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

Ecosystem services education for protected area management

Situation analysis of Mongolia and the Russian Far East

Blas Mola-Yudego[a], Cosmin Salasan[b], Mari Selkimäki[a], Dorjpagma Enebish[c], Xiaoqian Xu[a], Pere Gelabert[d], Alexander Toygildin[e], Adiyasuren Tsokhio[c], Ichinkhorloo Batjargal[f], Narantogtokh Davaajav[g], Irina Kozyr[h], Natalia Lkhasaranova[i], Sukhtulga Tserennadmid[j], Baigal-Amar Tuulaikhuu[j], Burenjargal Otgonsuren[j], Cristina Vega-Garcia[d] and Zoya Yampilova[k].

Evidence from the 2021 expert survey and protected area records

Training Masters in Ecosystem Services Management in Protected Areas

Grant Agreement 619060-EPP-1-2020-1-ES-EPPKA2-CBHE-JP[1]

Erasmus+ programme of the European Union

[1]This project has been funded with support from the European Commission. This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Contents

Executive summary **1**

1 Introduction **2**
1.1 Protected areas and ecosystem services . . . 2
1.2 Mongolia . . . 2
1.3 Russian Federation and the wider study region . . . 3
1.4 Aim and objectives . . . 3

2 Data and methods **3**
2.1 Protected area records . . . 3
2.2 Expert questionnaire . . . 4
2.3 Respondents and data handling . . . 4
2.4 Analysis and interpretation . . . 4

3 Protected area extent and development **5**
3.1 Recorded extent . . . 5
3.2 Size distribution and designation history . . . 6

4 Expert views on skills and education **8**
4.1 Professional backgrounds . . . 8
4.2 Recognised ecosystem services . . . 8
4.3 Anticipated professional competencies . . . 9
4.4 Recruitment difficulties and existing staff skills . . . 9
4.5 Preferred forms of education . . . 10
4.6 Teaching formats and curriculum content . . . 10

5 Implications for education and professional development **11**
5.1 Complementary routes into training . . . 11
5.2 Proposed curriculum priorities . . . 11
5.3 Delivery and evaluation . . . 12

6 Limitations **12**

7 Conclusions **12**

Acknowledgements **13**

Authors and affiliations **13**

References **14**

Executive summary

The 2021 ECOSERVE survey identifies a need for additional training in ecosystem services and protected area management among the experts consulted in Mongolia and the Russian Federation. Short courses received the broadest support among the training options presented, while a separate question also showed substantial support for a specialised master's programme. These findings favour an educational offer that combines accessible professional development with opportunities for advanced study and practical experience.

The analysis brings together protected area records from the October 2021 World Database on Protected Areas (WDPA) and responses from 302 experts: 170 in Mongolia and 132 in the Russian Federation. Respondents included government staff, consultants, representatives of environmental non-governmental organisations, activists and researchers. The survey was conducted online in July and August 2021 through the participating institutions.

Regulating and supporting services were the most frequently recognised ecosystem service categories. The strongest anticipated demand for professional competencies concerned the assessment, quantification, remediation and restoration of impacts on biodiversity, soils and geodiversity, selected by 224 respondents (74%). Recruitment difficulties were reported by 134 respondents (44% of the full sample), while 71 reported no difficulties and 97 gave no clear answer. These results indicate a perceived skills gap, although they do not establish its size across the regional labour market.

Short courses were selected by 220 respondents, equivalent to approximately 73% of the full sample. Around 45% selected specialised master's programmes and a similar proportion selected internships. In a separate direct question, 82% supported an MSc programme intended to address educational gaps in ecosystem services and protected area management. Support for formal training was generally higher among Mongolian respondents. A combination of lectures, online learning and practical experience received the highest mean rating among the delivery options reported.

The findings support a curriculum centred on applied ecological assessment, supported by environmental management, geographical information systems (GIS), relevant legal knowledge and communication skills. Courses should enable participants to apply these skills to actual management questions. The proposed educational priorities in this report are recommendations derived from the survey, rather than an already validated curriculum.

This is a historical situation analysis based on evidence assembled in 2021. The sample was recruited through institutional networks, and the two national groups differed in their professional composition. The protected area totals describe the selected database records; their geographical coverage and treatment of overlapping designations require confirmation before they can be interpreted as comprehensive estimates of protected land.

1 Introduction

1.1 Protected areas and ecosystem services

Protected areas are an established instrument for conserving biodiversity and maintaining natural and cultural heritage. Their geographical extent has increased, while expectations of their management have broadened (Watson et al., 2014). Alongside conservation, protected areas can support local livelihoods, tourism, environmental education, research and climate change mitigation and adaptation (Infield, 2010; Naughton-Treves et al., 2005).

These functions are closely connected to ecosystem services: the benefits that people obtain from ecosystems. In the framework used by the survey, these comprise provisioning, regulating, cultural and supporting services. Protected area management must therefore consider ecological processes together with the ways in which people use, value and depend on them. Decisions may involve competing objectives, particularly where conservation requirements intersect with local livelihoods and economic development.

Climate change adds to this complexity by altering the conditions under which ecosystems and protected areas are managed. Responding to these changes requires skills that extend beyond conventional disciplinary training. Managers need to assess environmental conditions, interpret evidence, plan interventions and communicate with stakeholders. Education in ecosystem services can help connect these tasks within a coherent approach to management.

