

# ЕКОЛОГІЯ

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## SOLVING CURRENT ENVIRONMENTAL PROBLEMS BY HARMONIZATION OF DOCTORAL PROGRAMS WITH EUROPEAN STANDARDS

**Н. В. Максименко, Г. В. Тітенко, К. Б. Уткіна, А. Н. Некос, А. Д. Шкарубо. ВИРІШЕННЯ СУЧАСНИХ ПРОБЛЕМ ЕКОЛОГІЇ ШЛЯХОМ ГАРМОНІЗАЦІЇ ДОКТОРСЬКИХ ПРОГРАМ З ЄВРОПЕЙСЬКИМИ СТАНДАРТАМИ.** На теперішній час в Україні актуальність екологічних проблем постійно зростає. Запорукою комплексного та ефективного їх вирішення є використання сучасних підходів, що може бути виражене через гармонізацію із найкращими світовими практиками. При комплексному підході підготовка фахівці вищої кваліфікації є важливою складовою. Наразі в Україні вона здійснюється за 4 спеціальностями екологічного спрямування: 03.00.16- Екологія, 08.00.06 - Економіка природокористування та охорона навколишнього середовища, 11.00.11 - Конструктивна географія і раціональне використання природних ресурсів та 21.06.01- Екологічна безпека. Окрім того ще у 15 спеціальностях Переліку 2011 року розглядаються певні питання екології. Проблема «розпорошення» екологічних питань по різних спеціальностях різних галузей знань не просто залишилась, а і зростає, оскільки кількість останніх збільшилась. Ця ситуація викликає у науковій спільноті занепокоєння.

Стаття містить результати дослідження думки фахівців, що здійснюють підготовку кадрів вищої кваліфікації в Україні за спеціальностями екологічного спрямування. Мета дослідження - з'ясування проблем, що є у національній системі підготовки аспірантів за спеціальностями екологічного спрямування і захисту ними дисертацій згідно сучасних вимог, та пошук шляхів покращення цієї ситуації, спираючись на світовий досвід. Методичною основою роботи є опитування шляхом анкетування та його статистичний аналіз, проведене у рамках реалізації Проекту Erasmus+ «Комплексна докторська програма з екологічної політики, менеджменту природокористування та техноекології – INTENSE», 586471-EPP-1-2017-1-EE-EPPKA2-SVHE-JP. Отримані результати показали існування проблем організаційного і наукового характеру. Важливою проблемою названа відсутність у оновленому переліку галузей знань і спеціальностей, за якими здійснюється підготовка здобувачів вищої освіти, у т.ч. докторів філософії («Перелік 2015») окремо кваліфікації з екологічних наук - PhD (Екологія). Проблемами наукового характеру названо глибини наукових досліджень, низький рівень застосування новітніх технологій, неузгодженість тематики із потребами суспільства, відсутність співставлень зі світовим досвідом дослідження тих же проблем тощо. До організаційного блоку віднесено: низьке матеріально-технічне забезпечення, відсутність можливості закордонного стажування аспірантів, низький рівень мовної підготовки, проблеми з опублікуванням у рейтингових журналах та очною презентацією дослідження на міжнародних конференціях тощо.

**Ключові слова:** національна рамка кваліфікації, аспірант, спеціальність, екологічні науки, проблеми, менеджмент природокористування, екологічна політика, техноекологія.

**Н. В. Максименко, А. В. Тітенко, Е. Б. Уткіна, А. Н. Некос, А. Д. Шкарубо. РЕШЕНИЕ СОВРЕМЕННЫХ ПРОБЛЕМ ЭКОЛОГИИ ПУТЕМ ГАРМОНИЗАЦИИ ДОКТОРСКИХ ПРОГРАММ С ЕВРОПЕЙСКИМИ СТАНДАРТАМИ. В**

*настоящее время в Украине актуальность экологических проблем постоянно растет. Залогом комплексного и эффективно их решения является использование современных подходов, может быть выражено через гармонизацию с лучшими мировыми практиками. При комплексном подходе подготовка специалистов высшей квалификации является важной составляющей. Сейчас в Украине она осуществляется по 4 специальностям экологической направленности: 03.00.16- Экология, 08.00.06 - Экономика природопользования и охрана окружающей среды, 11.00.11 - Конструктивная география и рациональное использование природных ресурсов и 21.06.01- Экологическая безопасность. Кроме того еще в 15 специальностях Перечня 2011 рассматриваются некоторые вопросы экологии. Проблема «распыления» экологических вопросов по различным специальностям различных отраслей знаний не просто осталась, а и выросла, так как количество последних увеличилось. Эта ситуация вызывает у научного сообщества беспокойство.*

*Статья содержит результаты исследования мнения специалистов, осуществляющих подготовку кадров высшей квалификации в Украине по специальностям экологической направленности. Цель исследования - выяснение проблем в национальной системе подготовки аспирантов по специальностям экологической направленности и защиты ими диссертаций в соответствии с современными требованиями и поиск путей улучшения этой ситуации, опираясь на мировой опыт. Методической основой работы является опрос путем анкетирования и его статистический анализ, проведенный в рамках реализации проекта Erasmus + "Комплексная докторская программа по экологической политике, менеджменту природопользования и техноэкологии - INTENSE», 586471-EPP-1-2017-1-EE-EPPKA2-SBHE- JP. Полученные результаты показали существование проблем организационного и научного характера. Важной проблемой названо отсутствие в обновленном перечне отраслей знаний и специальностей, по которым осуществляется подготовка соискателей высшего образования, в т.ч. докторов философии («Перечень 2015») отдельной квалификации по экологическим наукам - PhD (Экология). Проблемами научного характера названо упрощение глубины научных исследований, низкий уровень применения новейших технологий, несогласованность тематики с потребностями общества, отсутствие сопоставлений с мировым опытом исследования тех же проблем и т. п. В организационный блок отнесены: низкое материально-техническое обеспечение, отсутствие возможности стажировок аспирантов, низкий уровень языковой подготовки, проблемы с опубликованием в рейтинговых журналах, очной презентацией исследования на международных конференциях и т.п.*

***Ключевые слова:** национальная рамка квалификаций, аспирант, специальность, экологические науки, проблемы, менеджмент природопользования, экологическая политика, техноэкология.*

**Introduction.** Today, environmental problems in Ukraine can be considered as dangerous and their solution needs much attention and implementation of complex actions and measures. Introduction of advanced approaches and techniques can be identified as the basis for such an approach for effective solution to the existing problems. It can be translated and implemented into best world practices. Training of specialists is a key part of the integrated approach. At present one of the tools and examples of the training system harmonisation is ERASMUS+ project «Integrated Doctoral Program for Environmental Policy, Management and Technology – INTENSE» (2017-2020, Erasmus + Capacity Building in the field of higher education project (K2)). It addresses such root causes of environmental problems in Mongolia (MN), Ukraine (UA) and Vietnam (VN) as poorly formulated policies, inadequate selection of management actions and lack of suitable technology. The capacity for academic excellence in doctoral training in environmental studies in PCs (and beyond) is being built. Its aims are the following:

1) to improve the practice of doctoral training and professionalise its governance by integrating PhD programs. These programs deal with environmental policy, management and technology in 7 PCIs to 3 nationwide integrated doctoral schools (INTENSE NIDS). They are based on common Code of Operational Practices & research framework (COP & RF), consolidating these schools into the INTENSE International Network;

2) to enhance doctoral training by integrating and upgrading existing learning contents. These can

be used for doctoral provision (total 80 ECTS by M36), infrastructure for accessing the courses, setting & monitoring flexible research training trajectories and their progression. This is INTENSE open education platform, including sustainable mechanisms for its development and maintenance and shared access to research facilities;

3) INTENSE will offer PhD students customized training trajectories and options to enrol on the courses, which will contribute to the progression of PhD theses. The IT infrastructure will provide access to the e-courses (including MOOCs) collected from all the PCIs belonging to INTENSE. These will include the full range of disciplinary fields related to environmental policy, management and technology, as well as eScience modules creating individual learning portfolio;

4) to build the capacity of PhD students to improve their published output through a strengthened multidisciplinary approach to doctoral training. This will be aided by facilitating access to global and EU research networks (including facilitation of academic mobility), development of transferable skills, promotion of joint research / supervision arrangements & interdisciplinary & practice-oriented thesis topics.

**Analysis of previous studies and publications.** In accordance with the Order of the Ministry of Education and Science of Ukraine dated September 14, 2011, No. 1057 “On Approval of the List of Scientific Specialties” [1] (“List 2011”), training of research and academic personnel during doctoral and postgraduate studies is performed in 27 branches of science and within them in 541 specialties.

