

4.5. The ARROW project

The ARROW project – “Improvement of Research and Innovation Skills in Mongolian Universities”–, with an approved budget of 551,140 euros, aimed to contribute to the promotion and strengthening of scientific writing capacity building and results visibility in Mongolian universities belonging to the consortium. This consortium comprised four European (1 Portuguese, 1 Polish and 2 Spanish) and 11 Mongolian Higher Education Institutions (HEIs). ARROW provided Mongolian universities with adequate tools to increase the visibility and rates of scientific production in terms of better scientific manuscripts and patents. The innovative character of the present proposal was raised in the combination of different arrows to achieve the bullseye. ARROW 1: to know how to manage the “medium” where science grows (databases, plagiarism, patents); ARROW 2: to improve scientific skills (scientific English, scientific writing, statistics); and ARROW 3: solving problems workshop. Moreover, a novel structure was proposed, consisting of a platform that allowed senior researchers from both European and Mongolian universities to contact junior or inexperienced researchers from the partner and associated universities of Mongolia.

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1. Background

In recent years, Mongolia has paid considerable attention to reforming and modernizing its science and technology system, to train professionals at a level comparable to the most developed economies. Training, research and entrepreneurship were the activities that the most prestigious universities in the world used to develop high-level professionals. A proper combination of these three activities could generate a modern and successful research and development model in Mongolia. To do so, it was necessary to establish some research and development levels that would allow achieving the proposed goals, which were none other than reaching the international standards in education, research and development. These were important factors in building the capacity of Mongols to the international standards in education, research, innovation, industrial, business and financial fields. Mongolia’s rapid economic growth was highly dependent on the mining operations of the country. Scientific development requires, in turn, the training and the implementation of capacities and skills for its correct development and communication. One of the most recognized ways of communicating and disseminating of scientific results was through scientific manuscripts or “papers”. In this sense, at the time of the presentation of the ARROW project, the universities of Mongolia shared the same scenario: greater focus on teaching

than on research and publication. Therefore, the quality scientific production was low or very low, so the submission of scientific articles to journals of recognized prestige was very low.

According to Scimago Group (2007), from 1996 to 2014, all countries have produced around 35 million papers. The USA is the main contributor with 22% of the scientific production, China is the second one with 10% and only 20 countries have more than 1% of the global contribution. Spain is in the position number 10 with the 2.48% of the global scientific production. Mongolian partners display a very low scientific production. All research work, dissertations and papers published by Mongolian researchers are in Mongolian language. Much less than 1% of these papers are published in international journals. Due to the language barriers, Mongolian HEIs have limited opportunities to publish scientific research and participate in international conferences and workshops. The global scientific production in Mongolia is just 0.008%.

After the initial status analysis, the main conclusion is that the average of the articles is rejected because of the quality of “how results are presented” and not the quality of the performed research. The combination of these factors makes ARROW happen. The fact of using a common methodology for scientific publications (comparing parameters of quality and homogeneously interpreting scientific results) may create synergies between European and Mongolian science. This project will give a direct opportunity to Mongolian partner universities to pool their strengths and weaknesses and jointly acquire the skills needed for greater collaboration and multidisciplinary understanding through scientific production and publications.

Antecedents

The project proposal was born due to the combination of some factors. On the one hand, the ULP-GC had a strong team in international cooperation which was coordinating different international projects (e.g., KA2-ReVET and the KA2-INSTANT among others) and had strong contact with some of the Mongolian partners included in ARROW through the Erasmus Mundus IMPAKT project. ULPGC had been exchanging students and staff with two Mongolian partners (Mongolian National University and University of Finance and Economics). Because of this, from the Mongolian universities, there was a high interest in participating in the ARROW project, so they actively participated in the design and application of the project.

The consortium

The ARROW project was implemented by a consortium of 4 European HEIs and 11 Mongolian HEIs (see Table 4.5.1). As far as European partners are concerned, the balance is granted by the participation of southern and northern European Universities, such as University of Porto (Portugal), University of Szczecin (Poland) and University of Las Palmas de Gran Canaria (Spain) together with Science and Technology Park Foundation (FPCT) (Spain). The experiences of the four universities are complementary and reinforce the plurality in the European consortium. Concerning the Mongolian partners, HEIs have been selected to set two criteria, background of relationship with European HEIs or other Asian HEIs and interest in the proposal. The Mongolian consortium counterpart involves 11 HEIs.

Table 4.5.1. **ARROW HEIs Partners**

Organizations *	Acronym	Country
Choi. Lubsangjab University of Language and Civilization	ULC	MONGOLIA
HANGAI University	HU	MONGOLIA
Mongolian National University of Education	MNUE	MONGOLIA
Mongolian National University of Medical Sciences	MNUMS	MONGOLIA
Mongolian University of Life Sciences	MULS	MONGOLIA
National University of Mongolia	NUM	MONGOLIA
New Mongol Institute of Technology	NMIT	MONGOLIA
Otgontenger University (associated partner)	OU	MONGOLIA
Scientific and Technological Park Foundation	FCPCT	SPAIN
Tsetsee Goun Management Institute	TGMI	MONGOLIA
Ulaanbaatar State University	USU	MONGOLIA
University of Finance and Economics	UFE	MONGOLIA
University of Las Palmas de Gran Canaria	ULPGC	SPAIN
University of Porto	UPORTO	PORTUGAL
University of Szczecin	US	POLAND
University of the Humanities	UH	MONGOLIA

*Listed by alphabetical order

Source: Own elaboration.