Mongolia and the Russian Far East contain forests, freshwater systems and other landscapes of substantial conservation importance (Darman et al., 2003). Protected area management in this wider region also operates within distinct social and economic settings (Sneath, 2003). These conditions provide the rationale for examining educational needs alongside the development of protected area networks.

1.2 Mongolia

The project background identifies mining, deforestation, off-road vehicle use, pollution, livestock pressure, poaching and climate change as concerns for environmental management in Mongolia. It also describes a long tradition of protecting landscapes and wildlife, alongside changes in land use and governance following the transition from a socialist economy (Sneath, 2003).

The national framework described in the source document distinguishes strictly protected areas, national conservation parks, nature reserves and national monuments. Local protection provides an additional level of designation. The relationship between national and local protection is relevant to this study because responsibilities, management support and access to specialist expertise may differ between these levels.

For ECOSERVE, the educational challenge was to connect ecological knowledge with the practical demands of managing protected areas under changing social, economic and environmental conditions. Participating institutions identified interdisciplinary teaching, fieldwork and engagement with local communities as priorities. Such training could support both university students and professionals already working in protected area management.

1.3 Russian Federation and the wider study region

The Russian protected area system includes strict nature reserves, known as zapovedniks, together with national parks and other designations. Zapovedniks have an established role in conservation, scientific research and environmental education (Danilina, 2001). The ECOSERVE background emphasised the need to connect this conservation tradition with a broader understanding of ecosystem services and their importance to local populations.

The project also identified climate-related pressures, including drought, fire, permafrost degradation and changes in ecological conditions. The study of desertification risk in Buryatia illustrates the relevance of environmental risk assessment to the wider region (Ubugunov et al., 2011). These concerns strengthen the case for training that links ecological assessment with management decisions and communication.

The participating institutions described a need to complement disciplinary programmes in biology, ecology and environmental management with more integrated training in protected area management. This is a project-level assessment of educational needs; the available material does not include a systematic inventory of all relevant university programmes in the Russian Federation.

The term *Russian Far East* is retained from the original study. However, the source material also refers to Lake Baikal and Buryatia, and the participating institutions and respondents are not all demonstrably confined to one geographical boundary. The spatial analysis and survey should therefore be understood as related components of the project, whose exact geographical correspondence remains to be documented.

1.4 Aim and objectives

This report examines the development of protected areas and expert perceptions of the skills required to manage their ecosystem services. Its purpose is to inform educational provision within the ECOSERVE project. The specific objectives are to:

1. describe the extent and designation history of protected areas represented in the selected WDPA records;
2. identify the ecosystem services recognised by the participating experts;
3. examine perceived demand for professional competencies and difficulties in recruiting suitably qualified staff; and
4. assess preferences for training content, qualification levels and modes of delivery.

The survey provides evidence about perceived professional needs. It does not measure job creation, vacancy numbers or the full range of potential employers.

2 Data and methods

2.1 Protected area records

The spatial component used the October 2021 WDPA release, cited as UNEP-WCMC and IUCN (2021). The database provides information on protected area location, size, designation and status. The cited Protected Planet release also refers to the World Database on Other Effective Area-based Conservation Measures (WD-OECM); the source report does not establish whether any WD-OECM records were included in the analysis.

The selected records were used to map protected areas, describe their size distribution and summarise designation years. Cumulative recorded area was plotted against designation year. These summaries describe the records retained for the analysis. The source does not document the spatial selection boundary, exclusions, handling of overlapping designations or whether area was taken from reported attributes or calculated from geometries. Consequently, summed areas should not be interpreted as unique protected land coverage without further checking.

2.2 Expert questionnaire

An online questionnaire was distributed to professionals and experts with experience relevant to ecosystem services and protected area management. The authors and partner institutions assembled the contact network. Respondents included government officials, consultants, environmental NGO representatives, activists and researchers, with backgrounds in forest management, environmental science and related fields.

Responses were collected in July and August 2021 with the participation of the Mongolian University of Life Sciences, ECO-Asia University, Ulyanovsk Agricultural University and Buryatia Agricultural Academy, using the institutional names reported in the study. The questionnaire was developed in English and administered in Mongolian and Russian. The participating organisations subsequently translated the responses for analysis.

The questionnaire covered recognised ecosystem services, competencies expected to be in demand over the following three to five years, recruitment difficulties, perceived staff skills, educational needs and preferred teaching formats. Open questions invited suggestions for curriculum content. The reference period for anticipated demand was therefore approximately 2024–2026, viewed from 2021.

2.3 Respondents and data handling

The survey yielded 302 responses: 170 from Mongolia and 132 from the Russian Federation. Government and administrative backgrounds predominated in the Mongolian group, whereas university and research backgrounds predominated in the Russian group (Figure 4). This difference is relevant when interpreting national comparisons because professional role may influence training preferences.

The source document states that responses were anonymised and treated confidentially, with access restricted to the researchers responsible for the analysis. It also states that the questionnaire was used for research and did not include sensitive items. Details of participant consent, ethics review and data retention were not provided in the material available for this report.

