**SUSTAINABLE FOREST ECOSYSTEM MANAGEMENT**

**NishantRangra**

**HOSEO University**

**Abstract**

Development in forest management focuses on property forest scheme management that collaborates with the surroundings socially, economically, and culturally. A continuation within the provider of timber is on the market by property forest scheme management. The most aim of property forest management is to keep up a healthy environmental society and to guard the diverseness for our future diversity. On the opposite hand, the property forest scheme emphasizes safeguarding and managing the scheme of the forest. Management emphasizes the methods that square measure was taken by property forest scheme management to guard the life within the forests to stay growing the trees of the forests naturally. In the given paper it is been discussed that awareness of the environmental, economic, and social relevance and worth of the Carpathian Mountains' forests, a natural legacy that may be a reliable component. The study has used a comparative study of the key trends and techniques in current sustainable forest management to strengthen the theoretical and methodological basis.

The paper has also included the few of the major challenges faced by the maintenance sector of forest ecosystem. Several sustainable forestry methods can help forests regenerate or protect them. They include erecting a fence to keep deer out, managing weeds and other vegetation, and cutting trees to enable more sunlight to reach the forest floor. Hence, the major goal was to show how crucial ecosystem services supplied all across these protected areas are for long-term local and national ecosystem development.

**Keywords**: Sustainability, sustainable management, management, ecosystem management, nature.

**Introduction:**

Nutrition, housing, wildlife habitat, fuel, and necessities such as medical components and paper are all provided by forests. Forests serve as a vital connection between the climate, earth, and oceans, balancing Greenhouse gas supply and exchange. The breath for the Earth, taking Carbon from the air and providing the oxygen humans need in exchange. Forests also assist to control the global climate by absorbing roughly 50% of the carbon pollution produced by humans. The present situation of the forest ecosystem is been deflating consistently for the past many years. Various man-made activities are liable for this deploying, the conversion of forest land in agricultural land, unsuitable forest management, and various other unmitigated cultivation is deploying the forest ecosystem all around the globe. To overcome this situation forest management development focuses on long-term forest ecosystem management that is socially, economically, and culturally compatible with the environment. Environmental management ideas encourage conservation and best practices for the benefit of current and future generations. Sustainable forest ecosystem management can ensure a steady supply of wood in the future. The following study is also based on the described issue and the way to overcome it to replenish the forest deficiencies and manage a proper forest ecosystem management disturbed by the various man-made activities.

**Purpose**

Development in forest management focuses on sustainable forest ecosystem management that collaborates with the environment socially, economically, and culturally. The concepts of environmental management both promote conservation and practices for the betterment of present and future generations. a continuation in the supply of timber is available by sustainable forest ecosystem management (Poudyal et al. 2018)[23]. It is known to us and well aware of the importance of trees in our environment. In many ways, trees help to keep the environment clean. The main aim of sustainable forest management is to maintain a healthy environmental society and to protect the biodiversity for our future diversity. On the other hand, the sustainable forest ecosystem emphasizes safeguarding and managing the ecosystem of the forest (Mori et al. 2017)[20]. Management emphasizes the strategies that are taken by sustainable forest ecosystem management to protect the wildlife in the forests to keep growing the trees of the forests naturally (Bottero et al. 2017)[5]. The sustainable forest ecosystem mainly aims at the use of the recycling of paper to reduce the cutting of trees.

It also aims the decrease soil erosion. Also, stated that in the sustainable forest management ecosystem, there are many ideas to promote people a better life and a clean and healthy environment (Schober et al. 2018)[26]. It is very necessary for the better improvement of our environment. Through the process, trees can not alone be benefitted, but it is also beneficial for the whole forest (Asherin, 2017)[5]. The forest management practices reduce the pollution of the environment. As mentioned by Krishna and Mohan (2017)[14], the methods of the sustainable forest ecosystem must include a scientific process. The trees of the forests can grow naturally in their climate. The old plants are used in growing the new plants (Hisano et al, 2018)[11]. The old forests are known as the habitation of animals as well. On the other hand, as per the views of development, innovative sustainable management also promotes the livelihood of the local people (Halofsky et al. 2018)[10]. The sustainable forest ecosystem offers a list of activities that offers a better ecosystem and a better environment in the ecosystem (Nojavan et al. 2018)[22]. The people of the rural area depend on the forests in many ways that the sustainable forest ecosystem management is very helpful for the betterment of their lives.

