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DEVELOPMENT OF PRACTICAL GUIDELINES FOR IMPROVING MANAGEMENT AT THE PROTECTED AREA: SCHORFHEIDE-CHORIN BIOSPHERE RESERVE CASE STUDY

The most important and actual management approaches at the Schorfheide-Chorin Biosphere Reserve (Germany) are determined. The algorithm of A'WOT-analysis to a multi-criteria optimization of the biosphere reserve's development strategies is developed. Four-level hierarchical model for choosing the best biosphere reserve's development strategy on the principles of sustainable development is created. The constraints and conflicts under resource use and relationships between ecological and social-economic systems are identified. Practical guidelines for improving management at the protected area are developed.

Keywords: biosphere reserve; strategy; nature conservation; sustainable resources use; climate change; tourism; education and public relations.

1. Introduction

One of the decisive trends of the last decades is the loss of ecosystems quality and their degradation. Climate change and strengthening pressure of human activity increase the role of nature conservation, maintaining the relevant ecosystem services and, at the same time, generate new challenges for it [2; 3; 4; 9; 15]. The synergy of these eco-destructive processes as decreasing of the ecosystems productivity and ecological stability, biodiversity impoverishment, quality deterioration of the ecosystem services, etc., is strengthened by the climate change process, which has a significant effect on nature conservation and protection [5; 6; 14].

The task of the «Man and the Biosphere» (MAB) programme [8] is to develop principles for sustainable use and for effective conservation of the biosphere's natural resources, and to put these into practice in exemplary fashion.

Biosphere reserve is divided into three zones [1; 10]:

- Core area or areas – nature conservation, monitoring. It must comprise at least 3% of the total area. It must be legally protected as a national park or nature reserve.

- Buffer zone – human settlements, research station or experimental research site, education and training, tourism and recreation – activities compatible with sound ecological practices. It should comprise at least 10% of the total area.

- The core area and buffer zone together must account for at least 20% of the total area.

- Transition zone – human settlements, research station or experimental research site, tourism and recreation – activities, where stakeholders work together to sustainably manage the resources. It must comprise at least 50% of the total area.

The aim of the investigation is development of a methodological approach and practical guideline to an assessment and multi-criteria optimization of the protected area's strategies for decision-making according to criteria of sustainable development.

Tasks:

- Investigation the features of history, natural conditions, practices of tourism, silviculture, and agriculture in the Schorfheide-Chorin Biosphere Reserve (SC BR) according to strengthening environmental threats, variability and vulnerability of natural conditions and under climate and land-use changes;

- Identification of the ecosystem services, which require maintenance and protection;

- Development of the optimal biosphere reserve's strategy based on evaluation of expert's opinions.

2. **Methods**

The theoretical basis of investigation is the conceptual approaches of Economic Theory, Ecological Economics, Economics of Nature Resources and Use, Environmental Economics.

Collecting information:

- Discussions, meetings with experts from Eberswalde University for Sustainable Development, Centre of Economics and Ecosystem Management and Administration of Schorfheide-Chorin Biosphere Reserves, expert's interviews;

- Excursion into protected areas, visiting of information centre Non-governmental Organization of Nature and Biodiversity Conservation Union (NABU);

- Questioning citizens, staffs.

- Common and specific quantitative and qualitative methods [11; 12; 16]:

- Questionnaire;

● A'WOT-method (SWOT-analysis + Analytic Hierarchy Approach (AHP)).

A'WOT-analysis procedure consists of eight steps (figure 1):