2.4 Analysis and interpretation

Results are presented as descriptive counts, percentages and mean ratings. Percentages calculated directly from a reported count use the full sample of 302 unless otherwise stated. National percentages and other summaries without underlying counts are retained as reported. Several questions allowed more than one selection, as indicated by totals exceeding the number of respondents; their percentages should not be expected to sum to 100%.

The teaching-format question used a scale from 1 to 10. The endpoints and wording of the recruitment-difficulty and staff-skill rating scales are not specified in the source document, so their means are reported without assigning qualitative categories. The original questionnaire and

response-level data would be needed to verify item-specific denominators, missing responses and scale interpretation.

The survey represents the views of the experts reached through the participating institutions. It was not documented as a probability sample, and neither the number invited nor the response rate was supplied. The results therefore identify priorities within this respondent group rather than statistically representative estimates for all professionals in the region. No inferential comparisons are reported.

3 Protected area extent and development

3.1 Recorded extent

The selected WDPA records contained 90,358 km² for Mongolia and 357,066 km² for the Russian study region, giving a combined reported total of 447,424 km² (Figure 1). These values refer to the study selection and should not be equated with complete national protected area totals.

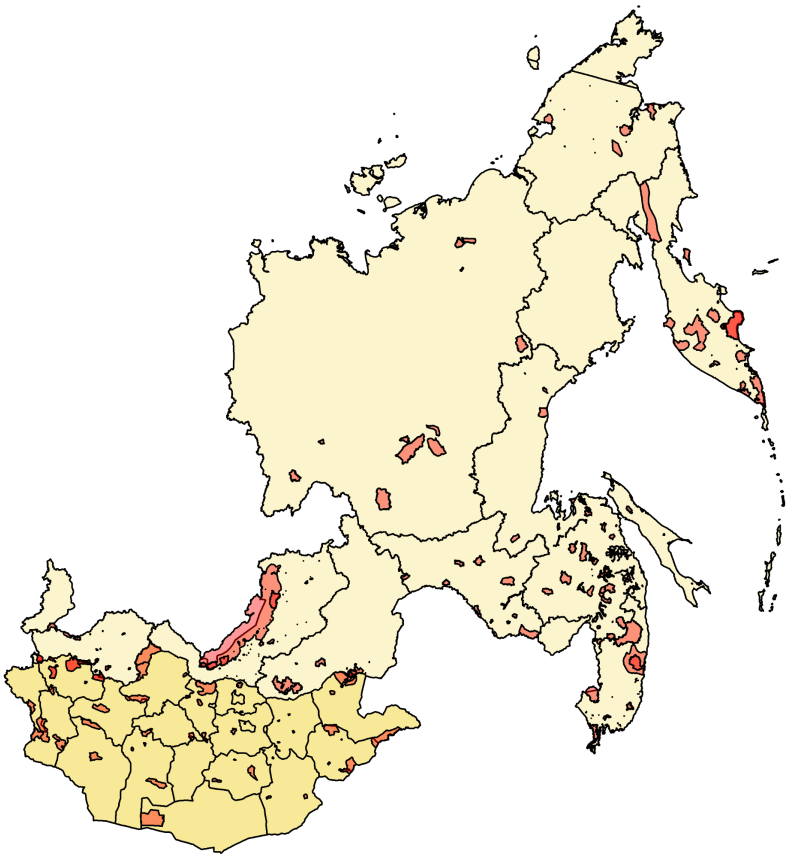


Figure 1: Protected areas represented in the study map, based on the October 2021 WDPA release (UNEP-WCMC and IUCN, 2021). The original map is retained. Its exact selection boundary, legend and cartographic metadata require confirmation.

The source identifies Lake Baikal as the largest record discussed, with a reported area of 85,508 km² and a designation year of 1996. Other examples include Parapolsky Dol, reported as 18,266 km² with a designation year of 1994, and a volcanic site in Kamchatka, reported as 1,685 km². For

Mongolia, the examples include the Uvs Nuur Basin, reported as 12,533 km² and designated in 2003, and the Tengis-Shishged area, reported as approximately 8,700 km² and designated in 2011.

These examples retain the values in the source report. The corresponding record identifiers, designation types, national or transboundary components, and site names need to be checked before comparing them as equivalent management units. In particular, an internationally designated property and a nationally designated protected area may represent different boundaries or overlapping records.

3.2 Size distribution and designation history

Protected area records varied widely in size in both study groups (Figure 2). The size distributions are therefore shown on logarithmic horizontal axes. The designation histories also differed: the source identifies particularly high numbers of designations in 2012 for Mongolia and in 1980, 1981 and 1984 for the Russian study region.