Among them, the environment-oriented ones are the following: 03.00.16 – Environmental Sciences (Life Sciences, Agrarian Sciences and Medicine), 08.00.06 – Economics of Environmental Resources Management (Economics), 11.00.11 – Constructive Geography and Wise Use of Natural Resources (Geographic Sciences) and 21.06.01 – Environmental Safety (Engineering and Industrial Technology Sciences, Chemistry and Geology).

In addition, a number of aspects of modern ecology, environmental protection, conservation and sustainable nature management are within the scope of such specialties on the “List 2011” as follows:

03.00.17 – Aquatic Biology (Life Sciences); 03.00.20 – Biotechnology (Life, Engineering and Agricultural Sciences); 04.00.07 – (Geo-engineering); 05.11.13 – Devices and Methods for Monitoring and Determining Composition of Substances (Engineering and Industrial Technology Sciences); 05.22.01 – Transportation Systems (Engineering and Industrial Technology Sciences); 05.23.20 – Urban Development and Land Planning (Engineering and Industrial Technology Sciences); 05.26.01 – Occupational Safety (Engineering and Industrial Technology Sciences); 06.01.04 – Agro-chemistry (Agriculture); 11.00.01 – Physical Geography, Geophysics and Landscape Geochemistry (Geographic Sciences); 11.00.02 – Economic and Human Geography (Geographic Sciences); 11.00.05 – Biogeography and Soil Geography (Geographic Sciences); 11.00.07 – Hydrology of Land, Water Resources, Water Chemistry (Geographic Sciences); 11.00.08 – Oceanology (Geographic Sciences); 11.00.09 – Meteorology, Climatology, Agricultural Meteorology (Geographic Sciences); 21.02.03 – Civil Defence (Chemistry, Biology, Engineering and Industrial Technology Sciences, Medicine, Warfare Studies, Veterinary), etc.

Resolution of the Cabinet of Ministers of Ukraine No. 266, dated April 29, 2015, “On approval of the list of branches of knowledge and specialties for which candidates for higher education are trained” [2] (“List 2015”) replaced “List 2011”. Order of the Ministry of Education and Science of Ukraine No. 1151, dated November 6, 2015, “On the peculiarities of introducing the list of branches of knowledge and specialties for which candidates for higher education are trained” [3], the table of compliance of the List of scientific specialties (“List 2011” and List of areas of knowledge and specialties for which candidates for higher education are trained, including PhDs (“List 2015”) [2] was approved.

At the same time, up to the present day, theses have been defended according to the “List 2011”. The problem of “dissemination” of environmental issues among various specialties in various branches

of knowledge not only remained, but also grew up, as the number of the latter increased. This situation is of concern to the scientific community.

**The purpose of the article** is to clarify the problems in the national system of postgraduate students’ training in environment-oriented specialties and defending their theses in accordance with modern requirements, finding ways to improve this situation, based on international experience.

**Methods.** As part of the implementation of project Erasmus + “Integrated Doctoral Program for Environmental Policy, Management and Technology - INTENSE”, 586471-EPP-1-2017-1-EE-EPPKA2-CBHE-JP, an anonymous survey of leading scientists engaged in post-graduate training and performing research work in the field of the environment was used. The questionnaire was developed by Odessa State Environmental University and the survey covered institutions of higher education in almost all regional centres of Ukraine, as well as the cities of Uman and Kremenchuk. It should be noted that such cities as Kharkiv, Lviv, Kyiv, Dnipro, Vinnytsia, Poltava and Uman were represented by several universities. The rest of the regions were represented by the respondents of one institution of higher education.

Due to certain “dispersion” of the content-related aspects of environmental sciences among various postgraduate programmes, the questionnaire was answered by scientists from various fields, among which representatives of geography dominated (44%). A quarter of respondents were Doctors or Candidates of Technical sciences, 19% were representatives of agricultural sciences and 6% were from pedagogical and physical and mathematical sciences, respectively.

Since postgraduate students are trained both by higher education institutions and research institutions, 81% of respondents are academic employees from universities and 19% are academic employees from research institutes.

The questionnaire contains the following questions:

1. What are the most important, in your opinion, gaps in doctoral studies in general?
2. What are the specific issues of research training in the field of environmental management, policy and technology?
3. What are the most important measures that can be taken, under the existing framework conditions, in order to improve the organisation and contents of doctoral studies?
4. In your opinion, is quality of PhD thesis/dissertation in environmental studies improving or declining? If it is declining, then please, briefly explain your point.

5. Do you recognise any major issues with the quality assurance in the process of doctoral training? Could you list the criteria / indicators that can be used in order to evaluate doctoral training?

6. Do you recognise any problems in organisation, quality and/or contents of training currently offered to PhD students?

7. Is there anything that can be done under the existing framework conditions, in order to improve the organisation, quality and/or contents of training currently offered to PhD students?

8. Any subject-related or general skills the PhD students and graduates are missing in order to make successful research careers and/or to complete their theses?

9. What forms of cooperation between PhD awarding (or providing doctoral training) institutions would improve the quality of doctoral studies at your institution and nationwide? In particular, in terms of:

- quality, contents and relevance of PhD courses
- joint research, supervision, publications and/or use of equipment and/or experimental facilities
- virtual and physical mobility of PhD students
- quality assurance and peer review
- networking, knowledge and data exchange

10. If doctoral training (including education and quality assurance) was provided and/or coordinated by a nationwide organisation (e.g. the doctoral school in environmental studies), what services would this organisation be expected to deliver?

11. How would you define the subject scope of a doctoral school in environmental management, policy and technology? (determine key subjects / key words).

**Results.** Answers to **Question 1**, “What are the most important, in your opinion, gaps in the doctoral studies in general?” identified a wide range of problems that can be combined into 7 groups (Fig. 1).

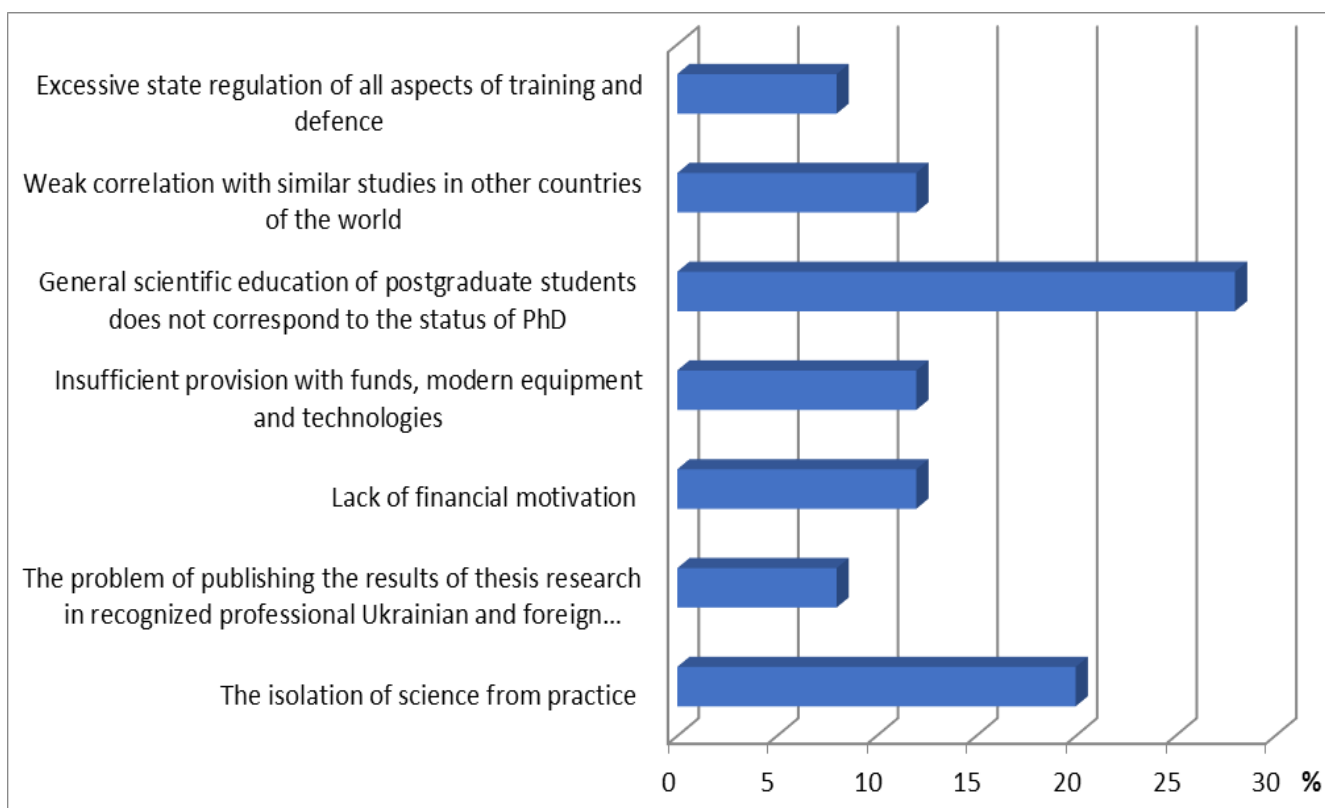


Fig. 1. Variation of answers to Question 1  
*«In your opinion, what are the most important, gaps in the doctoral studies in general?»*

Most often, the responses include various interpretations of the thesis “general scientific education of postgraduates does not correspond to the PhD status”. It is noted that the new training form of Doctors of Philosophy and Doctors of Science has just begun to act in accordance with the Resolution of the Cabinet of Ministers of Ukraine № 261 dated March 03, 2016. [4]. Therefore, it takes time to im-

plement it. In the meantime, in the absence of a unified concept of the national system for training Doctors of Philosophy in general, it includes very often only the theoretical part, there is no relation to a specific manufacture in the system. In general, respondents note that the scientific level of the degree of Doctor of Philosophy in comparison with the degree of Candidatus Scientiarum requires a deeper

theoretical and methodological preparation of the degree candidate. In particular, the “output” upon completion of the studies should be at a higher conceptual level.