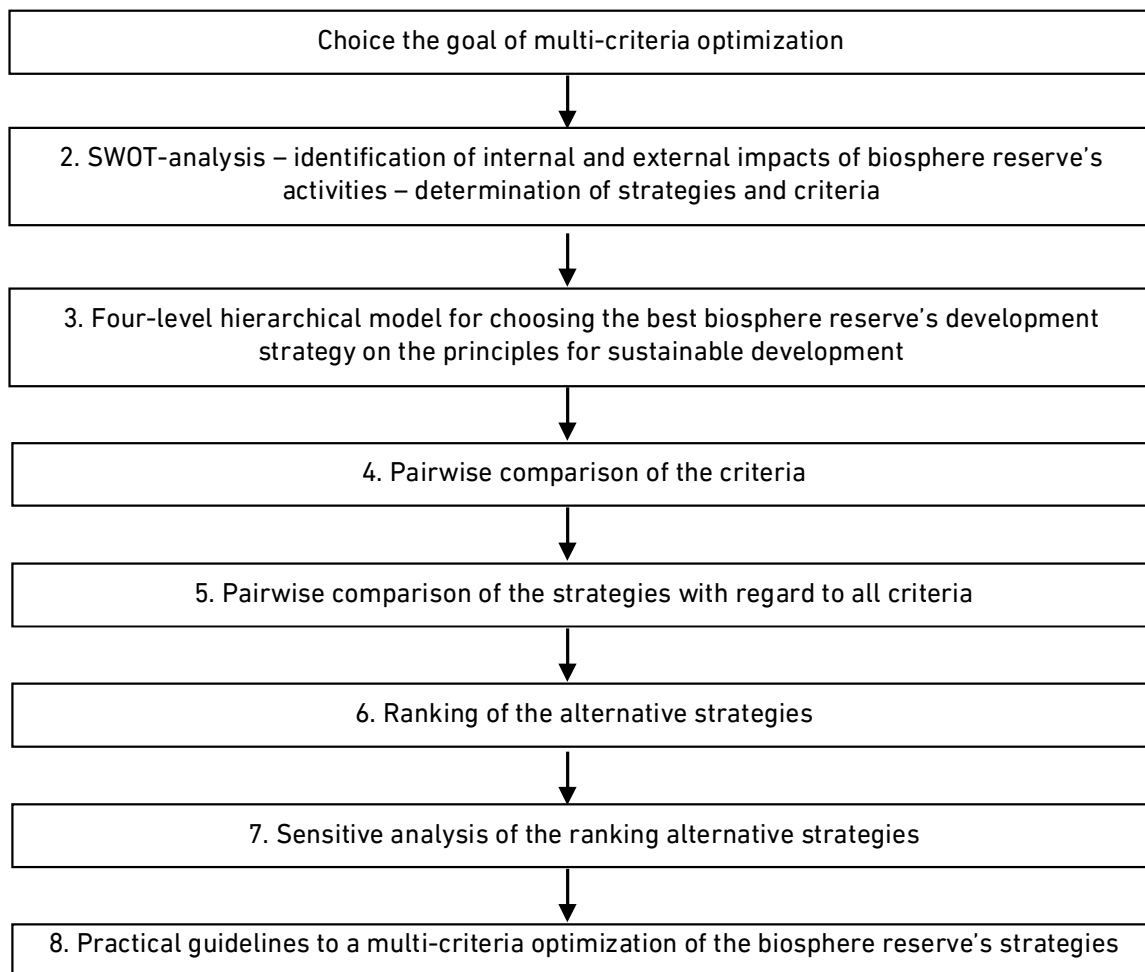


Figure 1. Algorithm of A'WOT-analysis to a multi-criteria optimization of the biosphere reserve's development strategies

3. **Results**

The Schorfheide-Chorin Biosphere Reserve (SC BR) is used as a case study. SC BR is located in the north-east of Brandenburg Land. It divided into two parts: the eastern is agrarian landscape and the western part is forest landscape. Woodland types included beech forests on moraines, pinewoods with oak on plains and alder woods in wet hollows. The rate of organic farming amounts to 32%, woodlands cover 48% of which 18% are deciduous of mixed forests and 30% are coniferous forests. There are more than 1000 plant species and 2000 animal species.

Analysis of the questionnaire shows that 97% of the respondents believe that enhanced international transboundary cooperation between

Schorfheide-Chorin Biosphere Reserve (Germany) and Cedynia Landscape Park (Poland) should improve management at the protected areas. The most important benefits from international cooperation are exchange of knowledge and the best practice examples (83%), development of common agendas for protected areas management (69% of respondents) and more opportunities to apply international funding (52%). According to financial support, the most effective should be funding from the national, regional, local budgets (52%) and financial support from international organizations (48%). For all interviewers it is strongly important to preserve the environment for future generations. 62% of the interviewers said that they are willing to pay a part of their family's income every year to maintain the protected area for future generations.