**Research questions**

* What will be the future of forest ecosystem if sustainable management is not practiced?
* What measures and strategies should be adapted to maintain the sustainable forest ecosystem management in the long run?
* What are the benefits of forest ecosystem in day to day human life?

**Methodology and data**

The methods and data in the study may be elegantly examined using qualitative secondary theme analysis. The secondary thematic analysis enables the work to differentiate from the same subject in a new way. Secondary thematic analysis qualitative analysis is mostly based on the replies of respondents to various inquiries from the inquiry questions. Secondary thematic analysis qualitative analysis aids in the examination of the paper's data (Aspers & Corte, 2019)[3]. It also aids in the resolution of various techniques of long-term forest ecosystem management. Several strategic techniques are required for qualitative analysis of secondary data. The process must contain several scientific methods. Thematic analysis is the practise of studying anything with the primary goal of locating ordinary people's thoughts, reviews, and remarks (Korstjens & Moser, 2018) [13]. There are several ways of qualitative data analysis. It is necessary to have a broad understanding of the issue before beginning a thematic data analysis (Haven & Van Grootel, 2019)[16]. The review of the topics is also necessary, according to Liu et al. (2017)[18]. Then there's the matter of identifying the topics.

Thematic data analysis is very effective in many ways (Saunders et al.2018)[25]. It does not require any money or extra time. So, the effectiveness of the thematic analysis also increases in analysing the various aspects of forest ecosystem management. In secondary data analysis, the data which is required is already cleaned and sorted. So, the researcher of the data does not need any extra data. The data which are collected by the researcher can be simple and analyzed. But on the other hand, there are also many disadvantages of secondary thematic data analysis. The main disadvantages of secondary thematic data analysis are that the response of the respondents does not match with the exact questions of the researcher, hence, the questions raised in the favour of research regarding the sustainable forest ecosystem management would not be able to match comprehensively (McGrath et al.2019)[19]. Similarly, if the researcher has a set of questions in his mind to analyze the data, then the thematic analysis cannot fulfil his desire. And also the responses of the respondents do not match with the exact questions (D'Amato et al.2019)[7]. And the data of the questions can be deferred for the geographical; or regional aspects. Secondary data analysis is a process of powerful data collection. And the questions in the process can be long and formative. The main aim of the secondary data analysis is to prevent the forests from cutting (Anne et al. 2018)[1]. The process of the sustainable management of the forest ecosystem has to keep the balance between economic, social wellbeing.

There are few different aspects of sustainability. The process also has an impact on the productivity and the safeness of the environment. According to Liao et al. (2020)[17], the process also keeps biodiversity unchanged. From the last few decades, the sustainability forest ecosystem is a major process to protect the environment and also the biodiversity of the environment (Wali et al.2017)[30]. There are also many benefits of the sustainable forest ecosystem. As stated by Gavrilidis et al. (2019)[9] through the process, the emission of greenhouse gases decreases. As a result it the temperature of the environment increases (Nijnik et al. 2018)[21]. The level of pollutants in the environment also increases. In the method of sustainable forest ecosystem, the impact of the harmful gases in our environment decreases. And also through the process, the ecosystem can be well maintained. The endangered species which have been lost through the process of deforestation can be maintained and the number of the endangered species can be well managed (Blicharska et al. 2020)[4]. In the implementation of the process, the process needs more technologies and scientific methods. There must be some scientific process in the implementation of the process. As suggested, there must be some laws and regulations in the process, and the common people who are related to the forests for their occupation, livelihood must be disciplined (Arsić et al. 2018)[2]. The sustainable forest CEO system management implements some rules and regulations to protect the biodiversity and the species of the forest.