A significant number of respondents pointed out separation of science from practice, lack of interest in research both from graduates [22] and in institutions at various levels, where the main positions are held by people, far from environmental studies and not interested in research and development. In the development of the thesis, it was noted that research results of the theses very rarely reached practitioners, managers or legislators, and mostly remained in libraries or scientific journals. Therefore, postgraduates have no understanding of the practical application of the results. Thus, many of them are demotivated.

Quite often, lack of financial motivation, namely, low postgraduate scholarships and, later, salaries of researchers or lecturers was indicated as an important problem. If you do not work in R&D institutes or universities, you do not get differential for the academic title at all.

Another aspect of the financial component indicated by a number of respondents is lack of resources and funds for research, modern equipment and technologies.

The problem of weak correlation with similar studies performed in other countries of the world, identified by the respondents, in our opinion, is closely related to the problem of publishing the results of dissertation research in recognized professional Ukrainian and foreign journals.

In the eyes of respondents, in general, the State of Ukraine does not clearly define the role and place of Doctors of Philosophy in the National Qualifications Framework and the Classifier of Professions, which causes discrepancy in the preparation of Doctors of Philosophy in specific sciences in accordance with the needs of Ukraine [5, 6]. At the same time, the respondents point out excessive state regulation of all aspects in the preparation and defence of the dissertation and inconsistency with international practice of dissertation defence procedure in permanent specialized scientific councils.

Also, the following is recognized as problems:

– mainly the single model of postgraduate studies (insufficient opportunities for universities and R&D institutions to independently choose the educational model of training Doctors of Philosophy. It could be done, for example, by developing joint postgraduate training programmes among universities and R&D institutions, both domestic and foreign ones);

– inadequate international academic mobility as a mandatory element in training Doctors of Philosophy.

Besides, it has been noted in the questionnaires that the study of this issue in the framework of an international project is really important, since it will allow us to develop a unified concept of the organisation of this process within the countries, participating in the project.

Answers to **Question 2** are expedient to be divided into 6 groups (Fig. 2), fully reflecting the range of opinions.

Most often, the answers in the questionnaires indicate the lack of an adequate modern facilities and equipment for doing research (lack of modern instruments, limited opportunities to carry out laboratory studies of environmental components of selected subjects at the universities, especially field studies, with the aid of portable mobile devices, a disastrous gap in teaching future Doctors of Philosophy the basics of the latest technology, imperfection and obsolescence of measuring equipment and laboratory base).

To resolve these problems without government support is very difficult. Although the respondents consider that the joint implementation of international scientific projects is one of the ways in resolving it.

A significant problem in the training of PhD candidates in the environmental field indicated by the respondents consists in the fact that the subject of modern environmental science is “dispersed” among agrarian, biological, geographical, economic, engineering and technological and medical sciences.

The respondents separately point out a weak connection with the practical activities of scientists, when innovative results obtained during the preparation of dissertations often remain unclaimed, that is, specific applications are absent. In addition, almost in every field of science and technology there are a few Ukrainian professional journals [7] included in international scientometric databases, the publication of research results in which could give a chance for their implementation.

An important problem is to obtain statistical information in the field of environmental studies. Everyone is familiar with the unwillingness of governmental bodies and authorities, controlling and monitoring measurements of the environment, to cooperate with postgraduates, both in terms of information and research. This results in insufficient use of modern information technologies for collecting and processing data necessary for assessing the state of the environment, the consequences of human impact on ecosystems, etc.

A number of respondents note that the listed spheres are not priorities considering the directions of science and technology development in Ukraine for the period up to 2020. The state has not clearly defined the scientific components of environmental

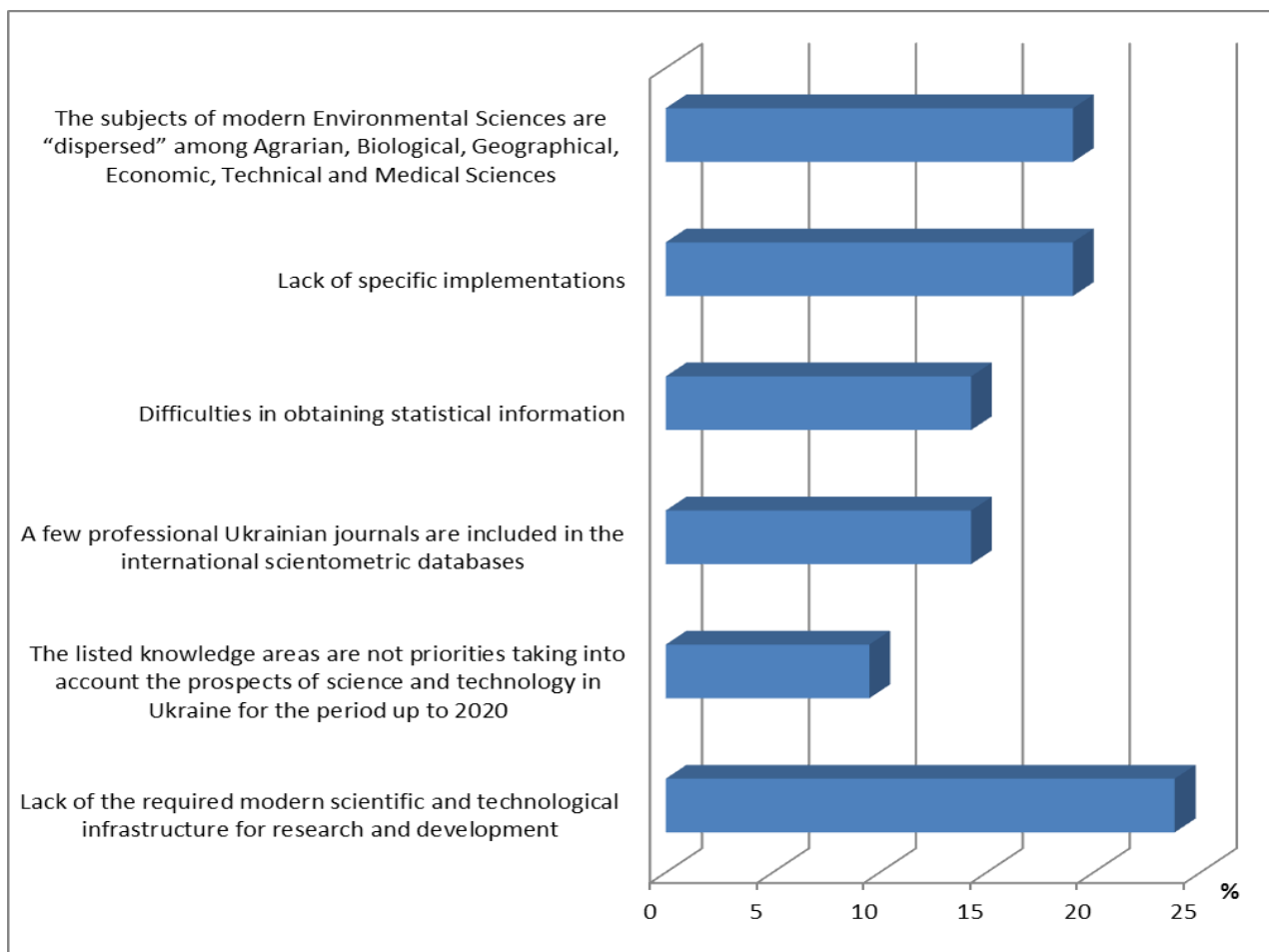


Fig. 2. Variation of answers to Question 2 «What are the specific issues of research training in the field of environmental management, policy and technology?»

management. Accordingly, these spheres are not included in the list of the most important scientific and technological (experimental) developments in the priority areas of the R&D, considering the fulfillment of the state order for the most important R&D (experimental) developments and R&D deliverables.