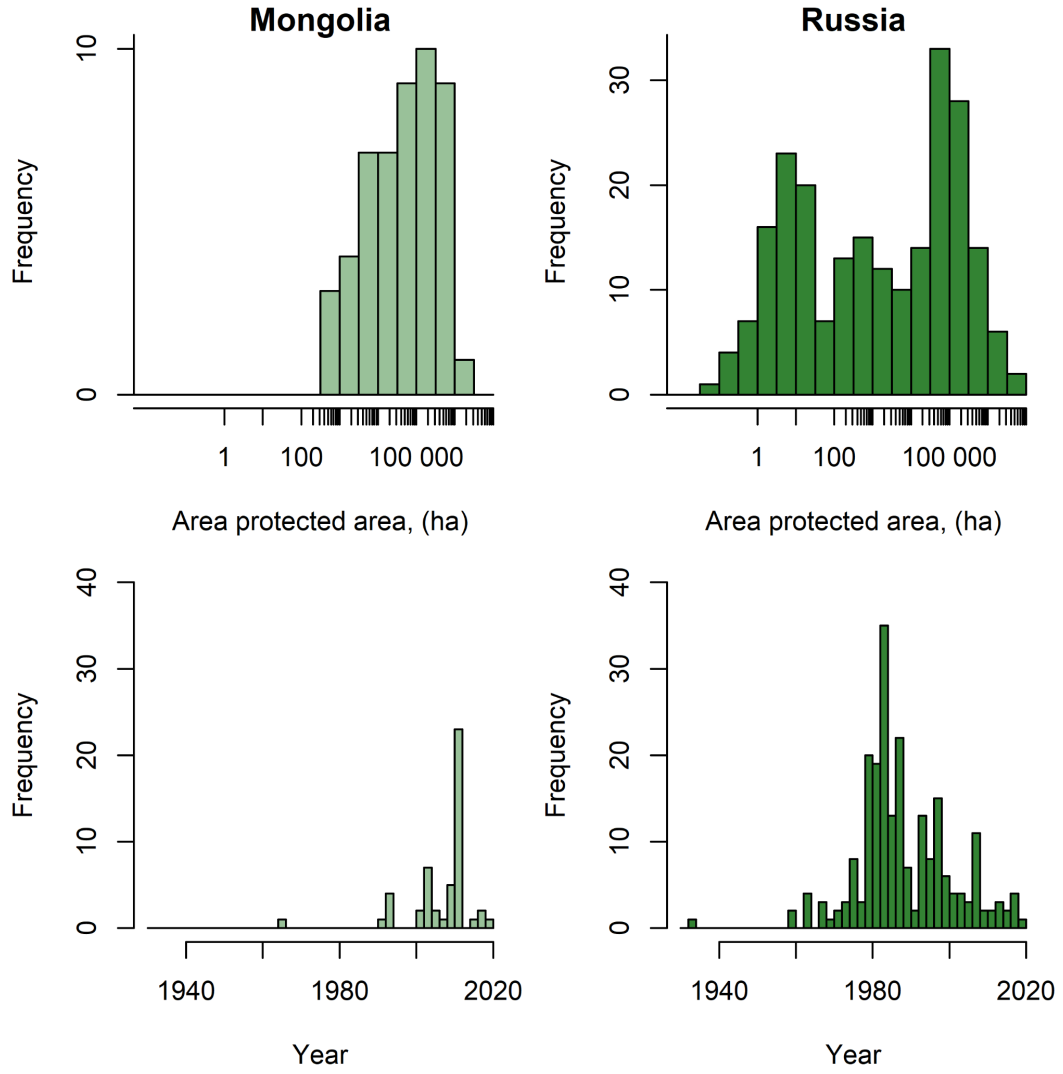


Figure 2: Size distributions and designation years of protected area records in Mongolia and the Russian study region. Upper panels show area in hectares on logarithmic horizontal axes; lower panels show designation years. Original figure based on UNEP-WCMC and IUCN (2021).

The cumulative curves indicate earlier growth in the Russian records and later expansion in the Mongolian records (Figure 3). The Russian series also contains a pronounced increase during the 1990s. This distinction matters: a peak in the number of new designations does not necessarily coincide with the largest increase in recorded area. A small number of large records can have a substantial effect on a cumulative area curve.