**Findings**

*Importance of sustainable management of the forest ecosystem*

There is an international conception of sustainable management in the forest ecosystem. But still, there are many endangered species of plants in the forest. Some of the species of the ecosystem collapse because of the cutting of random trees in the environment. Trees help us in many ways. The main aim of the process is to protect the ecosystem of the environment and to keep the environment healthier and safer (Tardella et al. 2017)[28]. The sustainable forest management system is to protect the trees for future generations. The demolition of trees can harm the life of the common people, so sustainable management of the forest system is highly required. The process mainly covers the land areas and the biodiversity of the land areas. The process is helpful for the environment. Through the process, the emission of carbon dioxide decreases. For that, greenhouse gases affect the environment. For that the temperature of the environment increases. Sustainable ecosystem management occurs through many processes (Humphries et al. 2020)[12]. The methods of the process must be scientific and organized. The main object of the process is to help the people who depend for their livelihood in the forest. Sustainable forest management mainly focuses on the whole development of the forests. The ecosystem must be managed in an organized way. The motive of the management is to keep the environment of the trees in a better way. It is very essential to implement the management of the ecosystem in the forests (de Oliveira Neto et al. 2020)[8]. The main cause of forest degradation is the industrialization and urbanization. And for that, the number of trees day by day decreases. There is a various important way that helps in the sustainable management of the forestry. As a result of deforestation, the number of trees decreases. For that, the level of carbon dioxide increases and, the total human being can be affected by that. But in through the process of sustainable forestry development management, carbon dioxide and other harmful gases like the greenhouse gases decrease. For that, the environment is very helpful to initiate the system in it. There should be many terms and conditions in the process so that the process could be implemented successfully.

**Practical Implications**

*Strategies that can be used for sustainable forestry practices*

Sustainable ecosystem management can occur in a well-organized and well-managed way. The process occurred in a scientific way. Different methodologies are used in the process of sustainable forestry management. There are many strategies by which the ecosystem of the forest can be prevented from degradation. To initiate the process of sustainable forest management, a land area must be needle first. The area of the land must be cleaned. The main aim of the process is to increase the quantitative and qualitative betterment of the forests for the plants of future generations. It should maintain or increase the biodiversity of the area. There must be a process to prevent the endangered species and protect them for the future. The aim of the process is also to prevent soil erosion and to increase the quality of the soil for betterment. There must be a process to maintain the quality and quantity of the water for better plantation, to maintain the recreation of the forests, and the opportunities and initiatives for the people who are depending for their livelihood in the forests. There must be a strategy to increase environmental literacy among the people. There must be a strategy involving rare species of plants in it. To implement sustainable forest and ecosystem management, certain strategies are important to maintaining in which the primary is practicing recycling of papers that result in the reduction of the harvest of wood pulp trees. It is also important to grow the timber on a long time rotation that in a period of 100 to 200 years. Another important strategy is to practice cutting of selective type individual trees and small types of tree species (Broz et al. 2017)[6]. Also, to enhance the sustainable management of forestry, it is important to minimize the fragmentation of the larger blocks that remain in the forest. It is important to make strategies while making forestry plans for avoiding the utilization of chemical pesticides and maintain land by prohibiting logging.

**Theoretical Implications**

*Principles of sustainable forest management*

The principles of the sustainable management of forests used to be referred to as the forests possessing their complex type of ecology. This ecology has importance for the sustainable development of the economy as well as for maintaining every form of life. As stated by Kulakowski et al. (2017)[15], the Principles of Forest Management postulates the right of nations for making a profit from their resources of the forest. However, it is needed to recommend that it is needed for occurring within a framework, and this framework is for the protection of forest and its management as well as for the conservation of forest.

The principles of the sustainable forest and ecosystem management forest are not used to be binding in a legal way but for providing recommendations on the practices of sustainable development. The Principles of Forest Management used to comprise as follows:

* Every nation needs to take part in the program “the greening of the world” by doing planting as well as by making conservation of forests.
* Forests are required to be managed for meeting the social and economic and ecological and cultural as well as needs in a spiritual manner of the present time as well as for the future generations also (Shackleton et al. 2019)[27].
* Unique specimens of forest are required to be protected, such as ancient era forests as well as forests having cultural and historical, and spiritual as well as religious significance.
* Pollutants that used to possess the feature of harming forests required to be controlled (Prata et al. 2019)[24].
* Plans of forestry are needed to consider the values of non-economic of the forests as well as the consequences of environmental for management of them. Degradation of Forest has to be avoided.