**Question 3** «What are the most important measures taken under the existing framework conditions in order to improve the organisation and contents of doctoral studies? » also provoked a lively discussion.

The respondents expressed their opinion both on how to improve the training of postgraduates in general and, separately, on environmental issues. Traditionally, the answers are divided into 8 blocks (Fig. 3).

The greatest number of respondents considers the urgent completion of the preparation and approval of national standards for training Doctors of Philosophy according to the main list of specialties of higher education in Ukraine as a key issue in improving postgraduate studies [2, 3]. This includes "Environmental Sciences" and ensures the appropriate quality of educational and scientific programmes

and syllabi for training PhD candidates (improving the list, content and scope of professional courses and interdisciplinary methodological courses).

Preeminently at the level of government management of scientific activities it is proposed to officially document an environmental research area, calling it "Environmental Sciences", in which PhD/Cand. Sci. dissertations and doctoral dissertations are to be prepared.

A special emphasis in the questionnaires is made on the expansion of the content of the educational component of the Doctors of Philosophy training, including mastering of modern international requirements by postgraduates concerning publications and presentation of research results at the international level. Since the postgraduate training involves assimilation of a large base of theoretical knowledge, it would be good to integrate this theoretical knowledge into international theoretical bases. This will make it possible to produce innovations, avoid repeating mistakes and resolve current problems in Ukraine, taking into account wide international experience. Obligatory mastering of a certain amount of credits in other domestic and foreign universities is the keynote.

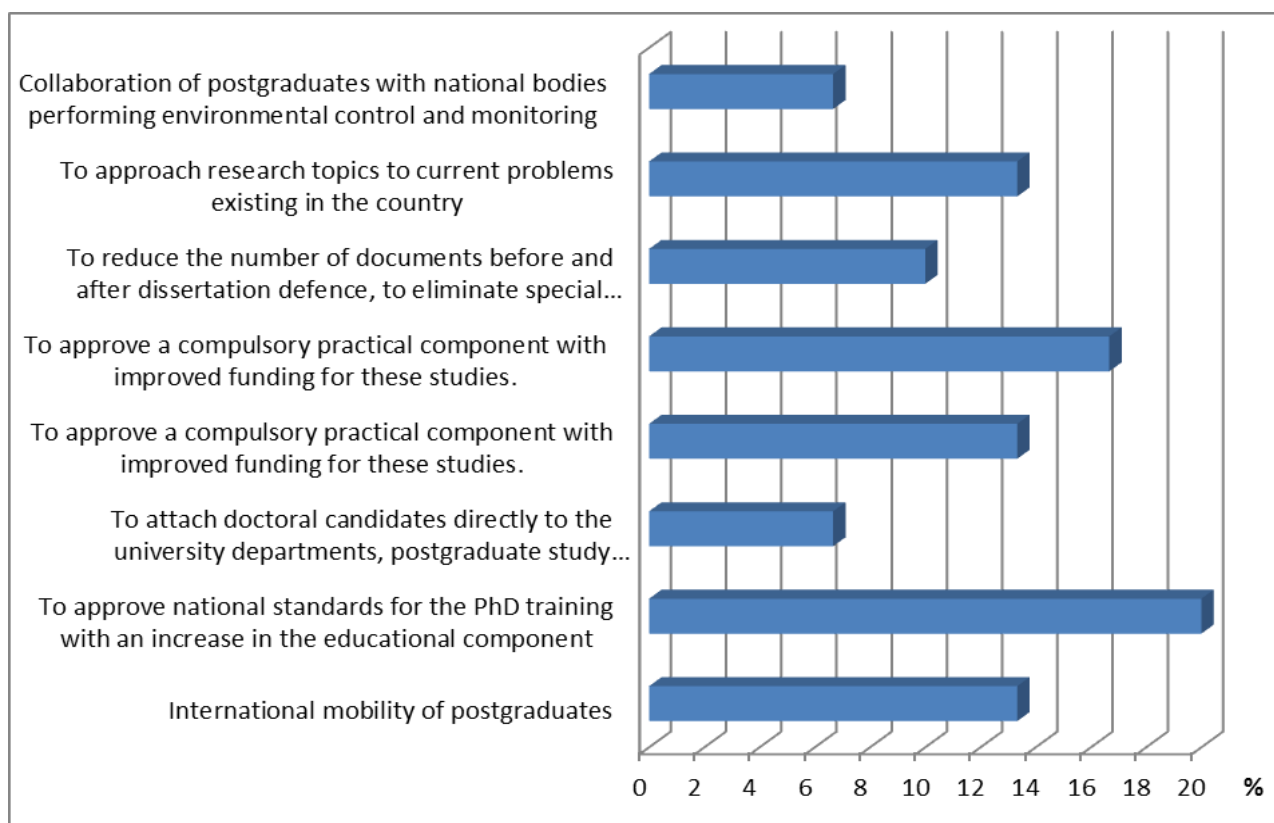


Fig. 3. Variation in answers to Question 3 «What are the most important measures that can be taken under the existing framework conditions in order to improve the organisation and contents of doctoral studies?»

The proposal to involve graduate students into various international programmes is closely related to the previous one. This will contribute to the mobility of undergraduates and postgraduates, helping them to take part in international scientific conferences and take internships in foreign research institutions, etc.

It is also proposed to take into account a practical component in the scientific work through increasing the funding of laboratory and field research of postgraduates. As it has been indicated in the questionnaires, participation of postgraduate students should be expanded in the implementation of governmental and other research programmes so that their investigations were applied in their character [8]. The tasks set by the Ministry of the Environment, departments of environment, state administrations, problem enterprises, etc. should be resolved, i.e. research topics should be closer to the pressing problems existing in the country.

Separately, it is recommended to support the cooperation of postgraduate students with governmental agencies controlling and monitoring the environment, to ensure access to environmental databases/information at all levels (except classified ones, as it is provided by data storage systems), to exchange information on postgraduate research. This is useful not only for postgraduate students, but would help fill the gaps in the governmental

environmental monitoring system and produce a fresh and topical analytical result for stakeholders, increasing the prestige and value of universities as R&D institutions.

The proposals of an organisational nature were allocated in a separate group. First of all, the respondents point to the need to legally state the “basic conditions”. At present, the procedure and mechanism of training and, most importantly, the defence of dissertations of Doctors of Philosophy have not been officially approved. It is necessary to drastically reduce the number of documents prepared before and after the defence. Even the proposal to liquidate the special councils and to execute defences only before 2-3 experts, as practiced in the majority of European countries was expressed.

Quite often the respondents expressed thoughts that doctoral studies should be organised at the departments, and not in such true administrative bodies as postgraduate study divisions. In the form that exists now, postgraduate study divisions are not needed. A postgraduate (full Doctor degree candidate) should be subordinated only to his/her supervisor, and not to the postgraduate study division.

Answers to **Question 4** «In your opinion, is quality of PhD thesis/dissertation in environmental studies improving or declining? If it is declining,

then please, briefly explain your point», received only three options: it improves, it worsens, it remains at the sufficiently high level.

Most respondents agree that, rather, thanks to the heroic efforts of old-school scientists, the quality of candidate dissertations remains at a fairly high level. It all depends on the responsibility of the supervisor of the postgraduate, the PhD candidate himself/herself, the authority of the specialised council. The level of dissertations fluctuates in time, slightly up, a little down, but the average level of works within the period of 10 years remains more or less constant. The level of application of modern scientific equipment and GIS technologies gets behind, but the quality of dissertations meets the requirements of the time and situation in the country. The positive role of the need in international publications of work results is noted.

Supporters of the thesis that the quality of dissertations deteriorates (Fig. 4) are fairly numerous,

too [23]. Explaining their opinions, the authors note that any research is reduced to the environmental one. There are no clear criteria in environmental investigations, the quality criteria of dissertations are not entirely clear judging from the results of environmental studies. Taking into consideration the fact that the overwhelming majority of research in the field of environmental protection is applied investigations, first of all, it is necessary to evaluate the degree (level) of the implementation of environmental research results.

According to this indicator, not all defended dissertations, for example, in the specialty 21.06.01, contain information about the practical implementation of the research results. Lack of environmentalists' practical developments is primarily associated with the catastrophic decline in the number of jobs for environmentalists during recent years.