A'WOT-analysis [7; 13] for choosing the best biosphere reserve's development scenario/ strategy/management practice on the principles of sustainable development: Schorfheide-Chorin Biosphere Reserve case study is presented on table 1 and figure 2.

Table 1

Ranking of strategies

Criteria	Strategies						Weights of criterion's importance
	Nature conservation	Sustainable resources use	Adaptation to climate change	Tourism	Education and public relations	Non sustainable resources use	
Environmental	17,7%	16,2%	17,1%	7,8%	38,4%	2,8%	74,8%
Economic	20,0%	33,3%	20,7%	6,3%	17,2%	2,5%	7,2%
Social	19,5%	24,5%	14,0%	6,7%	32,4%	2,9%	18,0%
Ranking of strategy							
	18,19%	18,93%	16,80%	7,49%	35,79%	2,80%	

- ▶ Nature conservation – 18,19%
- ▶ Sustainable resources use – 18,93%
- ▶ Adaptation to climate change – 16,80%
- ▶ Tourism – 7,49%
- ▶ Education and public relations – 35,79%
- ▶ Maximization of financial income through intensive resources use – 2,80%.

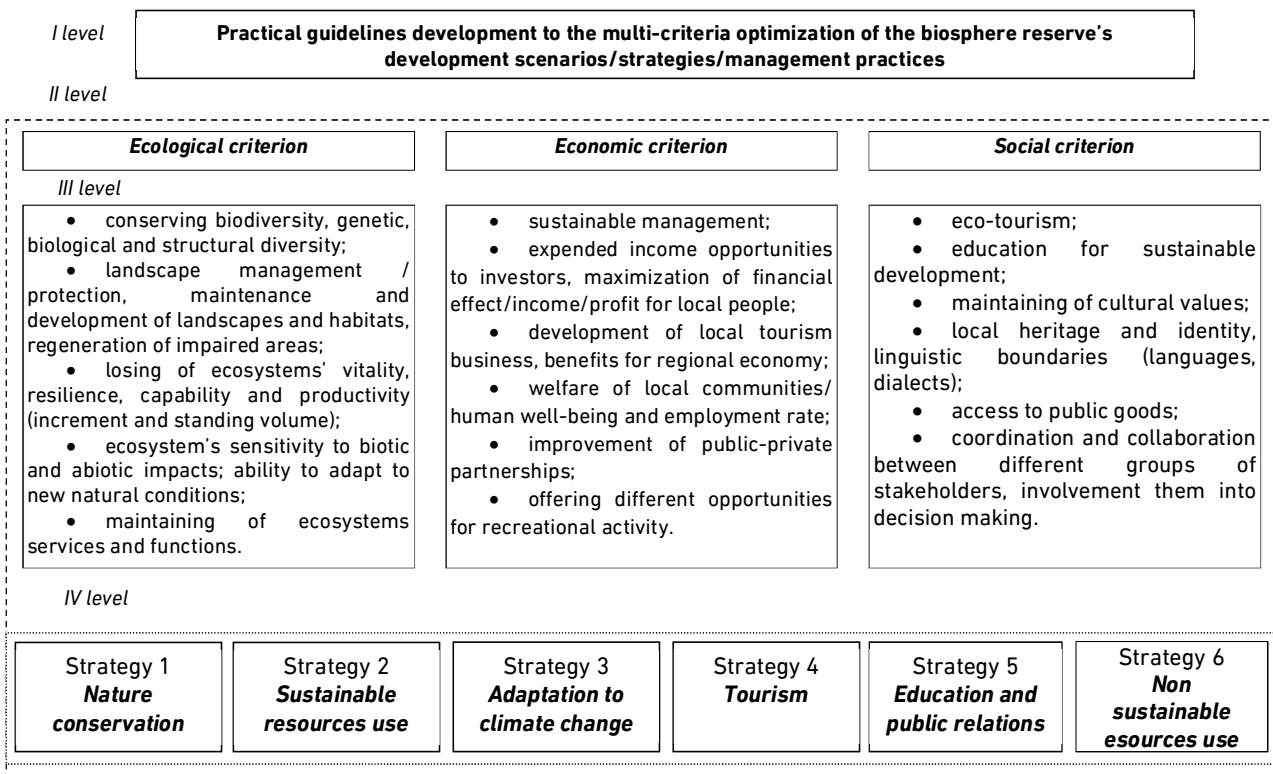


Figure 2. Four-level hierarchical model for choosing the best biosphere reserve's development scenario/strategy/management practice on the principles of sustainable development

The realization one of the strategy (sustainable resources use, nature conservation, education and public relations, adaptation to climate change, tourism or maximization of financial income through intensive resources use) should be maintenance of ecosystem services (83% of respondents) and increased awareness of different groups of stakeholders about sustainable development (66% of respondents).

The best strategy for Schorfheide-Chorin Biosphere Reserve is development of education and public relations (35,79%). It requires enhanced cooperation between different groups of stakeholders (governmental institutions, non-governmental organizations, administration of biosphere reserve, scientific institutions, entrepreneurs, local people etc.); realization of common projects and practical activities according to nature conservation