**Discussion**

Forests support the livelihoods of more than a billion people around the globe and are essential for biodiversity conservation, electricity production, and soil and water preservation. Forests and trees assist to avoid droughts and salinization by reducing water-related hazards including landslides and local floods. Forests are also liable for benefiting the environment in end number of ways like it helps in increasing of relative humidity of the air by also increasing the fertility of the surface soil as well. The given study, in its various parts, has explained the importance of the forest ecosystem for the well-being of humans. The forests, in the present times, are not taken seriously by humans and they are getting over utilised consistently over the period of time. Overuse of forests has a number of negative repercussions, including biodiversity loss and resource depletion. Explanation: Overutilization relates to the overhunting of forest resources, which results in natural resource degradation such as soil erosion and the spread of weeds.

The concept behind the sustainable development of forest ecosystem was first introduced in 1987 in which it was stated that development that satisfies current demands without harming populations' capacity to fulfill their own needs, various strategies are also mentioned as the strategies to maintain the sustainable forest ecosystem management. The major issue which are leading forests in their depletion is deforestation. The most serious dangers to forests are deforestation and forest degradation. From the late '90s, more than half of the world's largest tropical forests have been lost, with more than one plot being burned or severely degraded every second. It is urgently needs to be realised that forests contribute significantly to the Earth's capacity to sustain its climate through the worldwide influence of photosynthesis. They are real protection against global warming since they remove carbon dioxide from the atmosphere and produce oxygen. This aids in the purification of the atmosphere and the regulation of rising global temperatures.

**Research Limitations & Future Research**

The sustainable development goal aims to protect and restore the diversity of the forests. Forests play an important role in decreasing the level of natural disasters, soil erosion, and floods. Through the process of sustainable management, the investment in the forest and forestry, mainly in the rural area will develop the livelihood and the income of the rural people. There are some rules and regulations in sustainable forest ecosystem management in the world. Through the process of it, the Institutions increase the scope of the activity of the depending people, who are dependent upon the forests. There must be a strategy in the process to recycle the use of paper for the reduction of harmful ingredients in the environment. Every nation should take part in the process of sustainable forest ecosystem management. Also, in the implementation of the strategies, every nation should take initiatives to protect the natural biodiversity of the ecosystem. The ecosystem management should also take the initiatives to resist the use of harmful particles in the environment. Ecology is a vital part of the environment and through the steps, we can save the diversity of the ecosystem. It is important to remember in the implementation of the process that there must be several scientific strategies for the prevention of the ecosystem in the environment. Forests are required to manage the collaboration socially, economically, and culturally. The purpose of sustainability gradually increases the efficiency of forests and also protects and prevents the biodiversity of the ecosystem. The sustainable forestry management system is the system in which the methods play an important role in the environment.

**Paper Type**

This paper can easily be considered as both empirical and conceptual in nature. The topic of Sustainability is fairly new with the only couple of decades since its conception. Sustainability is still in its formation process with the world not fully aware and still do not accept its existence. Therefore Sustainability and its management are still in the early stages of ideas and concept forming. While the article is also conceptual in nature due to the fact that ideas and questions need to be answered through research and data assimilation. To take care of the forest has been into our minds and in some practical work for over a half-century but no proper solutions for its maintenance and running structure has ever been in real-time. This paper provides ideas and concepts that need to be looked at, researched, and practically implied for proper conservation.