According to the respondents, some works are not of sufficient quality through simplification of the

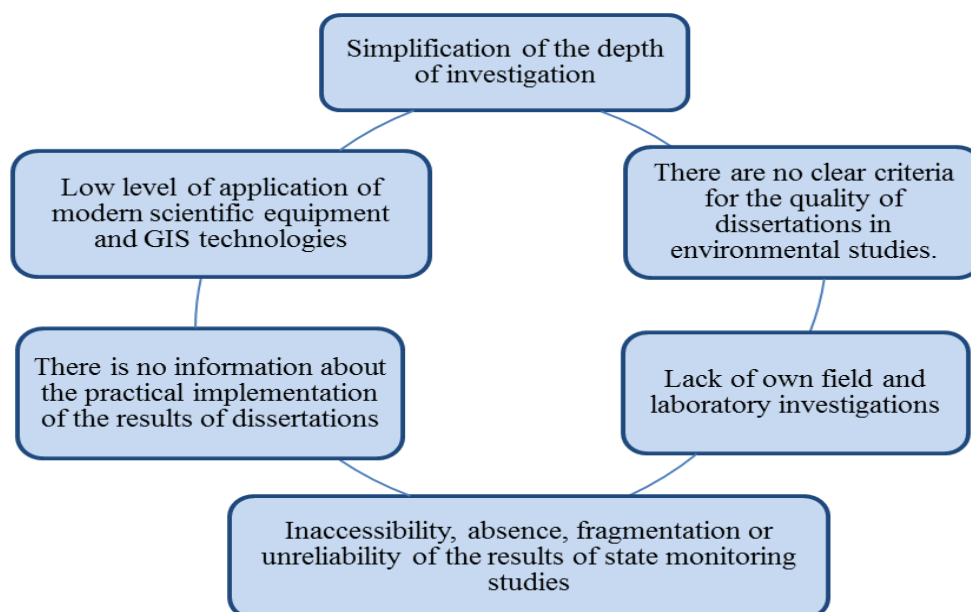


Fig. 4. The reasons for the deterioration in the quality of dissertations in respondents' opinions

depth of scientific research, lack of own laboratory research, including in connection with the outdated laboratory facilities and the lack of modern tools and instruments for the environment study. And the absence of experimental infrastructure is a consequence of the meagre level of funding.

Deterioration in the quality of dissertation work is also associated with inaccessibility, absence, fragmentation or unreliable results obtained by the governmental monitoring agencies.

Answering **Question 5**, «Do you recognise any major quality issues in the process of doctoral training? Could you list the criteria / indicators that can be used in order to evaluate doctoral training? », the

majority of the respondents agreed with the existence of problems and proposed their own list of criteria and indicators.

The groups of existing problems defined through the survey by a questionnaire are shown in Fig. 5 [23].

A number of the respondents believe that it is necessary to apply more often to the standards of higher education, compiled by the best experts in the relevant branches of knowledge. The relevant criteria have already been established and one only needs to get acquainted with the relevant standard of higher education and apply it in practice. According to the standard, knowledge and competences suffi-



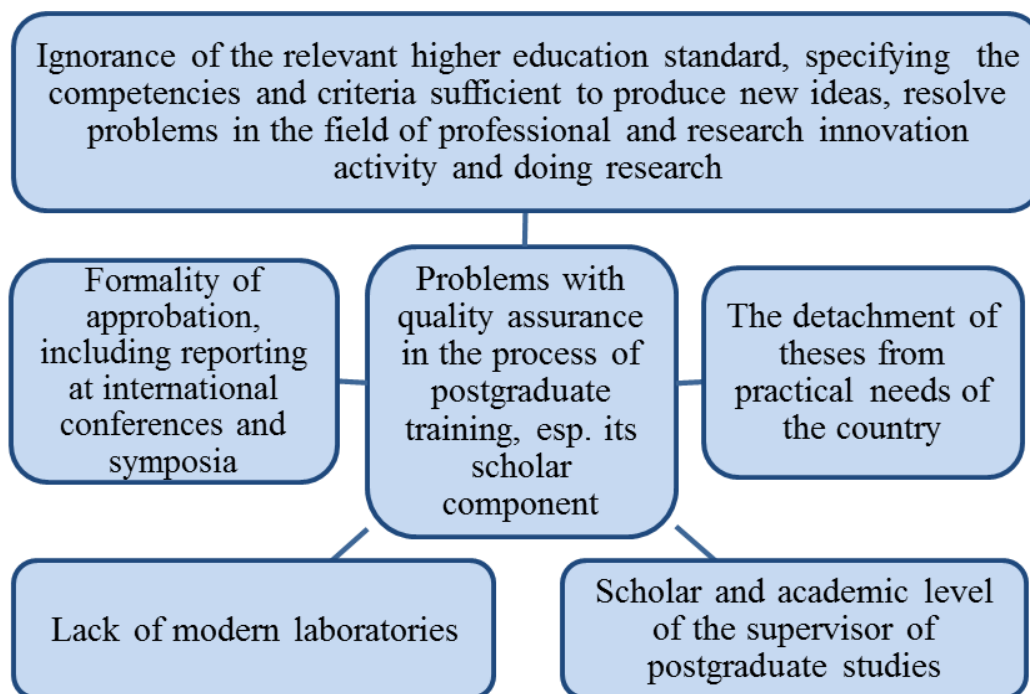


Fig. 5. Problems impairing the quality of postgraduate students' training

ent for producing new ideas are developed from practical activities in the process of resolving complex problems. Our postgraduates mainly gain knowledge and competences in writing scientific papers to acquire theoretical basis, or rather empirical data that do not allow resolving integrated problems in the field of professional activity, including teaching environmental disciplines.

The formality in approbation of the research results is also assigned to the problems, as follows:

- participation in conferences, especially international ones, mostly by correspondence due to the lack of funds for business trips;
- transfer of research results to target institutions/enterprises also does not require feedback;
- publication in high-ranked scientific journals is almost impossible due to outdated laboratory equipment and research techniques unrecognized in Europe, as well as due to extremely high value policies of many publishers.

The problem is often in the fact that the supervisors of the degree candidates do not always possess modern professional knowledge, environmental situation and computer skills when training young scientists.

A long list of criteria that can be used to evaluate the PhD candidates' training has been proposed; they partially repeat the existing ones, but there are many additions.

As noted by the respondents, the only criterion for the quality assessment of scholar training should be a well-worked qualification work (thesis) pre-

pared for the defense in time. Meanwhile, taking into account general scientific competencies that postgraduates should receive during their training according to the educational and scientific programme (ESP), control over the ability to present and discuss their own scientific results should be tightened.

It would be an issue of interest to organise a separate type of scientific conferences, conferences of Doctor of Philosophy degree candidates, separately within the limits of each specialty according to the main list - List 2015. Holding of such events can be entrusted to institutions of higher education in which permanent specialised scientific councils for theses defense will operate.

Also, the respondents note the need to take into account the following:

- number of publications in peer-reviewed journals;
- participation in international scientific conferences;
- participation in international scientific projects;
- at least one published article on the methodology of science.

A number of the respondents consider it necessary to acquire competences in teaching environmental disciplines. Therefore, they propose to introduce the following indicator: implementation of the educational load of 75 - 100 hours per year and make mandatory the candidate exam on the methodology of science.

It was also proposed to simplify the require-

ments and facilitate the procedure for the defence for PhD degree candidates who work on dissertations (and will defend them) in English.

**Question 6** «Do you recognise any issues with the organisation, quality and/or contents of training currently offered to PhD students? » (Fig. 6) was

answered by a fourth of the respondents “No, I do not”. In addition, a number of the respondents do not find their positions because they believe that the implementation of the new form takes time. “We are accustomed to other forms of postgraduate education. What is the best time to tell?”

