns with the practices of many countries with highly educated diasporas. Such an institution will strengthen economic ties with the diaspora, advocate for its interests at the highest level in Ukraine, safeguard the rights of the diaspora abroad, simplify the coordination of migration policy regarding the diaspora at the state level across various institutions, and develop comprehensive policies for repatriation

and reintegration, including for scientists currently residing abroad.

2. Ensure compliance with the provisions of academic mobility during war and post-war periods.

Academic mobility is a cornerstone of the Bologna Process, facilitating knowledge exchange and enhancing education and scientific quality. However, despite the possibility for Ukrainian scientists who have been forced to leave abroad to retain their jobs (without salary accrual) for two years, as stipulated by the Resolution of the Cabinet of Ministers of Ukraine dated May 13, 2022, many scientists were prematurely dismissed from the start of full-scale war. Moreover, complications have arisen in the departure of male scientists of conscription age abroad, including those with academic degrees actively engaged in scientific activities. Urgent resolution of these issues are imperative to foster international cooperation, sustain scientific partnerships, and preserve knowledge and experience exchange with displaced scientists.

3. Enhancing the legal framework for attracting the scientific diaspora and foreign scientists at Ukraine's research and higher education institutions (HEIs).

It is necessary to improve the regulations for attracting foreign scientists and representatives of the scientific diaspora to work in the Ukrainian research institutions and HEIs. Streamlining bureaucratic processes and broadening the institutions eligible to invite foreign researchers will facilitate “brain circulation” in Ukraine, fostering knowledge exchange and innovation.

4. Develop pilot programs to repatriate valuable Ukrainian scientists and experts for priority scientific fields.

The development of pilot programs for the Ukrainian scientists repatriation should be primarily based on priority areas of scientific, scientific-technical, and innovative activities

necessary for Ukraine during wartime and for post-war recovery. This will allow selective engagement of diaspora representatives in the scientific-innovation area now and enhance its capacity in defined sectors. Pilot programs will also help refine legal mechanisms that can be further considered in the development of a broader spectrum of return programs for scientific diaspora engagement in Ukrainian science. Such programs should consider the availability of necessary research infrastructure, financial and other resources, legal conditions, prospects for further career growth and professional development in Ukrainian science, assistance with addressing a range of social issues (housing, employment for spouses/partners, schools for children) to facilitate and expedite reintegration.

5. Conduct a comprehensive mapping of the Ukrainian scientific diaspora, foster the growth of the network and institutions and establish connections with diaspora members worldwide.

To enhance the involvement of the scientific diaspora in Ukraine's reconstruction efforts, firstly it is necessary to understand the available human capital, its geographical distribution, thematic areas, access to infrastructure, etc. Secondly, creating opportunities for expanded networking, collaboration, and potential partnerships is vital. This requires mapping of the scientific diaspora and the creation of a corresponding database, as well as measures to establish and support connections. These efforts may involve scientific diaspora's forums, webinars for knowledge sharing among diaspora representatives, round table discussions with legislative and executive authorities, as well as the establishment and growth of diaspora-centric networks and institutions.

6. Initiate dialogue with international organizations supporting the repatriation of scientists to develop return programs for Ukrainian scientists — forced migrants.

Several international organizations (including IOM, UN) make efforts to manage migration flows by developing international return programs for

highly skilled migrants of certain countries back to their homeland (temporary or permanent) and have years of experience implementing such programs in African and Asian countries. Their support can significantly aid in facilitating the safe return of displaced scientists to contribute to Ukraine's scientific landscape.

7. Develop proposals for the establishment of a Diaspora Foundation – a non-governmental organization aimed for mobilizing funds and supporting scientific initiatives.

The establishment of a Diaspora Foundation can address multiple challenges simultaneously.

Serving as an alternative avenue for international donors who are not ready to invest in state institutions, it can foster trust among the Ukrainian diaspora, and serve as a platform for fundraising efforts. Such a foundation could spearhead programs and projects related to Ukrainian reintegration, repatriation of skilled personnel, and more. An initial step in its creation should be studying the experience of existing Ukrainian scientific diaspora organizations worldwide (in the USA, Germany, Canada, Poland, etc.), as well as the experience of similar foundations in other countries (South Korea, Morocco, etc.) to determine the most effective model and fundraising strategies.