Publication status before ARROW

To give a general overview of the Mongolian research situation before the development of the ARROW project, we present the results of a bibliometric analysis based on international databases. To obtain the necessary records for the bibliometric analysis, a bibliographic reference advanced search was performed in the Web of Science (WOS) Core Collection and Scopus Database. For the advanced search “period” and “country” fields were specified to make the query of the specific features and terms. Concerning the year, the period selected was from 2014 to 2018 inclusive. In the same WOS and Scopus advanced search, the name referring to Mongolia was selected within the “country” field to

display all the publications published by Mongolian researchers. Mongolian institutions produced 2,105 documents included in the Web of Science database between 2014 and 2018 (see Table 4.5.2). The National University of Mongolia (NUM) and Mongolian National University of Medical Sciences (MNUMS) are two of the three first-positioned universities that produce the most scientific documents; these two universities are ARROW partners.

Table 4.5.2. **Authors' affiliations in documents with authors in Mongolian institutions (2014-2018) (Top 10)**

Institutions	Documents	% of 2,105
NATIONAL UNIVERSITY OF MONGOLIA*	495	23,515%
MONGOLIAN ACADEMY OF SCIENCES	478	27,708%
MONGOLIAN NATL UNIV MED SCI*	332	15,772%
RUSSIAN ACADEMY OF SCIENCES	228	10,831%
MONGOLIAN UNIV SCI TECHNOL	217	10,309%
JOINT INST. NUCLEAR RESEARCH RUSSIA	155	7,363%
MONGOLIAN UNIVERSITY OF LIFE SCIENCES*	134	6,366%
CHINESE ACADEMY OF SCIENCES	126	5,986%
HELMHOLTZ ASSOCIATION	83	3,943%
SEOUL NATIONAL UNIVERSITY SNU	79	3,753%
MINISTRY OF HEALTH MONGOLIA	72	3,420%

Note: Data of WOS from 2014/01/01 till 2018/12/31. * Mongolian institutions in ARROW project.

Source: Web of Science.

The next Mongolian university project partner by number of publications is the Mongolian University of Life Sciences (MULS) with 134 documents. Among the three partner institutions of the project, they produced 45% of the documents indexed in the WOS database in the 2014-2018 period. The remaining Mongolian members of ARROW individually produced less than 1.5% of the total production.

In Figure 4.5.1, the results of international research collaborations are presented. As it can be seen, collaborations in publications are made among Mongolian authors themselves. Secondly, there are collaborations with the United States, followed closely by Russia. Thirdly, collaborations with other Asian countries (Japan and China) stand out. In fourth place, there are collaborations with countries of the European Union, with Germany standing out, followed by England and Italy. Finally, publications with Australia appear in the tenth position.

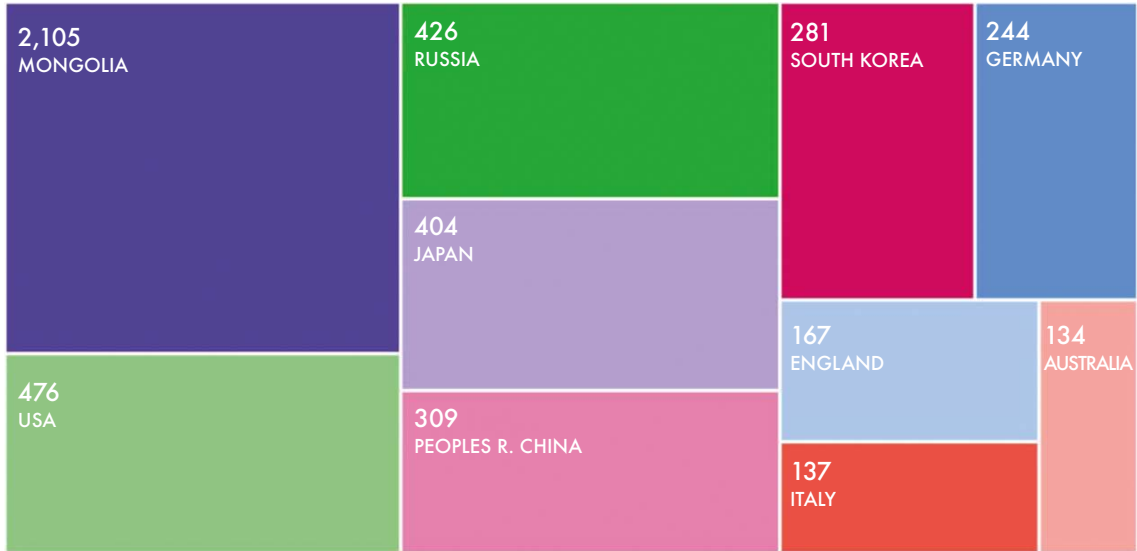


Figure 4.5.1. International collaborations (Top 10) in the production of Mongolia (2014-2018)

Source: Web of Science.