**Conclusion-**

* Forest management that adheres to the principles of sustainable development is known as sustainable forest management. Forest management that is sustainable must find the right balance amongst three primary foundations: ecological, economic, and socio-cultural.
* Forest protection is critical in the fight against global warming.
* The given study has analysed various factors affecting sustainable forest ecosystem development and management. From the selection of the type of data in the methodology section from analysing the various strategies to maintain the sustainable development in the forest ecosystem.
* The method of sustainable forestry management involves a variety of approaches. There are several ways for preventing the deterioration of the forest ecosystem. A land area must be needle first before beginning the process of sustainable forest management. It is necessary to sanitise the land area.
* The process's main goal is to improve the forest's quantitative and qualitative quality for future generations of plants. The area's biodiversity should be maintained or increased.
* There has to be a system in place to prevent endangered species from becoming extinct and to ensure that they are protected in the future. In addition to preventing soil erosion, the method aims to improve soil quality.

|  |  |  |  |
| --- | --- | --- | --- |
| **References** | **Area of Study** | **Findings** | **comments** |
| 1. Aspers, P., & Corte, U. (2019)[]. What is qualitative in qualitative research. *Qualitative sociology*, 42(2)[], 139-160. DOI.org/10.1007/s11133-019-9413-7 | Qualitative Approach | The selection of the approach used in the study. | Primary and secondary data are also recommended. |
| 1. Blicharska, M., Angelstam, P., Giessen, L., Hilszczański, J., Hermanowicz, E., Holeksa, J., ... & Winkel, G. (2020)[]. Between biodiversity conservation and sustainable forest management–A multidisciplinary assessment of the emblematic Białowieża Forest case. *Biological Conservation*, 248(1)[], 10-30. DOI.org/10.1016/j.biocon.2020.108614 | Biodiversity conservation and sustainable forest management. | The level of pollutants in the environment. | Measures to control the pollutants might also be discussed. |
| 1. D'Amato, D., Korhonen, J., & Toppinen, A. (2019)[]. Circular, green, and bio economy: how do companies in land-use intensive sectors align with sustainability concepts?. *Ecological economics*, 158, 116-133. DOI.org/10.1016/j.ecolecon.2018.12.026 | Organisation’s in land-use intensive sectors align with sustainability concepts | How companies and businesses are using land intensively. |  |
| 1. Korstjens, I., & Moser, A. (2018)[]. Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *European Journal of General Practice*, 24(1)[], 120-124. DOI: 10.1080/13814788.2017.1375092 | Practical guidance to qualitative research. | Better understanding of the qualitative data collection method. | Quantitative data collection might also be taken into the consideration. |
| 1. McGrath, C., Palmgren, P. J., & Liljedahl, M. (2019)[]. Twelve tips for conducting qualitative research interviews. *Medical teacher*, 41(9)[], 1002-1006. DOI.org/10.1080/0142159X.2018.1497149 | Twelve tips for conducting qualitative research. | Guide to use the effective qualitative data collection. | Some Drawbacks of qualitative data collection method should also be taken into the consideration. |
| 1. Arsić, S., Nikolić, D., Mihajlović, I., Fedajev, A., & Živković, Ž. (2018)[]. A new approach within ANP-SWOT framework for prioritization of ecosystem management and case study of National Park Djerdap, Serbia. *Ecological Economics*, 146, 85-95. DOI.org/10.1016/j.ecolecon.2017.10.006 | Prioritization of ecosystem management | Acknowledged about the ways, how to prioritise ecosystem management. | Few points on the environment prioritisation must also be considered to elaborate the study. |
| 1. Broz, D., Durand, G., Rossit, D., Tohmé, F., & Frutos, M. (2017)[]. Strategic planning in a forest supply chain: a multigoal and multiproduct approach. *Canadian Journal of Forest Research*, 47(3)[], 297-307. DOI.org/10.1139/cjfr-2016-0299 | Strategic planning in a forest supply chain. | Forest supply chain management skills. |  |
| 1. Wali, A., Alvira, D., Tallman, P., Ravikumar, A., & Macedo, M. (2017)[]. A new approach to conservation: using community empowerment for sustainable well-being. *Ecology and Society*, 22(4)[].12-30. DOI.org/10.5751/ES-09598-220406 | A new approach to conservation: using community empowerment for sustainable well-being. | Approaches to conserve the biodiversity or ecosystem. |  |
| 1. Tardella, F. M., Postiglione, N., Vitanzi, A., & Catorci, A. (2017)[]. The effects of environmental features and overstory composition on the understory species assemblage in sub-Mediterranean coppiced woods: implications for a sustainable forest management. Polish *Journal of Ecology*, 65(2)[], 167-182. DOI: 10.3161/15052249PJE2017.65.2.001 | The effects of environmental features and over story composition on the understory species assemblage in sub-Mediterranean coppiced woods. | Importance of sustainable management of the forest ecosystem | Limitations should also be concerned. |
| 1. Nojavan, M., Salehi, E., & Omidvar, B. (2018)[]. Conceptual change of disaster management models: A thematic analysis. Jàmbá: *Journal of Disaster Risk Studies*, 10(1)[], 1-11. DOI.org/10.4102/jamba.v10i1.451 | A thematic analysis | Selection of the analysis method. | More analysis method might also be taken into the consideration like descriptive analysis and more. |
| 1. Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., ... & Jinks, C. (2018)[]. *Saturation in qualitative research: exploring its conceptualization and operationalization. Quality & quantity*, 52(4)[], 1893-1907. DOI.org/10.1007/s11135-017-0574-8 | Saturation in qualitative research . | Explored qualitative analysis’s conceptualization and operationalization. |  |
| 1. L. Haven, T., & Van Grootel, D. L. (2019)[]. Preregistering qualitative research. *Accountability in Research*, 26(3)[], 229-244. : https://DOI.org/10.1080/08989621.2019.1580147 | Accountability in research. | Research analysis. |  |
| 1. Liu, Y., Bi, J., Lv, J., Ma, Z., & Wang, C. (2017)[]. Spatial multi-scale relationships of ecosystem services: A case study using a geostatistical methodology. *Scientific reports*, 7(1)[], 1-12. DOI:10.1038/s41598-017-09863-1 | Use of geostatistical methodology. | Methodology guidance. |  |