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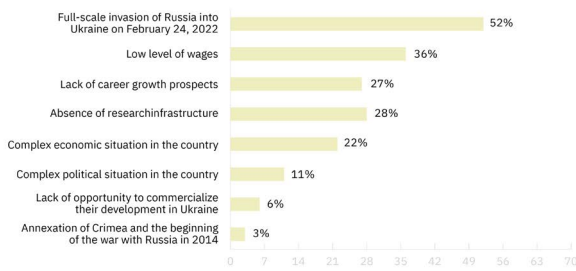
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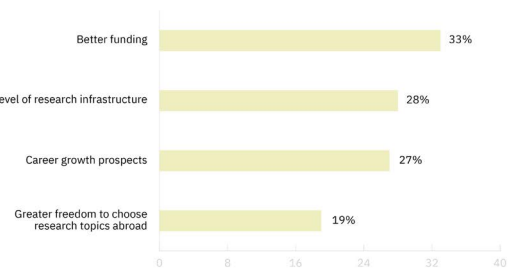
APPENDICES

Appendix 1. Main reasons for emigration abroad indicated by respondents (“push” and “pull” factors), N=398, %.

"Push" factors:

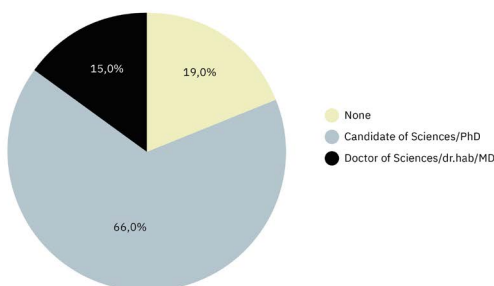


"Pull" factors:

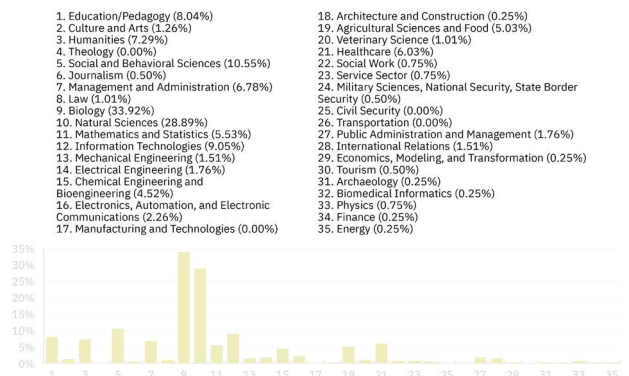


Appendix 2. Academic degree and specialty of respondents, N=398, %

Academic degree

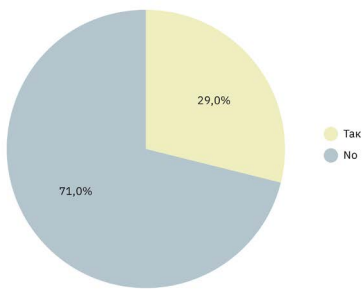


Fields of scientific research

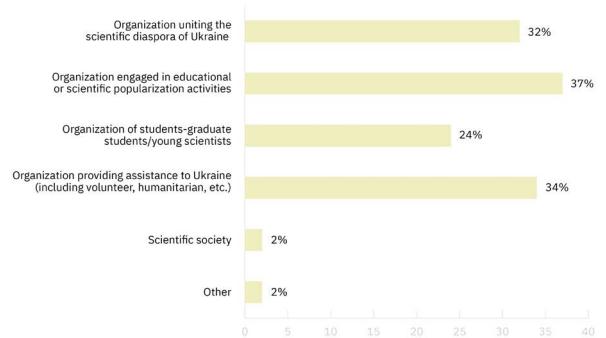


Appendix 3. Participation of respondents in public organizations abroad and in Ukraine, N=398, %

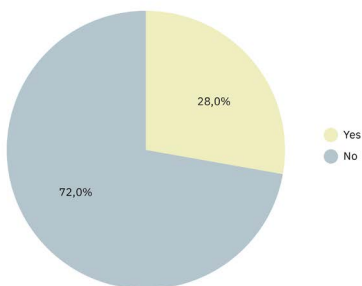
Participation in public organizations abroad:



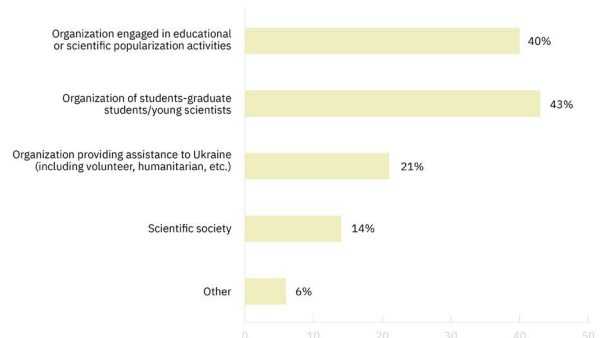
Type of activity of the public organization:



Participation in public organizations in Ukraine:

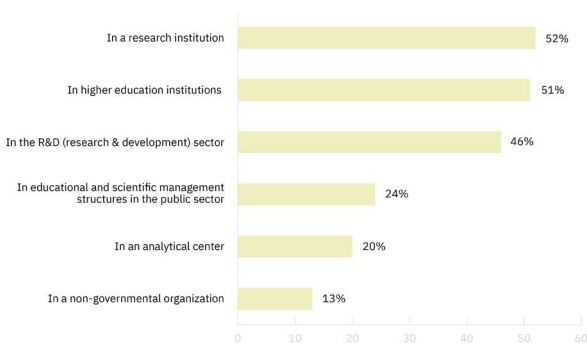


Type of activity of the public organization:



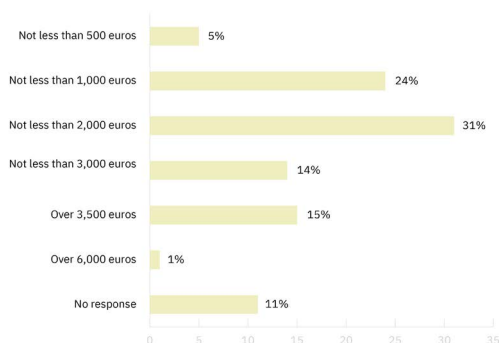
Appendix 4. Distribution of responses of respondents (scientists) currently residing abroad to the question of where they are willing to work upon returning to Ukraine, N=320, %

Where you are willing to work upon returning to Ukraine?

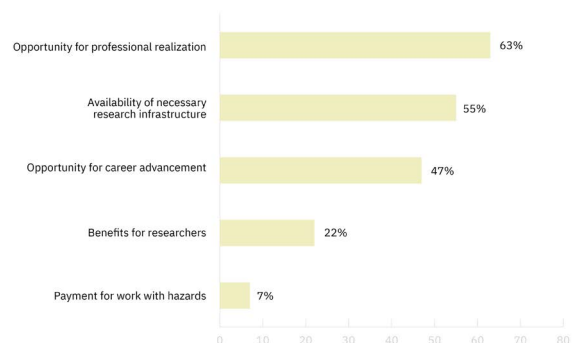


Appendix 5. Distribution of respondents' answers to the question "What financial and career conditions should be created for you to be able to return to the scientific and educational sphere of Ukraine?", N=398, %

Financial conditions:

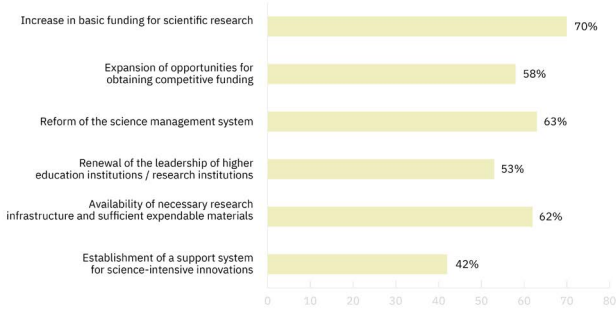


Career conditions:



Appendix 6. Distribution of Respondents’ Responses to the Question “What Changes in the Ukrainian Science Sector Could Facilitate Your Return to Scientific Research Activity in Ukraine?”, N=398, %

What Changes in the Ukrainian Science Sector Could Facilitate Your Return to Scientific Research Activity in Ukraine?



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