Then, a classification by field category was made of all publications in the Web of Science database from Mongolian centers. Figure 4.5.2 shows the first 10 publication field categories. As it can be seen, the field category with the highest number of publications is “Environmental Science”, followed by the category “Geosciences Multidisciplinary” and thirdly, category “Ecology” and “Multidisciplinary Sciences”.



Figure 4.5.2. Field categories (Top 10) in the production of Mongolia (2014-2018)

Source: Web of Science.

Mongolia's scientific publications are concentrated in a few universities and are also carried out in research categories focused on the science category. Considering Mongolian publications, the results showed that the research documents are not made with European scientists, the co-authorship is mainly with Mongolian authors. All these reasons strengthen the great usefulness of the development of the ARROW project to strengthen scientific relations between Mongolian and European researchers.

As a complementary analysis, strengths and weaknesses analysis were carried out and responded to by the ARROW consortium partners. When looking at the aggregate weaknesses and strengths of Mongolian universities, their differences become less apparent. The following common findings can be considered when looking at the weaknesses. First, to increase the visibility of Mongolian researchers or to improve research collaboration in international projects, most Mongolian universities emphasized the need to join international research networks. Second, the low level of English proficiency for publishing scientific articles was identified by some universities as another weakness. Finally, another weakness identified in developing scientific understanding is the lack of international research materials, equipment and techniques.

Furthermore, the most notable strength of Mongolian universities was the motivation and willingness of academic staff to collaborate. The main resource for maximizing the objectives proposed by the ARROW project is the high motivation to improve their skills.

Project's goals

This ARROW project is a challenge to improve Mongolian research and innovation skills. As an important objective of this ARROW project, every partner aimed to encourage Mongolian universities to develop together the necessary skills for greater multidisciplinary collaboration and understanding, through research production and scientific publications. The long-term main objective proposed by ARROW is based on the ability to disseminate the research conducted by the Mongolian partners, so the high visibility of the research will contribute the Mongolia's development. Therefore, the ARROW project's main objective was to contribute to the promotion and strengthening of scientific writing skills and the visibility of the results in Mongolian universities belonging to the consortium. Data establishes that countries with higher standards of life are linked with good scientific production, due to progress based on knowledge and science which provides knowledge to society. The ARROW project tried to provide Mongolian universities integrated into the consortium with the proper tools to increase the visibility of scientific production in terms of better scientific research results, such as indexed papers and patents. Besides, ARROW implemented a mentor-scientist network, where prestigious scientists cooperated (and still do) altruistically to improve Mongolian researchers' results.

Activities

To achieve the project's goals, the following "ARROWS" were shot:

- a) On-line course on scientific databases. Publishing a research paper in a journal or conference is an important activity within the academic community. It allows researchers/scholars to network with other scientists and to further refine their ideas and research. We can say that scientific journals are probably the most common place to publish the results of research. Finding the most suitable academic journal for a concrete topic and writing style will increase the chance of being published ("Know your audience and write accordingly"). The first step to reach this objective is to know how to use scientific databases (Web of Science, Scopus, Pubmed, etc.). This first arrow intended to give Mongolian partners a deep knowledge of the modern database for data search which is the starting

- point of each publication. This course was taught by University of Szczecin with 15-16 staff enrolled per each of the 12 partner universities, and a total number of enrolled participants of 188 among students and staff.
- b) On-site scientific English courses. Attention must be paid to how other research papers are written: the format, the type of articles (quantitative studies versus qualitative ones, primary research, review of existing papers), the writing style, the subject matter, and the vocabulary. Specific grammar for scientific use is a great tool to improve the quality of the manuscripts and consequently the acceptance rate of manuscripts. These courses provided Mongolian partners with the right tools for writing a good manuscript. The total number of participants enrolled was 165 (since such courses required an allocated budget, the associated partner OU could not benefit from this action).
 - c) On-line course on plagiarism and self-plagiarism. Nowadays the pressure on the scientist to publish is increasing plagiarism and self-plagiarism cases. To raise awareness among researchers about the importance of originality is the main objective of the present activity. This course was taught by FPCT with 15 staff enrolled per each of the 12 partner universities, total number of participants of 180 students and staff.
 - d) On-line workshop on writing skills and problem-solving work camp. This workshop gave the Mongolian scientists the necessary skills to write a good manuscript. The discussion over real cases (with the contribution of Mongolian scientists) helped to understand and interiorize the concepts. Sometimes journals asked authors to revise the paper and resubmit. At this point, many Mongolian authors surrender and never publish the results. Through this work camp, we pretend to transfer the “keep trying” mentality to Mongolian partners so they can learn how to solve these very common obstacles. In this regard, this workshop and work camp helped Mongolian partners to use all their skills as researchers and writers to create a superior paper. Even, if ultimately, they are rejected by the “target” journal they can continue to re-write the paper and submit it to another one. This course was taught by ULPGC. Three staff members per each of the 12 Mongolian partners attended.
 - e) On-line seminar on patents and university knowledge transfer. Nowadays, the protection of generated knowledge with commercial applications is mandatory. To understand how and when the scientist must perform that protection is essential for the country's development. FCPCT coordinated the patents seminar due to its wide experience in patents and technology transfer.
 - f) On-site applied statistics course. Experiment design and results interpretation through statistics is a core point in science. Sometimes too much work is devoted to an experiment with a wrong design, and the reviewers must reject the manuscript. The present course allowed the scientist to improve their knowledge of statistics applied to science. This course was taught by University of Porto and took place in Ulaanbaatar simultaneously to the intermediate meeting, the total number of participants enrolled was 65 students/staff.
 - g) On-site workshop on funding opportunities and proposal writing. This workshop was offered to present the landscape of scientific project funding. It was the opportunity to give information about Horizon Europe, Erasmus+ and other international programs. It was taught by University of Porto. Three staff members per each of the 12 Mongolian partners (total 36 Mongolian staff) plus 8 EU partners attended.
 - h) On-line workshop on Design Thinking in Education & Science, and On-line workshop on Dissemination of Project Results, titled “Sharing and making use of project results and actions”. These workshops