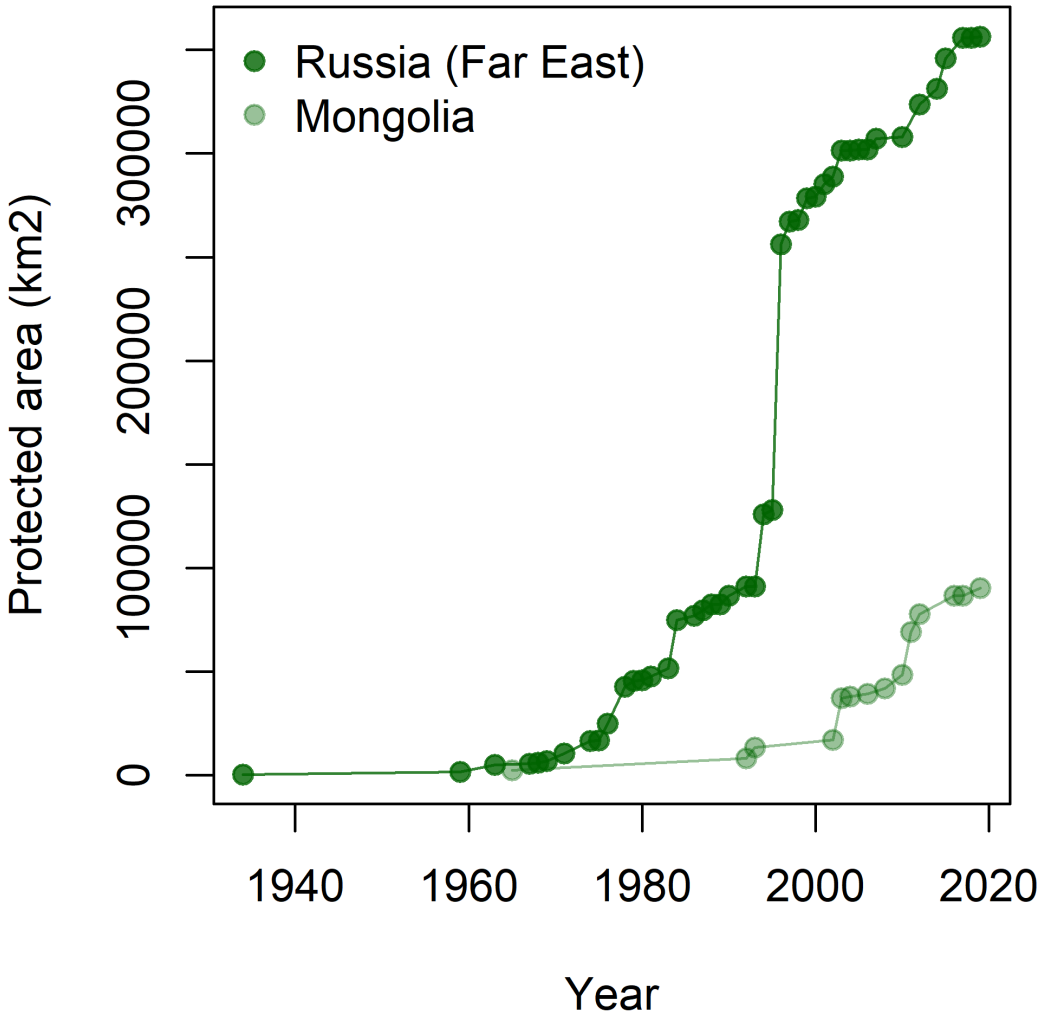


Figure 3: Cumulative recorded area by designation year for Mongolia and the Russian study region. The curves reproduce the original analysis of the October 2021 WDPA records. They do not demonstrate changes in management effectiveness or unique protected land coverage.

Designation histories provide useful context for the development of protected area networks, but they do not by themselves measure conservation outcomes. Changes in boundaries, overlapping designations and differences in the completeness of historical records may also influence the curves.

4 Expert views on skills and education

4.1 Professional backgrounds

The two respondent groups covered a range of professional backgrounds but differed in their composition (Figure 4). Mongolian responses were concentrated in government and administration, while Russian responses were concentrated in universities and research. These differences should be considered alongside country-level results, particularly where the groups express different preferences for qualifications or training formats.

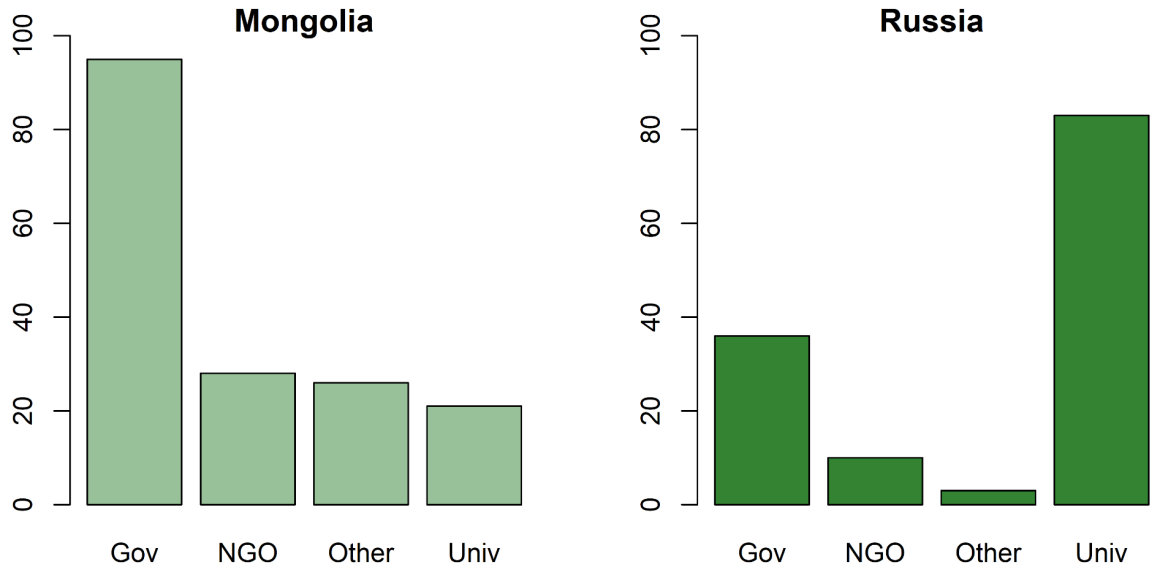


Figure 4: Professional backgrounds of respondents from Mongolia (n = 170) and the Russian Federation (n = 132). Bar heights show respondent counts. Gov denotes government-related backgrounds; NGO denotes non-governmental organisations; Univ denotes universities or research centres; Other denotes other or unspecified backgrounds.