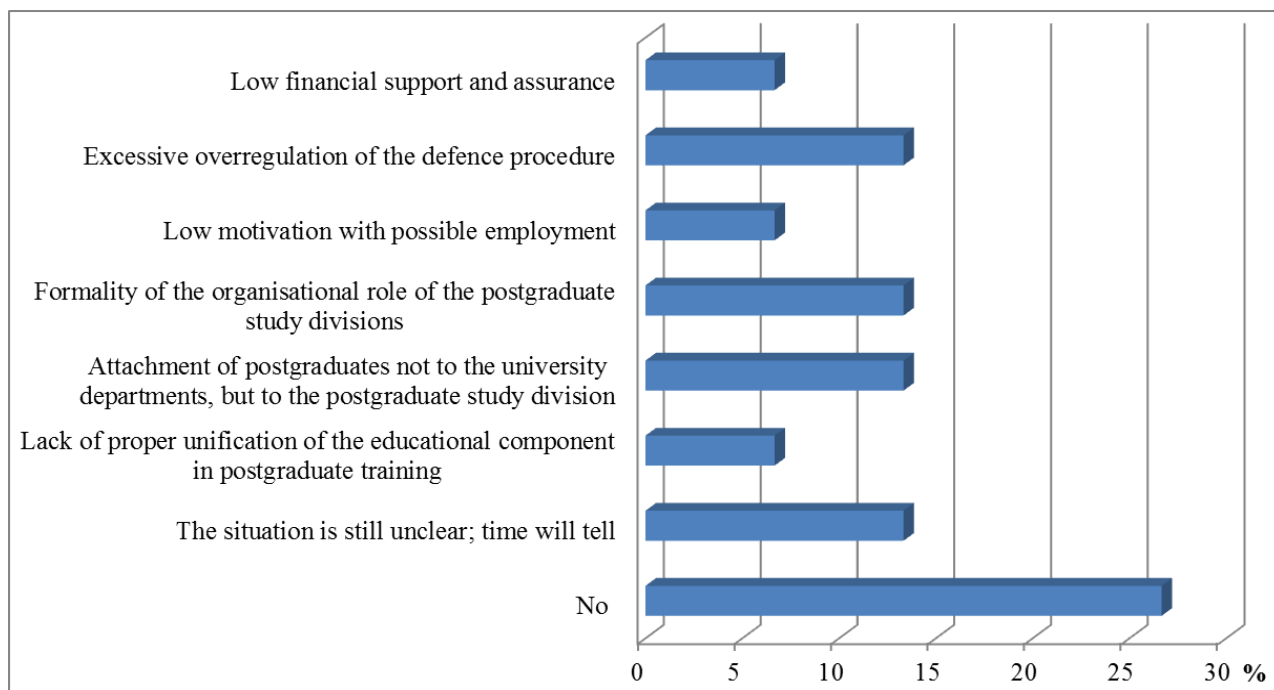


Fig. 6. Variation in answering Question 6 «Do you recognise any issues in the organisation, quality and/or contents of training, currently offered to PhD students?»

The remaining respondents focused almost equally on the following:

- absence of the organising role of the postgraduate study division, which reduces to taking into account the implementation of the programme, organising exams and collecting various reports. In fact, the whole burden of postgraduate training is entrusted only to the postgraduate and his/her supervisor. And the final result depends only on their persistence and perseverance. That is why, in order to improve the quality of training, it is advisable to select the best research supervisors, only Doctors of Science, attach postgraduates to their departments, not to the postgraduate study divisions.
- excessive governmental regulation of all aspects in the preparation and defence of the thesis research, execution of great number of accompanying documents, inconsistencies in the proportion of attention to the scientific value of the research in relation to the documentary support for the thesis defence [8-21] This is especially true for the formal requirements to the number of articles, “5 papers for natural science specialties is too many”. As noted by the respondents, the specific results of scientific

work appear in the third or fourth year of study. This period is characterised by a significant load for the postgraduate: writing the necessary publications, participating in conferences for approving the research results, preparing, completing and executing the dissertation itself. And under regular planning of writing papers, the conclusions of the first one may differ from the results of the last one, or after 4 years the first paper becomes less relevant;

- some of the answers indicate the problem of lack of motivation among future Doctors of Philosophy concerning employment and financial allowance, which makes it impossible or significantly reduces the field or laboratory stages of research.

At the same time, the authors note that “The procedure of training PhD and DSc candidates in higher education institutions (R&D institutions)”, approved by the Resolution of the Cabinet of Ministers of Ukraine No. 261, dated March 23, 2016 [4], provided for resolution of a number of problematic issues addressing the organisation, quality and content of PhD candidates training in Ukraine.

A graphical analysis of the answers to **Question 7** «Is there anything that can be done under the

existing framework conditions, in order to improve the organisation, quality and/or contents of training

currently offered to PhD students?», is shown in Fig. 7.

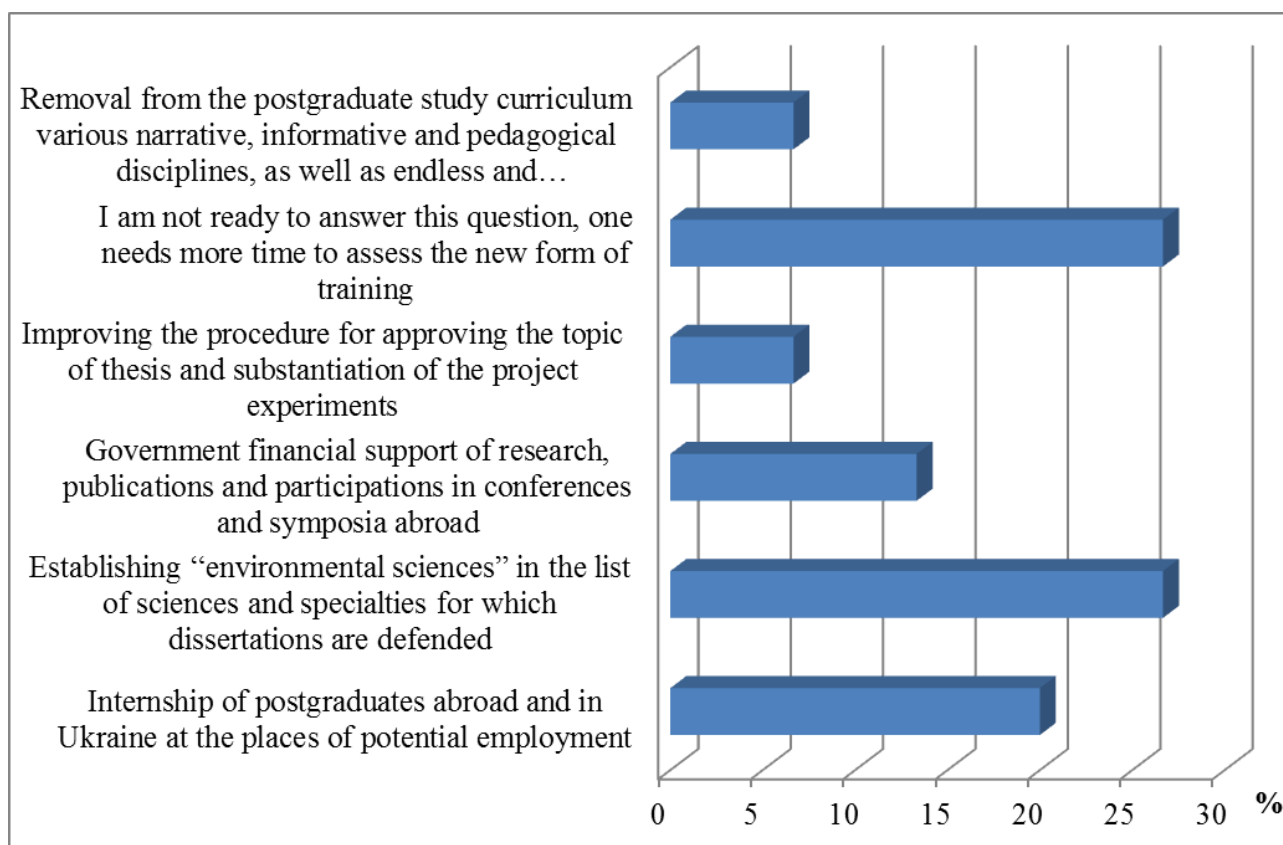


Fig. 7. Variation in answering Question 7

«Is there anything that can be done under the existing framework conditions, in order to improve the organisation, quality and/or contents of training currently offered to PhD students?»

Also, the questionnaires indicate that postgraduates need governmental financial support in the form of grants, which could be used for field or experimental research, the opportunity to participate in conferences, including foreign ones or to publish papers in the high-ranking journals.

Several respondents, with the aim to improve the organisation of postgraduate training, offer to remove a variety of narrative, informative and pedagogical disciplines with the endlessly and fruitlessly learning foreign languages. Practice is of utmost significance.

To improve the effectiveness of the research, there were suggestions to improve the procedure for approving the topic of the thesis. In particular, to approve not the actual title of the topic, as it is practiced today, but a research project with a thorough justification of the topic presented by a student (after the first year of study), a review of existing literature sources, problematic issues that need to be investigated, as well as a deeply understood formulation of the purpose and objectives of the study.

**Question 8** «Are there any subject-related or general skills the PhD students and graduates are

missing in order to make successful research careers and/or to complete their theses?» Every second respondent thinks that it is sufficient. On average, the respondents note that the training during postgraduate studies provides all the necessary competencies to postgraduates.

In the future, everything will depend on the personality of the postgraduate and traditions of the scientific school he was involved. The main thing is to have a desire. But talent is of utmost importance, too. The remaining respondents gave various response options, which are presented in Fig. 8 [23], but they all share one opinion that the very prospects are not very bright for a successful scientific career, because many R&D institutions are closing now, their funding, as well as the staff are being reduced, etc.