were taught by University of Porto. Three staff members per each of the 12 Mongolian partners (total 36 Mongolian staff) plus 8 EU partners attended.

- i) Creation of the mentor-scientist webpage. This platform was designed to be the future of the project. This is a virtual place where mentors (i.e. experienced researchers) and mentored (i.e. new researchers) scientists can meet and where mentored scientists can find someone experienced enough to help altruistically. The innovative character of ARROW consisted precisely of the combination of training and mentoring for the improvement of research skills and the publication of results in prestigious scientific media.

2. Main achievements of the project

The fact of involving so many different institutions was crucial for the creation of a very powerful network of cooperation. Before the project started, the 12 domestic Mongolian institutions did not collaborate very often, on the contrary, they perceived others as competitors. However, after the ARROW implementation, they started to cooperate, signed bilateral and multilateral agreements and, most importantly, they now consider themselves as partners, colleagues and friends who share and circulate knowledge, information and experience thus creating a transversal synergic effect, probably being the most relevant result of the project. Moreover, traditionally Mongolian HEIs tended to cooperate internationally with South Korea and the United States, EU possibilities for cooperation were not well established there yet. The ARROW project was also innovative in terms of the partnership. The project has reached new beneficiaries that may not have been reached otherwise and has made Europe popular among Mongolians and Mongolia among Europeans. Then again, Mongolia and Central Asia, which were still quite unpopular destinations for academic and scientific cooperation in the EU, have considerably increased their academic and scientific exchange.

Moreover, the ARROW project is in line with the national priorities and with the objectives of the main Mongolian HEIs to get better recognition in the international scientific community. ARROW provided a wide group of researchers, belonging to Mongolian Partner HEIs, with a set of theoretical and practical content aimed at improving research, publication, and intellectual property skills. As a result of this program, beneficiaries acquired not only technical skills related to using a scientific database, selection of the most appropriate journal where to publish or international regulations for patent registration, but they also received training and advice on soft skills necessary for successful publication of research results. In this sense, through several courses, workshops and personalized mentoring, ARROW beneficiaries acquired the right skills for appropriate communication with referees of quality journals, as well as for a “problem-solving” mentality at the time of publication and the establishment of productive relationships with partners and colleagues.

Finally, it should be noted that ARROW enabled the acquisition of different equipment to improve the research capabilities of the partners. Equipment was purchased just for partner countries and included ICT equipment, electronic books, antiplagiarism software subscriptions to licenses, online newspapers and scientific journals depending on the very specific necessities of each HEI. A quite big difference in necessities among partners was detected. According to the evaluation of needs implemented, some universities already had access to scientific databases and journals whilst others did not.

3. Outputs, outcomes and impact

The ARROW project generated high interest in the partner society and enabled the interaction of different actors and stakeholders as the international activities implemented in the project reached a wide audience and involved the private sector. ARROW's aims and scopes engaged local and regional stakeholders such as technical institutes, travel and intercultural agencies, linguistic agencies and academies, ICT suppliers, software providers, local and national media (national press and TVs disseminated the ARROW activities on several occasions), non-partner HEIs, academic foundations, student associations, cultural and folkloristic associations, among others.

The ARROW project successfully pursued its third specific objective by emphasizing the enhancement of problem-solving capacities through mentoring initiatives. A key contribution of the ARROW project was the establishment of a mentoring network that connected young Mongolian researchers with outstanding European mentors and predominantly established scientists, fostering a disinterested exchange of knowledge and expertise.