4.2 Recognised ecosystem services

Regulating services were the most frequently selected ecosystem service category, identified by 225 respondents. Examples included climate regulation, water purification and flood prevention. Supporting services were selected by 206 respondents, cultural services by 188 and provisioning services by 166 (Table 1). In open responses, one participant mentioned ecological tourism and two mentioned research and scientific services.

Table 1. Recognition of ecosystem service categories across all respondents.

Ecosystem service category	Respondents	Percentage of full sample
Regulating	225	74.5%
Supporting	206	68.2%
Cultural	188	62.3%
Provisioning	166	55.0%

More than one category could be selected. Percentages use n = 302.

Regulating services were selected by 86% of Mongolian respondents and 59% of Russian respondents. Provisioning services were selected by 63% and 45%, respectively. These are descriptive differences; their statistical significance was not assessed. Figure 5 presents the reported national patterns.

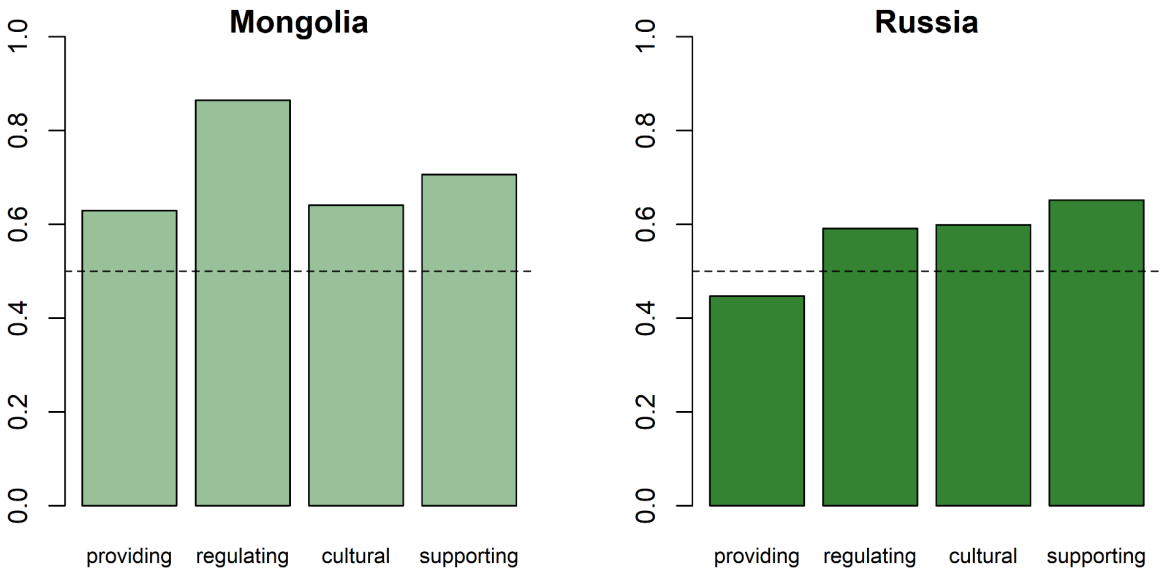


Figure 5: Proportions of respondents selecting each ecosystem service category in Mongolia and the Russian Federation. The vertical scale ranges from 0 to 1, and the dashed line marks 0.5. The label "providing" in the original figure corresponds to provisioning services.

4.3 Anticipated professional competencies

When asked about competencies expected to be in demand over the following three to five years, 224 respondents (74%) selected skills in assessing, quantifying, remediating and restoring impacts on biodiversity, soils, geological heritage and other components of geodiversity. Analytical competencies were selected by 170 respondents, project development by 154 and service provision by 119.

The assessment and restoration category was selected by 79% of Mongolian respondents and 67% of Russian respondents. The source describes smaller differences for the other categories, although it does not provide all corresponding national counts. Taken together, the results support a practical emphasis on diagnosing environmental conditions and translating assessments into management action.

4.4 Recruitment difficulties and existing staff skills

Recruitment difficulties were reported by 134 respondents, while 71 reported no difficulties and 97 gave no clear answer. Thus, difficulties were reported by 44% of the full sample and by approximately 65% of those giving a clear yes or no answer. Describing this as a majority of all respondents would overstate the finding.

Among Mongolian respondents, 53% reported difficulties and 15% reported no difficulties. Among

Russian respondents, the corresponding figures were 33% and 34%. One open response suggested that existing professionals and rangers could acquire the required knowledge through additional training, indicating that recruitment and staff development may offer complementary responses to perceived shortages.

The mean reported recruitment-difficulty rating was 6.45. Respondents who explicitly reported difficulties had a mean of 7.04, compared with 5.40 among those who did not. Respondents who gave no clear categorical answer had a mean of 6.4. The national means were 6.15 for Mongolia and 6.83 for the Russian Federation. These values cannot be fully interpreted without the question wording and scale endpoints; in particular, a numerical answer should not be treated as an admission of a difficulty that the respondent did not explicitly report.

Asked about reasons for the perceived shortage, 195 respondents selected difficulties in finding specialists, equivalent to approximately 65% of the full sample. Insufficient competencies among existing staff and a lack of available education were reported at 37% and 36%, respectively. The relationship between this question and the earlier recruitment question needs to be clarified, since the count of 195 exceeds the 134 respondents who explicitly reported recruitment difficulties.