**In Question 9** «What forms of cooperation between PhD awarding (or providing doctoral training) institutions would improve the quality of doctoral studies at your institution and nationwide? In particular, in terms of:

- quality of provision, contents and relevance of PhD courses

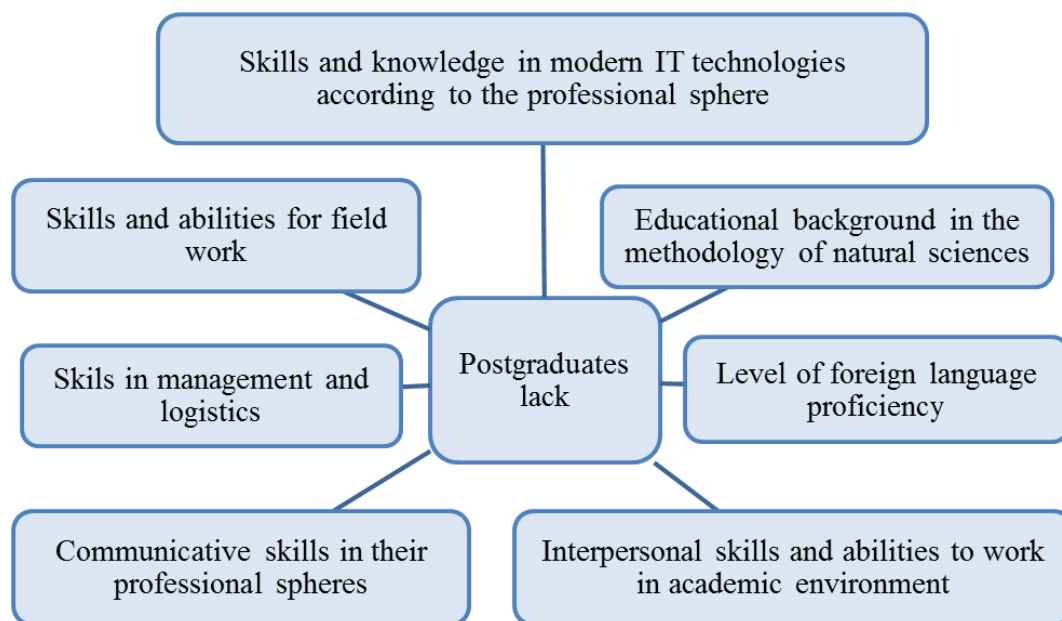


Fig. 8. Variation in answering Question 8 «What do postgraduates lack for a successful career?»

- joint research, supervision, publications and/or use of equipment and/or experimental facilities

- virtual and physical mobility of PhD students
- quality assurance and peer review
- networking, knowledge and data exchange

Regarding cooperation on quality of provision, contents and relevance of PhD courses, the respondents were unanimous: it is necessary to organise events that promote active scientific communication (scientific conferences, methodological workshops, postgraduate internships at other universities (including foreign ones), as well as mastering a certain number of credits in other universities.

Regarding joint research, supervision, publications and/or use of equipment and/or experimental facilities, joint research with the same methods in different regions is offered, or joint research by various scientists at the intersection of sciences, such as: geography and biology, ecology and geography, economics and geography, geography and environmental and ecological technologies, etc. Usually the results of such studies are the most integrated, systems and effective ones in their implementation. Carrying out the joint grant projects is also considered promising. The possibility of cooperation of a postgraduate not only with one supervisor, but with several ones, both in Ukraine and abroad (sandwich projects, etc.) is proposed.

Regarding virtual and physical mobility of PhD students, two components were considered: virtual and physical. The need for both, the first and second options, is not questioned by any of the respondents.

For virtual mobility there is a need to create the Internet libraries, common information platforms,

distant participation in Internet conferences, etc. Physical mobility is proposed to be implemented in the options shown in Fig. 9.

According to the respondents, to assure quality and peer review, it is necessary to involve reputable scientists from domestic and foreign universities and R&D institutions to teach disciplines to postgraduates. That is, teaching the disciplines stipulated by the educational and scientific programme, as well as in the permanent and one-time specialised scientific councils for the thesis defence.

It is also advisable to attract more intensively experts from other regions to evaluate the reports of postgraduates and review their publications, and perhaps even to compile a register of opponents (experts) on the main areas of the specialty. In the opinion of respondents, the quality of work would be enhanced by blind peer reviewing at least doctoral work and a reasonable assessment of work by experts.

The respondents also point out the need for introducing policies and procedures for quality and scientific ethics: preventing plagiarism in the work of postgraduate students; disregarding publications in substandard scientific journals with questionable editorial practices; encouraging publications in Ukrainian and foreign scientific journals, conducting high-quality peer-review, introducing adequate ethical work standards, disapproving of fictitious participation in scientific conferences; promotion of high-quality approbation of research results.

In addition, the responsibility of the supervisor and the primary institution which approve the thesis for submission increases (a department of the university or a division/section of the R&D institute).

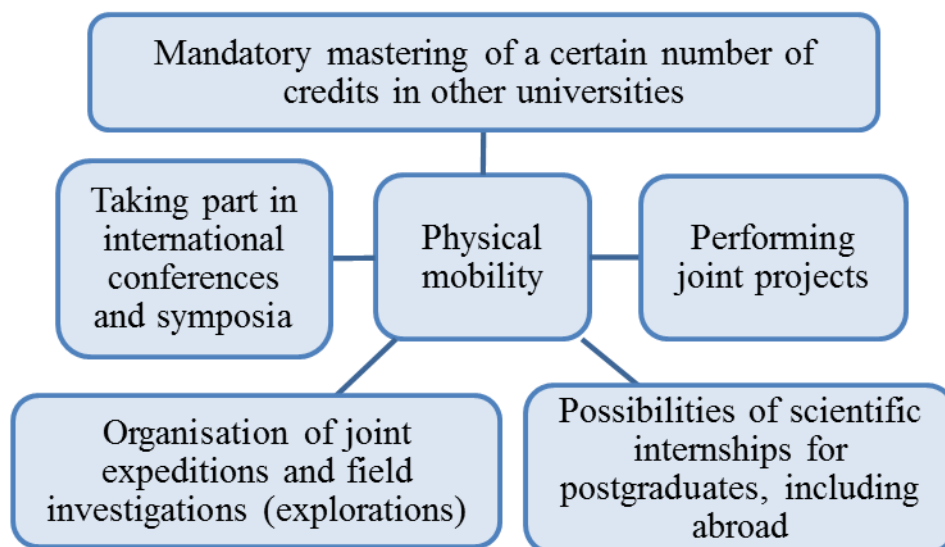


Fig. 9. Proposed options for physical mobility of postgraduates

All the respondents actively supported the necessity of networking, knowledge and data exchange. In the development of this thought, it was recommended to attract PhD candidates to social networks like ResearchGate, Academia.edu, etc. It has also been noted that at present there are no problems in this respect but there is a language barrier.

**Question 10** of the questionnaire, «If doctoral

training (including the educational provision and quality assurance) would be provided and/or coordinated by a nationwide organisation (e.g. the doctoral school in environmental studies), what services would you expect this organisation to deliver?» has caused controversy from the absolute needlessness of such a structure to placing very high hopes on it (Fig. 10).