Mentoring stood as a cornerstone of the project, facilitated through the ARROW website's functionalities designed explicitly to serve as a platform for mentor-scientist interactions. The project deemed it imperative to actively seek and enlist senior researchers capable of providing altruistic mentorship. Following a meticulous recruitment phase, a total of 71 mentors pledged their commitment to guide and support inexperienced researchers. These European mentors hailed from diverse knowledge domains, ensuring comprehensive coverage across all areas essential to meet the requirements of the Mongolian partners. In the context of inexperienced researchers, the year 2020 witnessed the participation of 117 individuals within the mentor-scientist network, comprising 71 women and 46 men. This achievement notably fulfilled the objective of gender parity, marking a significant stride toward bolstering the capabilities and empowerment of women within the program.

It should be emphasized that the satisfaction indicator provided an excellent level in an overall summary of all training activities. All 329 certified participants rated all training activities above 4 out of 5. Among the most relevant ranking data of the group of certified participants, the following can be highlighted as follows. First, most of the participants (48.7%) were in the age group between 30 and 40 years old. Second, it should be noted that 62 % of the participants had master's degrees and 36 % had PhDs. In terms of the gender of the participants, the strong participation of female scientists was highlighted, with 74% of certified participants being women. Gender parity was always sought when selecting participants, focusing on one of ARROW's main objectives.

At a general level, the impact on the local society after the implementation of the project will be sustainable. The improvement of the academic capacities of Mongolian public higher institutions will make them more attractive for national students, thus preventing brain drain to other regions. Many Mongolians are still pursuing tertiary education opportunities both domestically and abroad, especially towards China, South Korea, the US, the Czech Republic, the UK, Canada, and Japan. The improvement of national economic conditions, professional opportunities, and higher education capacities, such as the ones created through the ARROW project, will not only incentivize their stay (or return) but also provide the local public and private sector with highly specialized staff/researchers.

Thanks to the acquired knowledge and skills, universities, enterprises, and other relevant stakeholders will be more effective and targeted in finding solutions for Mongolian society's development challenges. It is important to bear in mind that the impact on the visibility of Mongolian publications should be

assessed in a time horizon of 10 years, where it is possible to see what the effect has been on the new generations of Mongolian researchers. In any case, considering the period 2019-2023², an increase in the number of publications registered in the Web of Science can be seen, as for these five-year period, 3,379 scientific papers have been published. These papers were co-authored by Mongolian researchers. Although there are no major changes in the nationalities of the co-authors, it should be noted that India enters the top 10 rankings. Moreover, it enters strongly as publications with authors from India are on par with those from countries such as South Korea and Italy, which have been present since 2014. This may imply that given the increased visibility of Mongolian publications, research networks have been created in a new country (see Figure 4.5.3).

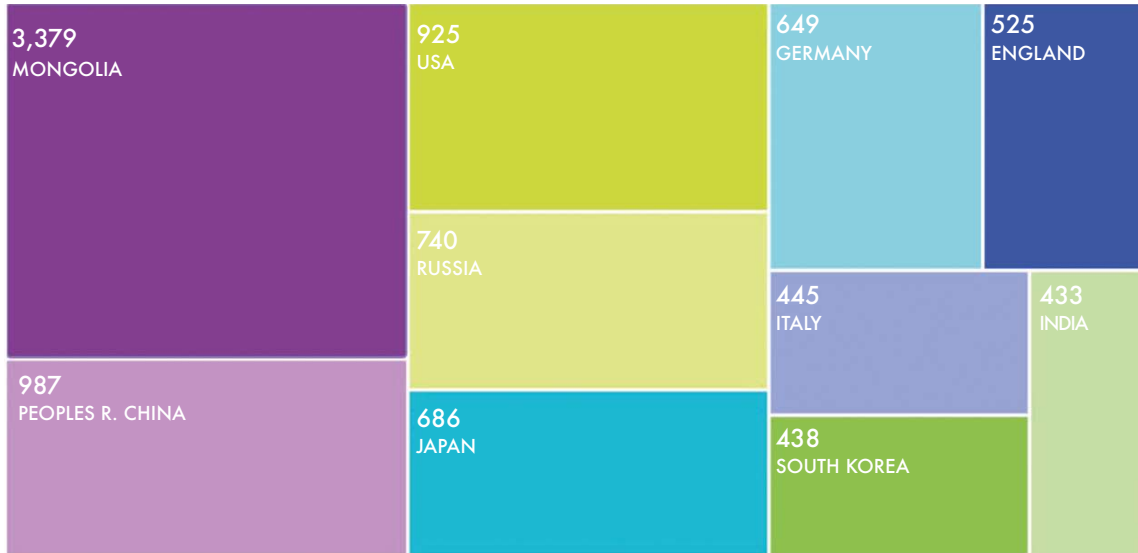


Figure 4.5.3. International collaborations (Top 10) in the produced publications in Mongolia along 2019-2023

Source: Web of Science.

If we consider the analysis of scientific research papers published in Mongolia between 2019 and 2023, we can see a change in the trend of publication fields compared to 2018 (see Figure 4.5.4). Certainly, the field of Environmental Sciences (326 papers) is still in first place, but it is closely followed by the fields of Physics Particle Fields (278 papers) and Astronomy Astrophysics (200 papers). These last two fields have increased their publications significantly, indicating that research in Mongolia has expanded into different fields, which implies a diversification of the scientific knowledge generated in Mongolia.