Open responses linked shortages to the relative novelty of ecosystem services as a professional field and to gaps in staff training. The mean rating of existing staff skills was 6.26, with means of 5.87 for Mongolia and 6.77 for the Russian Federation. As with recruitment difficulty, the missing scale definition limits interpretation of these values.

4.5 Preferred forms of education

Short courses were the most frequently selected educational option, chosen by 220 respondents, or approximately 73% of the full sample. Specialised master's programmes and internships were each selected by around 45%. Support for short courses was 79% among Mongolian respondents and 65% among Russian respondents. The corresponding proportions for a specialised master's programme were 52% and 35%, while support for internships was similar at 44% and 47%.

Among university respondents, 45% selected a specialised master's programme; among NGO respondents, the proportion was 55%. Respondents linked to administration favoured short courses (73%). Approximately 60% of this group did not select each of the master's and internship options. Unless the questionnaire explicitly distinguished opposition from non-selection, this should not be interpreted as active opposition to those options.

In a separate direct question about an MSc programme designed to address educational gaps in ecosystem services and protected area management, 82% expressed agreement: 91% in Mongolia and 70% in the Russian Federation. This result is compatible with lower selection of master's programmes in the earlier question. General support for establishing a programme is a different judgement from choosing it among available training options.

4.6 Teaching formats and curriculum content

A combination of conventional lectures, online learning and practical experience received the highest reported mean rating, 6.21 on a scale from 1 to 10. The combination without practical experience received a mean of 4.95, conventional lectures 4.76, e-learning and massive open online courses (MOOCs) 4.13, and live online lectures 4.06.

The source reports 35 missing ratings for an online-course option and 41 for e-learning. These

missing responses mean that the averages may be based on different respondent subsets. They do not, on their own, demonstrate unfamiliarity with digital learning. The precise wording of the online options and the number of valid responses for each should be checked against the questionnaire.

Open responses most often proposed ecology and related subjects (68 mentions), followed by environmental sciences (50), mapping and GIS (20), legal aspects of management (19), and communication and languages, particularly English (19). These are reported topic counts rather than a complete ranking of all possible curriculum components. The coding procedure and treatment of responses containing several topics were not described in the source material.

5 Implications for education and professional development

5.1 Complementary routes into training

The findings support developing short professional courses alongside a specialised master's pathway. Short courses may suit staff who need specific competencies while remaining in employment. A master's programme could offer more sustained integration of ecological assessment, management and independent project work. Internships and field assignments could connect both routes to practical problems encountered by protected area organisations.

This interpretation follows from the combination of strong support for courses, broad agreement with the proposed MSc programme and interest in practical experience. The survey does not establish likely enrolment, affordability or institutional delivery capacity. These aspects require consultation with prospective students, employers and teaching partners before programme commitments are made.

5.2 Proposed curriculum priorities

The following priorities translate the reported needs into possible educational responses. They are recommendations for curriculum development and have not been tested as programme outcomes.

1. **Applied ecological assessment.** Teach participants to describe ecosystem condition, assess impacts and plan monitoring, with attention to biodiversity, soils and geodiversity. Restoration tasks should connect assessment to the selection and evaluation of interventions.
2. **Ecosystem services in management.** Link the four service categories used in the survey to management objectives and decisions. Practical exercises could examine how alternative actions affect different services and stakeholder interests.
3. **Spatial analysis.** Develop mapping and GIS skills through protected area data, including attention to boundaries, overlapping designations, data quality and the interpretation of spatial indicators.
4. **Governance and communication.** Integrate relevant legal knowledge, stakeholder communication and professional language skills into case studies and project assignments.
5. **Project development and practical work.** Give participants opportunities to formulate a management question, analyse evidence and present a feasible response, preferably with input from a protected area organisation.

The emphasis and depth of these components should be adjusted to the intended qualification and participants' experience. Existing professionals may need targeted modules, whereas a master's programme would require a coherent progression from foundational knowledge to independent analysis.

5.3 Delivery and evaluation

The highest-rated delivery option included practical experience, suggesting that fieldwork and applied assignments should be central to programme design. Online materials could support preparation and follow-up, while face-to-face sessions could focus on discussion, supervised methods and field activities. The relatively low ratings and missing responses for some online options warrant further consultation about access, suitability and preferred formats.

An initial pilot could test whether the proposed content meets participants' needs. Evaluation should examine demonstrated learning through practical work, participant feedback and the relevance of assignments to employers. The present survey provides a basis for selecting priorities, but evidence from implementation would be needed to establish whether training improves professional performance.

6 Limitations

The main limitation is the scope of the evidence. Recruitment through institutional networks produced a relevant group of respondents, but the sampling frame, invitation count and response rate are not available. Claims of statistical representativeness would therefore be unsupported. The different professional composition of the national groups also prevents a simple interpretation of every observed difference as a country effect.

The available report contains aggregate summaries rather than the questionnaire and response-level dataset. Scale endpoints, item-specific denominators, question routing, translation checks and the coding of open responses are not fully documented. These gaps limit comparisons between questions and the interpretation of mean ratings. They also prevent verification of whether missing responses affected the reported preferences.

The protected area analysis has separate limitations. Its exact geographical boundary, record filters and handling of overlapping designations are not documented. The selected area totals should therefore be treated as descriptive results from the original analysis, pending confirmation of the underlying records. Designation dates describe administrative history rather than management effectiveness or ecological outcomes.