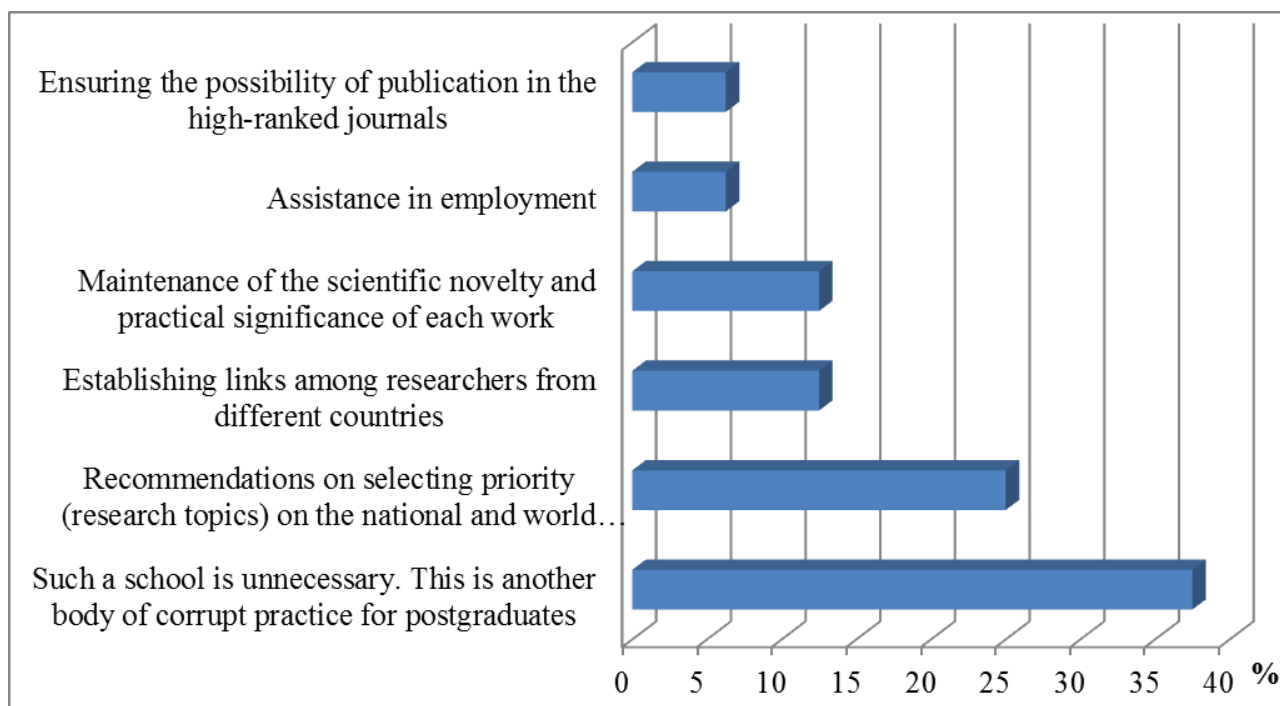


Fig. 10. Variation in answering Question 10 «If doctoral training (including the educational provision and quality assurance) would be provided and/or coordinated by a nationwide organisation (e.g. the doctoral school in environmental studies), what services would you expect this organisation to deliver?»

Most respondents believe that new organisations do not need to set up. This would be one another body of postgraduates' dependency with a

high risk of corruption. Postgraduate training is carried out at scientific schools. Universities already have postgraduate study divisions. It is just required

to increase their effectiveness with taking into account the remarks that will be found in the course of this study.

Among the respondents there is also an opinion that such a structure could contribute to the selection of national and world-priority research, the profiling of doctoral schools and the resolution of regional problems.

They rely on such an organisation and hope for establishing ties among researchers from different countries for individual research work using equipment, providing joint scientific guidance, etc.

In addition, among the expectations there is the actualisation of the scientific novelty and practical significance of each work, recommendations for writing dissertations and its expert assessment after completion (a review from this organisation).

Individually, there is a hope for learning the current international requirements for preparation of scientific articles, methods of writing high-quality articles, the choice of scientific journals of adequate quality, in which it is advisable to publish the results of the research and assistance in the employment of environmental specialists.

When asked «How would you define the subject scope of a doctoral school in environmental management, policy and technology? (please, define key subjects / key words)», in **Question 11** the following list was delivered:

- Natural resources, secondary resources, alternate resources, resource saving, sustainable natural resource use.
- Environmentally tolerant natural resource use in various branches.
- Environmentally tolerant technologies, renewable energy, recycling in energy saving. Recultivation of degraded lands.
- Environmental technologies, including protective technologies of soils; water; and atmosphere. Environmental safety.
- Investigation of contemporary man-induced nature of Ukraine, its environmental geochemical and environmental geophysical features and impact on human health Environmental risk.
- Revitalisation and reconstruction of socio-environmental systems, environmental friendly housing. Environmental infrastructure.
- Environmental monitoring; observations, assessment and prediction of environmental shifts under the man-made effects.
- Environmental design.
- Environmental legal acts, environmental fines.
- National environmental policy. Sustainable development. Sustainable development of territorial communities, cities and regions.

- Environmental management; functions of environmental management.
- Optimisation of natural resource use, preventive approach in natural resource use.
- Conservation of biodiversity. Organisation and development of the environmental network.
- Environmental culture, environmental consciousness; Philosophic basis of management in natural resource use.
- Environmental education.

**Conclusions.** The research has shown that at present in Ukraine specialists of high qualification are trained on 4 environmental specialties: 03.00.16 - Environmental Sciences, 08.00.06 – Economics of Environmental Resources Management (Economics), 11.00.11 - Constructive Geography and Wise Use of Natural Resources (Geographic Sciences) and 21.06.01- Environmental Safety (Engineering and Industrial Technology Sciences, Chemistry and Geology). In addition, separate issues of environmental protection are considered in 15 specialties from the List 2011. All these from the one hand, give the opportunity for various types of specialists to work on solution to environmental problems. On the other hand, such approach eliminates the efforts on prioritizing environmental problems in society. One of the ways to solve this problem is to introduce a separate category for environmental sciences.

Scientific problems are scientific research of low quality, low level of application of modern technologies, non-correlation between the topics of the society demands, ignoring foreign experience in the solution to similar problems, etc.

Organisational problems are poor technical provisions, non-availability of training abroad for PhD students, low level of English, split between the PhD department and PhD students, problems with publications in peer-review journals and visual presentation of reseraches on international conferences, etc.

The list of recommendations to improve the training process for future environemtnal specialists in Ukraine includes:

- To establish “environmental sciences” in the list of sciences and specialties for which these are defended;
- To achieve government financial support of research, publications and participations in conferences and symposia abroad;
- To perform joint projects, joint expeditions and field investigations (explorations);
- Possibilities of scientific internships for post-graduates, including abroad.

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Co-funded by the  
Erasmus+ Programme  
of the European Union

The publication was prepared in the framework of ERASMUS+ project “Integrated Doctoral Program for Environmental Policy, Management and Technology – INTENSE”, financed by European Commission. Responsibility for the information and views set out in this publication lies entirely with the authors.

**Authors Contribution:** All authors have contributed equally to this work.

UDC: 911+378:502/504

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## SOLVING CURRENT ENVIRONMENTAL PROBLEMS BY HARMONIZATION OF DOCTORAL PROGRAMS WITH EUROPEAN STANDARDS

**Formulation of the problem.** At present in Ukraine environmental problems are very topical. A comprehensive and effective solution to these problems can be grounded on the use of modern approaches, expressed through harmonization with the best world practices. Training of highly qualified specialists is an important component of the integrated approach. Currently, in Ukraine it is performed on 4 environmental specialties: 03.00.16 - Environmental Sciences, 08.00.06 – Economics of Environmental Resources Management (Economics), 11.00.11 - Constructive Geography and Wise Use of Natural Resources (Geographic



Sciences) and 21.06.01- Environmental Safety (Engineering and Industrial Technology Sciences, Chemistry and Geology). In addition, separate issues of environmental protection are considered in 15 specialties from the List 2011. Resolution of the Cabinet of Ministers of Ukraine No. 266, dated April 29, 2015, "On approval of the list of branches of knowledge and specialties for which candidates for higher education are trained" ("List 2015") canceled "List 2011" [2]. Order of the Ministry of Education and Science of Ukraine No. 1151, dated November 6, 2015, "On the peculiarities of introducing the list of branches of knowledge and specialties for which candidates for higher education are trained" [3], the table of compliance of the List of scientific specialties ("List 2011" and List of areas of knowledge and specialties for which candidates for higher education are trained, including PhDs ("List 2015")) [2] was approved.

At the same time, up to the present day, theses have been defended according to "List 2011". The problem of "dispersion" of environmental issues among various specialties in various branches of knowledge not only remained, but also grew up, as the number of the latter increased. This situation is of concern to the scientific community.

**The purpose of the article.** To clarify the problems existing in the national system of postgraduate students' training in environment-oriented specialties and defending theses by them in accordance with modern requirements, as well as finding ways to improve this situation, based on international experience.

**Methods.** As part of the implementation of project Erasmus + "Integrated Doctoral Program for Environmental Policy, Management and Technology - INTENSE", 586471-EPP-1-2017-1-EE-EPPKA2-CBHE-JP, an anonymous survey of leading scientists engaged in post-graduate training and doing research work in the field of the environment. The questionnaire was developed by Odessa State Environmental University and the survey covered institutions of higher education in almost all regional centres of Ukraine, as well as the cities of Uman and Kremenchuk. It should be noted that such cities as Kharkiv, Lviv, Kyiv, Dnipro, Vinnytsia, Poltava and Uman were represented by several universities. The rest of the regions were represented by the respondents of one institution of higher education.

**Results.** The obtained results have shown the existing organisational and scientific problems. The key problem is the lack of a separate category for PhD (Environmental Sciences) in the updated List 2015. Scientific problems are scientific research of low quality, low level of application of modern technologies, non-correlation between topics with society demands, absence of foreign experience consideration in the solution to similar problems, etc. Organisational problems are poor technical supply, non-availability of training abroad for PhD students, low level of English, problems with publications in peer-review journals and visual presentation of the research at international conferences, etc.

**Keywords:** National Qualification Frameworks, PhD student, speciality, Environmental Sciences, problems, nature management, environmental policy, environmental technology.

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