and raising awareness of citizens about environmental protection. Biosphere reserves combine [10; 16] scientific knowledge, participatory governance in order to reduce a loss of biodiversity and conservation of cultural diversity; improve livelihoods of local people and enhance social, economic and cultural conditions for environmental sustainability; research, monitoring, education and training.

4. Discussions and Conclusions

- In the conditions of increasing constraints for assessing a multi-criteria optimization biosphere reserve's strategies are needed to consider the synergy of economic, environmental and social effects.

- The results could be used to simulate management scenarios for Schorfheide-Chorin Biosphere Reserve. The investigation shows society how goals in decision making can be achieved and what changes in management we need to choose as the priority in order to improve the situation. Also, it can be useful for scientific purposes.

- The comprehensive assessments of the strategies priorities will prevent the adoption of suboptimal decision-making and contribute to the increase of human-wellbeing.

1. Bioret F., Cibien C., Cenot J. C., Lecomte J. A guide to biosphere reserve management: a methodology applied to French biosphere reserves. 1998. URL: <https://unesdoc.unesco.org/> (дата звернення: 11.01.2022). 2. Haines-Young R., Potschin M. Common International Classification of Ecosystem services (CICES, Version 4.1). EEA. 2012. 33 p. 3. Changes in the global value of ecosystem services / Costanza R., De Groot R., Sutton P., et al. *Global Environmental Change*. 2014. № 26. P. 152–158. 4. De Groot R., Wilson M. A., Boumans R. M. J. A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecological Economics*. 2002. № 41. P. 393–408. 5. Ibish P. L., Hobson P. R., MARISCO. Adaptive Management of vulnerability and RiSk at COnservation sites. A guidebook for risk-robust, adaptive and ecosystem-based conservation of biodiversity. Centre for Ecnics and Ecosystem Management,