Throughout the ARROW project, the name of the country “Mongolia” has been recognized by search engines in scientific databases (i.e. Web of Science). When the activities of ARROW started, the name of the country appeared incorrectly in the databases of scientific journals as “Mongolian People’s Republic”, although this name had not existed since 1992. Thanks to the ARROW project, the name of Mongolia was correctly referred to and gained importance.

Among the unexpected results, the increased interest in Mongolia within the academic world should be highlighted. Not only have the publications of local researchers themselves increased, but also the rest

² Period: from 01/01/2019 till 01/12/2023.

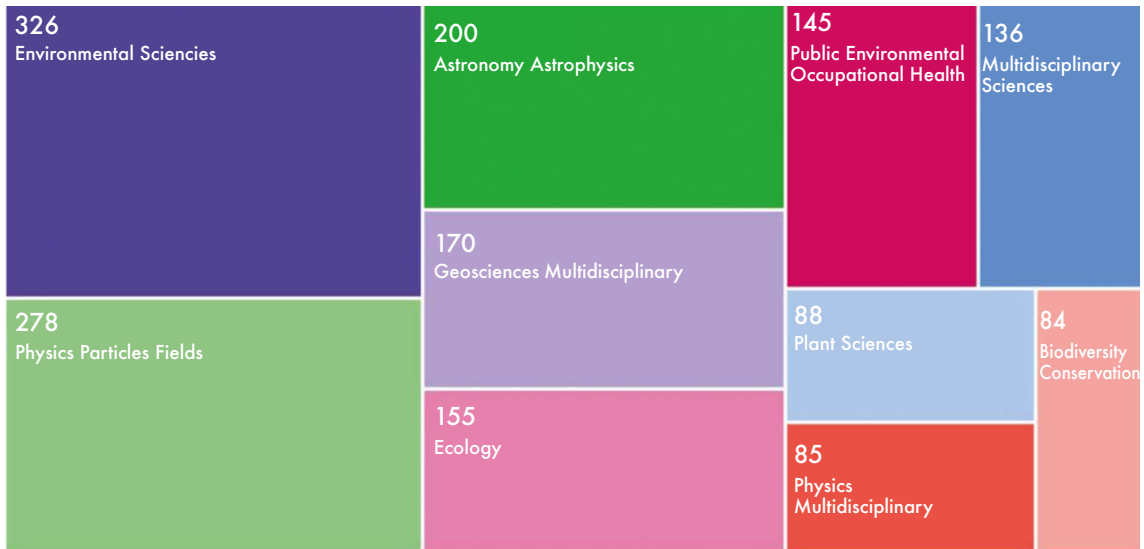


Figure 4.5.4. Field Categories (Top 10) in the produced publications in Mongolia along 2014-2023

Source: Web of Science.

of the researchers in Europe have considered Mongolia as a point of development for their research. This is supported by the fact that in the Web of Science database, European Union countries have begun to appear as authors of research with Mongolia. Specifically, focusing on the countries of the European institutions participating in ARROW, since 2018, a total of 391 publications from Spain (102 documents), Portugal (72 documents) and Poland (217 documents) have been published in Mongolia. This is an advance of Mongolia's presence and visibility in the scientific world. In the academic world, being an object of study has a very important impact on the generation of knowledge and the development of science.

Finally, and although it was not one of the actions planned in the project, efforts were joined to produce a book edited by the publication service of the ULPGC (Verano-Tacoronte et al., 2022) in electronic format in which the experiences and learnings of the universities that composed the consortium were compiled. This book served to reflect the experiences lived during the project and was an important deliverable that demonstrated that it was possible to work coordinately with a common goal among all the participating universities. Since the coordination of the project, the motivation of the participants in the correct elaboration of the materials and the dissemination of the manual among the various interest groups, both within the institutions of the consortium and in their social contexts, was evident.

4. Success factors

As indicated earlier, the ARROW project stands out for a series of innovative features: the combination of training in the different areas and basic tools of scientific research, the sharing of the results of the training and development processes, and, notably, the interaction between experienced researchers and novice researchers. As far as we know, no such approach has been done previously in this sector.

The close collaboration between European and Mongolian universities and, fundamentally, between the Mongolian universities, has facilitated the success of the project. Although all Mongolian partners were in Ulaan Baatar, they had not collaborated very often before the project. The project allowed them to make connections both on an institutional and personal level. Local universities, which usually competed, started working together towards a common goal creating a multiplier effect. The ARROW project has opened an entire spectrum of new partners and possibilities for Mongolia and the entire region.

The Dissemination and Exploitation Committee (DEC) of the ARROW project was responsible for ensuring the dissemination and communication strategy of the project and its activities and for reporting to the Steering Committee the implementation of the actions, surveys, measures of improvement, etc. The official project website³ was developed and launched at the beginning of the project. The website was designed, hosted and maintained by ULPGC, and acted as the major information reference on the project activities and results. It contains general information on the project, its contents, goals and partners. It also worked as a tool to support the connections between senior and junior researchers through its mentor scientist platform (through an intranet field). The main documents on the project were published on the ARROW website (with more than 4.000 users in 3 years) during the projects lifetime and are available for free download.