Finally, the survey and database release date from 2021. The report describes perceptions and records from that period, and should not be presented as a newly collected assessment. A present-day programme decision would benefit from updated consultation and a check of educational provision and management needs.

7 Conclusions

The ECOSERVE evidence identifies a perceived need for additional education in ecosystem services and protected area management among the experts consulted in 2021. Respondents most frequently recognised regulating and supporting services and anticipated strong demand for applied assessment and restoration competencies. Recruitment difficulties were reported by a substantial share of respondents, with a higher proportion in Mongolia than in the Russian group.

Short courses attracted the broadest support among the training options, while a separate question indicated substantial support for a specialised MSc programme. These findings support complementary educational routes that combine ecological knowledge with practical assessment,

spatial analysis, governance and communication. Practical experience should be an integral part of curriculum development.

The survey offers a useful starting point for educational planning, subject to its sampling and reporting limitations. The next step is to confirm the unresolved methodological details and develop the proposed training with prospective participants and employers. Programme effectiveness should then be evaluated through demonstrated learning and its application to protected area management.

Acknowledgements

This report received funding from the Erasmus+ programme of the European Union through the project "Training Masters in Ecosystem Services Management in Protected Areas" (ECOSERVE). We thank the experts who participated in the survey and the institutions in the ECOSERVE network for their contributions to data collection and the study.

Authors and affiliations

Blas Mola-Yudego[a], Cosmin Salasan[b], Mari Selkimäki[a], Dorjpagma Enebish[c], Xiaoqian Xu[a], Pere Gelabert[d], Alexander Toygildin[e], Adiyasuren Tsokhio[c], Ichinkhorloo Batjargal[f], Narantogtokh Davaajav[g], Irina Kozyr[h], Natalia Lkhasaranova[i], Sukhtulga Tserennadmid[j], Baigal-Amar Tuulaikhuu[j], Burenjargal Otgonsuren[j], Cristina Vega-Garcia[d] and Zoya Yampilova[k].

Affiliations are reproduced from the study, with English presentation standardised. Institutional names and addresses refer to the source document and require author confirmation.

a. School of Forest Sciences, University of Eastern Finland, PO Box 111, 80101 Joensuu, Finland.
b. Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timișoara, Faculty of Agricultural Management, Calea Aradului 119, RO-300645 Timișoara, Romania.
c. Environmental University "ECOASIA", between the 2nd and 3rd apartments, 13th microdistrict, Bayanzurkh District, Ulaanbaatar, Mongolia.
d. Department of Agriculture and Forestry Engineering, University of Lleida, Avda Alcalde Rovira Roure 191, 25198 Lleida, Spain.
e. Ulyanovsk State Agrarian University, Bul'var Novyy Venets 1, Ulyanovsk, Ulyanovsk Oblast, 432000, Russia.
f. Strictly Protected Territory of the Ulaansky Taiga, Ulaan-Uul soum, 5th bag, soum centre, 67270, Mongolia.
g. Argun-MANLAILAGCH, Darkhan-Uul province, 14th bag, 1st khoroolol, GD-2-104, Mongolia.
h. Baikalsky State Nature Biosphere Reserve, Krasnogvardeyskaya 34, 671220 Tankhoy, Russia.
i. Budgetary Institution of the Republic of Buryatia "Nature Mana", 11a Revolyucii 1905 goda Street, 670034 Ulan-Ude, Russia.
j. Mongolian University of Life Sciences, 17024 Zaisan, Khan-Uul District, Ulaanbaatar, Mongolia.
k. Buryat State Agricultural Academy, 8 Pushkin Street, Ulan-Ude 670024, Buryatia, Russia.

References

Danilina, N. (2001). The zapovedniks of Russia. *The George Wright Forum, 18*(1), 48–55.

Darman, Y., Karakin, V., Marteynenko, A., & Williams, L. (2003). *Conservation action plan for the Russian Far East ecoregion complex*. WWF.

Infield, M. (2010). Arguments for protected areas: Multiple benefits for conservation and use [Review of the book edited by S. Stolton & N. Dudley]. *Oryx, 44*(4), 614–615.

Naughton-Treves, L., Holland, M. B., & Brandon, K. (2005). The role of protected areas in conserving biodiversity and sustaining local livelihoods. *Annual Review of Environment and Resources, 30*, 219–252.

Sneath, D. (2003). Land use, the environment and development in post-socialist Mongolia. *Oxford Development Studies, 31*(4), 441–459.

Ubugunov, L. L., Kulikov, A. I., & Kulikov, M. A. (2011). On the application of risk analysis technology for assessment of the ecological hazard of desertification (by the example of Republic of Buryatia). *Contemporary Problems of Ecology, 4*(2), 178–185.

UNEP-WCMC & IUCN. (2021). *Protected Planet: The World Database on Protected Areas (WDPA) and World Database on Other Effective Area-based Conservation Measures (WD-OECM)* [Data set, October 2021 release]. UNEP-WCMC and IUCN. https://www.protectedplanet.net

Watson, J. E., Dudley, N., Segan, D. B., & Hockings, M. (2014). The performance and potential of protected areas. *Nature, 515*(7525), 67–73.