Eberswalde. 2014. 195 p. **6.** Ibish P.L. et. al. Great Altay Transboundary Biosphere Reserve. Development of a management plan of the Great Altay Transboundary Biosphere Reserve, Republic of Kazakhstan and Russian Federation. Centre for Economics and Ecosystem Management, Eberswalde. 2015. 188 p. **7.** A'WOT: Integrating the AHP with SWOT analysis / J. Kangas, M. Pesonen, M. Kurtilla, M. Kajanus. *In Proceedings of the ISAHP*. Berne, Switzerland, 2001. P. 189–198. **8.** Programme «Man and the Biosphere» (MAB). URL: <https://en.unesco.org/mab> (дата звернення: 11.01.2022). **9.** Planetary Boundaries: Exploring the safe operating space for humanity in the Anthropocene / J. Rockström, W. Steffen, K. Noone, Å. Persson et. al. *Nature*. 2009. Vol. 46. P. 472–475. **10.** Ruoss E., Biosphere Reserves as Model Sites for Sustainable Development. Protected Areas in Focus: Analysis and Evaluation. *Proceedings in the Management of Protected Areas*. 2013. Michael Getzner & Michael Jungmeier (eds.). Vol. 4. P. 99–114. **11.** Scolozzi, R., et al. Ecosystem services-based SWOT analysis of protected areas for conservation strategies. *Journal of Environmental Management*. 2014. URL: <http://dx.doi.org/10.1016/j.jenvman.2014.05.040> (дата звернення: 11.01.2022). **12.** Schultz L., Lundholm C. Learning for resilience? Exploring learning opportunities in biosphere reserves. *Environmental Education Research*, Nos. 5–6, October–December 2010, Vol. 16. P. 645–663. **13.** Загвойська Л. Д., Шведюк Ю. В. Оптимізація стратегії лісовідновлення в умовах Малого Полісся методом А'WOT на засадах сталого розвитку. *Вісник Львівського університету. Сер. Економічна*. Львів : ЛНУ ім. Івана Франка, 2014. Вип. 51. С. 136–145. **14.** Загвойська Л. Д., Шведюк Ю. В. Оцінювання еколого-економічної ефективності заходів з лісовідновлення. *Науковий вісник НЛТУ України : зб. наук.-техн. праць*. Львів : РВВ НЛТУ України. 2015. Вип. 25.1. С. 123–130. **15.** Transforming our world: the 2030 agenda for sustainable development. URL: <https://sustainabledevelopment.un.org/post2015> (дата звернення: 11.01.2022). **16.** The national strategy for the conservation and sustainable use of biodiversity. URL: <https://www.cbd.int/doc/world/pl/pl-nbsap-v2-en.pdf> (дата звернення: 11.01.2022).

REFERENCES:

1. Bioret F., Cibien C., Cenot J. C., Lecomte J. A guide to biosphere reserve management: a methodology applied to French biosphere reserves. 1998. URL: <https://unesdoc.unesco.org/> (data zvernennia: 11.01.2022). **2.** Haines-Young R., Potschin M. Common International Classification of Ecosystem services (CICES, Version 4.1). EEA. 2012. 33 p. **3.** Changes in the global value of ecosystem services / Costanza R., De Groot R., Sutton P., et al. *Global Environmental Change*. 2014. № 26. P. 152–158. **4.** De Groot R., Wilson M. A., Boumans R. M. J. A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecological Economics*. 2002. № 41. P. 393–408. **5.** Ibish P. L., Hobson P. R., MARISCO. Adaptive Management of vulnerability and RiSk at COnservation sites. A guidebook for risk-robust, adaptive and ecosystem-based conservation of biodiversity. Centre for Economics and Ecosystem Management, Eberswalde. 2014. 195 p. **6.** Ibish P.L. et. al. Great Altay Transboundary Biosphere Reserve. Development of a management plan of the Great Altay Transboundary Biosphere Reserve, Republic of Kazakhstan and Russian Federation. Centre for Economics and Ecosystem Management, Eberswalde. 2015. 188 p. **7.** A'WOT: Integrating the AHP with SWOT analysis / J. Kangas, M. Pesonen, M. Kurtilla, M. Kajanus. *In Proceedings of the ISAHP*. Berne, Switzerland, 2001. P. 189–198. **8.** Programme «Man and the Biosphere» (MAB). URL: <https://en.unesco.org/mab> (data zvernennia: 11.01.2022). **9.** Planetary Boundaries: Exploring the safe operating space for humanity in the Anthropocene / J. Rockström, W. Steffen, K. Noone, Å. Persson et. al. *Nature*. 2009. Vol. 46. P. 472–475. **10.** Ruoss E., Biosphere Reserves as Model Sites for Sustainable