The ARROW project was very active in social media channels, mainly Facebook, through a private group and a public page. The latter was an effective and efficient way to engage with a wider target audience interactively. By doing so, ARROW's activities and outcomes reached the public and especially academic audiences and stakeholders directly or indirectly related to the ARROW consortium. Also, EU partners, i.e. USZ, through their International Relations Facebook page, promoted and disseminated news regarding the ARROW meetings and other related activities. It is worth mentioning that all partners undertook hundreds of dissemination activities throughout the projects' lifetime such as info-days, events, course dissemination activities, participation in national and international congresses, interviews in press and national TV, news published on their institutional websites, certificate ceremonies where the Ministry of Education and local press was invited, etc.

Finally, the project had also a strong dissemination when EU and Mongolian partners recruited mentors and young researchers respectively for the mentorship program. In the EU, several teachers from different research groups were targeted, in some cases directly through their research centres. At the end of the project, ARROW received attention through a new initiative of dissemination about the mentorship program. This activity was important to continuously disseminate the existence of the project, in case other teachers and researchers intended to be also mentors for the mentorship program and to support young Mongolian researchers.

5. Sustainability

ARROW project's sustainability was focused on these pillars:

- a) Mentor-scientist network. This platform will agglutinate the new scientists and give them opportunity to share experiences and learn about others. This network will give Mongolian students and scientists the chance to inquire their doubts to a reputed mentor who will help them with the manuscript pre-

³ <http://arrow.ulpgc.es>

sentation, suggestion of the more appropriate journal for submission, corrections, etc. The ARROW mentor-scientist network will be maintained, and partners will care of the follow-up also after the end of the project. New-incorporated scientists and mentors will continue networking and sharing opinions and experiences through the platform. ULPGC and EU partners are committed to the maintenance and updating of the ARROW platform after the financed period.

- b) Agreements. Bilateral and multilateral agreements were signed to strengthen partners relationships. This remarks a clear intention to continue working together does exist. For example, individual mobility proposals KA1 (EU-Mongolia) have been submitted in different calls for applications. The project has tightened cooperation between 12 Mongolian HEIs and has had a remarkable impact on their cooperation. All Mongolian partners are located in Ulaan Baatar but haven't collaborated very often before the project. The project allowed them to make connections both on institutional and personal levels. Local universities, which usually compete with each other, have started working together towards a common goal creating a multiplier effect. The ARROW project has opened an entire spectrum of new partners and possibilities for Mongolia and the entire region. The academic staff of EU partners HEIs are very interested to continue cooperating with Mongolian researchers in different areas. Even though just a few EU academics contributed to the project by giving online and on-site courses, the other staff members from different institutes managed to benefit from these brand-new connections. For instance, PhD candidates and research staff from Mongolia were hosted in various units of the University of Szczecin in the frame of the PROM program, including areas of life sciences, economics, pedagogy and linguistics.
- c) Local sustainability. The local network will be maintained, and Mongolian partners will continue meeting regularly. Periodical on-line meetings will also be organized by ULPGC to ensure the continuity of the consortium.
- d) ARROW label. The project has created a unique label, where the activities will continue to take place after the project completion, under the same terminology as established during the project implementation. For example, the participants in the mentoring network were encouraged to use the tag "ARROW" when they tagged their publications on social media, such as Researchgate or LinkedIn. This was used to attract further attention and funding for the activities.
- e) Common research and cooperation projects. As a result of ARROW, different research projects and research jobs, and doctoral theses are being developed. This is one of the main by-products of the project. Besides this, the intense work experience with the Mongolian partners has generated important work and trust relationships. These relationships have resulted in the submission of cooperation projects to the European Commission KA2 calls, such as between the ULPGC and the NMU. In this project, and given the learning acquired in the management of international cooperation projects, the university coordinating the project was the NMU. Unfortunately, this project was not accepted in the first call in which it was submitted. One of the reasons is that, although the project was well evaluated, Mongolia is no longer a priority country in the funding of the European Commission's cooperation projects. However, the submission of the project "Work-based learning for Higher Education System in Mongolia towards better employability of University Graduates" (MONGWBL) was successful, and whose coordinating university was Otgontenger University.

6. Lessons learnt

The rich and varied experience gained during the coordination of ARROW project tasks can be summarized in the areas explained below.

One of the main challenges and opportunities of cooperation projects is to ensure the active participation of the local partners in the design and implementation of the project's activities. Cooperation projects should not treat the partners as mere passive recipients, but rather as active contributors who can bring their ideas and adapt the initial plans of the project to their needs, both in the design phase and in the implementation phase. This is what the ARROW project did, by encouraging the presence of outstanding Mongolian researchers who acted as mentors for the less experienced researchers who were the core of the project. Moreover, autonomy was given to the local partners to design reinforcement actions of the different trainings imparted, which allowed increasing their impact on the potential audience of the project. This autonomy produced a high participation of the local partners in the different dissemination actions of the project results, which gave it a remarkable impact in Mongolia.