**References**

1. Anne, B., Geoffroy, S., Cherel, J., Warot, G., Marie, S., Noël, C. J., ... & Christophe, S. (2018)[]. Towards an operational methodology to optimize ecosystem services provided by urban soils. *Landscape and Urban Planning*, 176, 1-9. DOI: ff10.1016/j.landurbplan.2018.03.019ff. ffhal-02008732f
2. Arsić, S., Nikolić, D., Mihajlović, I., Fedajev, A., & Živković, Ž. (2018)[]. A new approach within ANP-SWOT framework for prioritization of ecosystem management and case study of National Park Djerdap, Serbia. *Ecological Economics*, 146, 85-95. DOI.org/10.1016/j.ecolecon.2017.10.006
3. Aspers, P., & Corte, U. (2019)[]. What is qualitative in qualitative research. *Qualitative sociology*, 42(2)[], 139-160. DOI.org/10.1007/s11133-019-9413-7
4. Blicharska, M., Angelstam, P., Giessen, L., Hilszczański, J., Hermanowicz, E., Holeksa, J., ... & Winkel, G. (2020)[]. Between biodiversity conservation and sustainable forest management–A multidisciplinary assessment of the emblematic Białowieża Forest case. *Biological Conservation*, 248(1)[], 10-30. DOI.org/10.1016/j.biocon.2020.108614
5. Bottero, A., D'Amato, A. W., Palik, B. J., Bradford, J. B., Fraver, S., Battaglia, M. A., & Asherin, L. A. (2017)[]. Density‐dependent vulnerability of forest ecosystems to drought. *Journal of Applied Ecology*, 54(6)[], 1605-1614. DOI: 10.1111/1365-2664.12847
6. Broz, D., Durand, G., Rossit, D., Tohmé, F., & Frutos, M. (2017)[]. Strategic planning in a forest supply chain: a multigoal and multiproduct approach. *Canadian Journal of Forest Research*, 47(3)[], 297-307. DOI.org/10.1139/cjfr-2016-0299
7. D'Amato, D., Korhonen, J., & Toppinen, A. (2019)[]. Circular, green, and bio economy: how do companies in land-use intensive sectors align with sustainability concepts?. *Ecological economics*, 158, 116-133. DOI.org/10.1016/j.ecolecon.2018.12.026
8. de Oliveira Neto, R. R., Silva, S., de Albuquerque Santos, A. C., Leite, R. V., Gleriani, J. E. M., Leite, H. G., ... & Fardin, L. P. (2020)[]. Modeling the sensitivity of strategic plans to risks and uncertainties in forest management. *African Journal of Agricultural Research*, 15(2)[], 222-228. DOI: 10.5897/AJAR2019.14606
9. Gavrilidis, A. A., Niță, M. R., Onose, D. A., Badiu, D. L., & Năstase, I. I. (2019)[]. Methodological framework for urban sprawl control through sustainable planning of urban green infrastructure. *Ecological Indicators*, 96, 67-78. DOI.org/10.1016/j.ecolind.2017.10.054
10. Halofsky, J. E., Andrews-Key, S. A., Edwards, J. E., Johnston, M. H., Nelson, H. W., Peterson, D. L., ... & Williamson, T. B. (2018)[]. Adapting forest management to climate change: The state of science and applications in Canada and the United States. *Forest Ecology and Management*, 421, 84-97. DOI.org/10.1016/j.foreco.2018.02.037