Development. Protected Areas in Focus: Analysis and Evaluation. *Proceedings in the Management of Protected Areas*. 2013. Michael Getzner & Michael Jungmeier (eds.). Vol. 4. P. 99–114. **11.** Scolozzi, R., et al. Ecosystem services-based SWOT analysis of protected areas for conservation strategies. *Journal of Environmental Management*. 2014. URL: <http://dx.doi.org/10.1016/j.jenvman.2014.05.040> (data zvernennia: 11.01.2022). **12.** Schultz L., Lundholm C. Learning for resilience? Exploring learning opportunities in biosphere reserves. *Environmental Education Research*, Nos. 5–6, October–December 2010, Vol. 16. P. 645–663. **13.** Zahvoiska L. D., Shvediuk Yu. V. Optyimizatsiia stratehii lisovidnovlennia v umovakh Maloho Polissia metodom AWOT na zasadakh staloho rozvytku. *Visnyk Lvivskoho universytetu. Ser. Ekonomichna*. Lviv : LNU im. Ivana Franka, 2014. Vyp. 51. S. 136–145. **14.** Zahvoiska L. D., Shvediuk Yu. V. Otsiniuvannia ekoloho-ekonomichnoi efektyvnosti zakhodiv z lisovidnovlennia. *Naukovyi visnyk NLTU Ukrainy : zb. nauk.-tekhn. prats*. Lviv : RVV NLTU Ukrainy. 2015. Vyp. 25.1. S. 123–130. **15.** Transforming our world: the 2030 agenda for sustainable development. URL: <https://sustainabledevelopment.un.org/post2015> (data zvernennia: 11.01.2022). **16.** The national strategy for the conservation and sustainable use of biodiversity. URL: <https://www.cbd.int/doc/world/pl/pl-nbsap-v2-en.pdf> (data zvernennia: 11.01.2022).

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РОЗРОБЛЕННЯ ПРАКТИЧНИХ РЕКОМЕНДАЦІЙ ДЛЯ ПОКРАЩЕННЯ УПРАВЛІННЯ НА ТЕРИТОРІЇ БІОСФЕРНОГО РЕЗЕРВАТА ШОРФХАЙДЕ-ХОРІН

Визначено найбільш важливі та актуальні підходи до управління біосферним резерватом Шорфхайде-Хорін (Німеччина). Розроблено алгоритм A'WOT-аналізу (SWOT-аналіз + метод аналізу ієрархій (MAI) багатокритеріальної оптимізації стратегій розвитку біосферного резервату. Проведено анкетування різних груп зацікавлених сторін (працівників адміністрації біосферного резервату, науковців, місцевих жителів тощо) щодо вигод від міжнародного транскордонного співробітництва, можливих джерел фінансування природоохоронних заходів і важливості збереження довкілля для майбутніх поколінь. Створено чотирьохрівневу ієрархічну модель вибору найкращої стратегії для біосферного резервату на засадах сталого розвитку. Запропоновано такі стратегії розвитку як охорона природи, стале використання ресурсів, адаптація до зміни клімату, туризм, освіта та зв'язки з громадськістю, а також максимізація фінансових доходів внаслідок інтенсивного використання ресурсів. Розроблено практичні рекомендації для удосконалення управління природоохоронною територією. На думку експертів, оптимальною є стратегія поглиблення знань в галузі природокористування та розширення взаємозв'язків з громадськістю, яка поєднує наукові знання та реалізацію практичних заходів з метою

зменшення втрат біорізноманіття та збереження культурних цінностей, покращення соціальних та економічних умов для підтримання екологічної стійкості, проведення досліджень, моніторинг та навчання. Крім того, визначено обмеження та конфлікти щодо використання природних ресурсів та взаємозв'язків між екологічною та соціально-економічною системами. В умовах посилення обмежень під час оцінювання стратегії біосферного резервату необхідно враховувати синергію економічних, екологічних та соціальних ефектів. Комплексна оцінка пріоритетів стратегії запобігатиме прийняттю неоптимальних рішень і сприятиме підвищенню суспільного добробуту.

Ключові слова: біосферний резерват; стратегія; охорона природи; стале використання природних ресурсів; зміна клімату; туризм; освіта та зв'язки з громадськістю.

Отримано: 16 січня 2022 р.
Прорецензовано: 21 січня 2022 р.
Прийнято до друку: 25 березня 2022 р.