Multicultural management is another key aspect for the success of international cooperation projects, as it involves working with partners who have a wide range of backgrounds and interests. Therefore, multicultural management requires an attitude that recognizes and values diversity and seeks consensus and collaboration. The management of projects such as ARROW involves developing intercultural competencies that have also benefited the participating European universities. It should be highlighted that these variables and criteria were considered in the ARROW logo and slogan itself, which is why it did not opt for a stereotype, but rather combined scientific progress in the form of “papers” with the arrow and the bullseye. The image of Mongolia projected by the name, logo and slogan is itself innovative. At the same time, it respects certain traditional Mongolian cultural characteristics⁴.

The importance of having clear quality assurance measures in international cooperation projects is evident since these measures make it possible to evaluate the fulfilment of objectives, results and expected impacts, as well as to identify and correct possible deficiencies or deviations that may affect the quality and effectiveness of the interventions. In addition, quality assurance measures contribute to improving transparency, accountability and trust between project partners and beneficiaries, as well as generating knowledge and learning that can be used in future initiatives. Having clear indicators, with compliance levels that are known to all, helps to ensure the successful implementation of cooperation projects.

Last, but not least, the management under COVID-19 restrictions and the obstacles in finalizing the project tested the skills of the consortium members. COVID-19 made it necessary to adapt or suspend many of the activities planned in the projects, such as face-to-face training or coordination meetings (e.g., final meeting), delivery of products, dissemination of results, impact evaluation or financial closure, etc. Faced with this situation, partners, especially those with coordination responsibilities, had to find creative and flexible solutions, such as the use of virtual platforms, rescheduling of timetables, reallocation of resources and extension of deadlines. It is worth noting that in Mongolia, the duration of the lockdown was much longer than that of the European partners involved in ARROW.

⁴ See logo and slogan in “About us”: <https://arrow.ulpgc.es/>

7. Conclusions

As a conclusion to this project, we can take up again a repeated idea among Mongolian partners: They consistently highlighted the positive value they attributed to the ability to implement strategic changes within their institutions concerning research incentive policies. A significant proportion of Mongolian partners admitted that they had not previously understood the critical importance of being present in international editorial databases. Partners from Mongolian institutions expressed their intention to incorporate research dissemination into their strategic plans as a pivotal approach to fostering new interests among potential researchers. This acknowledgement highlights the project's role in reshaping institutional strategies towards a more research-centric and globally connected approach.

This strategic shift bears particular significance, especially for smaller Mongolian HEIs striving to attract research talent and to develop their doctoral candidates. The impending transformation in research incentive policies, prompted by the insights garnered from ARROW, is poised to significantly impact these smaller institutions. The necessity to appeal to research talent and cultivate their pool of doctoral candidates stands as a paramount challenge for smaller institutions. The forthcoming strategic changes, influenced by the ARROW project's revelations, offer a promising opportunity for these institutions to reshape their approaches.

This shift is poised to bridge the gap in research skills between larger and smaller institutions in Mongolia, creating an environment conducive to nurturing research excellence even in resource-constrained settings. The potential implications of this strategic alteration are extensive, promising to empower smaller institutions in their quest for research development and talent acquisition, thereby enriching the broader research.

ARROW project has provided European partners with an unprecedented opportunity to discover major research institutions whose advancements were previously concealed due to their lack of visibility in databases accessible to European institutions. As a result, avenues for establishing Erasmus+ exchanges or research licenses between participating European universities and Mongolian universities have emerged.

Despite the COVID-19 pandemic imposing strict travel restrictions on Mongolia, the ARROW scientific mentorship network facilitated the continuation of scientific collaborations through online channels. This mentorship network proved instrumental in sustaining virtual connections between the research communities of Mongolia and Europe, mitigating the challenges posed by travel restrictions and enabling ongoing scientific exchanges. The significance of this virtual connectivity established by ARROW cannot be overstated. It ensured the continuity of scientific collaborations and knowledge transfer between European and Mongolian institutions during a period of unprecedented global disruption. The project's ability to adapt and maintain this virtual platform underscored its resilience in fostering cross-continental scientific partnerships despite the challenging circumstances posed by the pandemic.

As coordinators of the ARROW project, the achieved impact stands as a testament to the successful outcomes attained. Throughout this cooperative initiative, a substantial enhancement in innovation and research capabilities has been witnessed, benefiting both Mongolian institutions and the coordinating university itself. The project has played a pivotal role in advancing research capacities within Mongolian institutions. Additionally, it has contributed significantly to bolstering the coordinating university's proficiency in managing allocated resources dedicated to research endeavours. The collaborative efforts invested in the ARROW project have been transformative, enriching the landscape of innovation and

fostering a culture of research excellence in the ULPGC. The acquired experiences have been invaluable, aiding in refining management competencies and skill sets, particularly concerning resource allocation for research initiatives.

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