11. Hisano, M., Searle, E. B., & Chen, H. Y. (2018)[]. Biodiversity as a solution to mitigate climate change impacts on the functioning of forest ecosystems. *Biological Reviews*, 93(1)[], 439-456. DOI: 10.1111/brv.12351
12. Humphries, S., Holmes, T., de Andrade, D. F. C., McGrath, D., & Dantas, J. B. (2020)[]. Searching for win-win forest outcomes: Learning-by-DOIng, financial viability, and income growth for a community-based forest management cooperative in the Brazilian Amazon. *World Development*, 125, 104336. DOI.org/10.1016/j.
13. Korstjens, I., & Moser, A. (2018)[]. Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *European Journal of General Practice*, 24(1)[], 120-124. DOI: 10.1080/13814788.2017.1375092
14. Krishna, M. P., & Mohan, M. (2017)[]. Litter decomposition in forest ecosystems: a review. *Energy, Ecology and Environment*, 2(4)[], 236-249. DOI 10.1007/s40974-017-0064-9
15. Kulakowski, D., Seidl, R., Holeksa, J., Kuuluvainen, T., Nagel, T. A., Panayotov, M., ... & Bebi, P. (2017)[]. A walk on the wild side: disturbance dynamics and the conservation and management of European mountain forest ecosystems. *Forest ecology and management*, 388, 120-131. DOI: 10.1016/j.foreco.2016.07.037
16. L. Haven, T., & Van Grootel, D. L. (2019)[]. Preregistering qualitative research. *Accountability in Research*, 26(3)[], 229-244. : https://DOI.org/10.1080/08989621.2019.1580147
17. Liao, C., Qiu, J., Chen, B., Chen, D., Fu, B., Georgescu, M., ... & Wu, J. (2020)[]. Advancing landscape sustainability science: theoretical foundation and synergies with innovations in methodology, design, and application. DOI.org/10.1007/s10980-020-00967-0
18. Liu, Y., Bi, J., Lv, J., Ma, Z., & Wang, C. (2017)[]. Spatial multi-scale relationships of ecosystem services: A case study using a geostatistical methodology. *Scientific reports*, 7(1)[], 1-12. DOI:10.1038/s41598-017-09863-1
19. McGrath, C., Palmgren, P. J., & Liljedahl, M. (2019)[]. Twelve tips for conducting qualitative research interviews. *Medical teacher*, 41(9)[], 1002-1006. DOI.org/10.1080/0142159X.2018.1497149
20. Mori, A. S., Lertzman, K. P., & Gustafsson, L. (2017)[]. Biodiversity and ecosystem services in forest ecosystems: a research agenda for applied forest ecology. *Journal of Applied Ecology*, 54(1)[], 12-27. DOI: 10.1111/1365-2664.12669
21. Nijnik, M., Nijnik, A., Sarkki, S., Muñoz-Rojas, J., Miller, D., & Kopiy, S. (2018)[]. Is forest related decision-making in European treeline areas socially innovative? A Q-methodology enquiry into the perspectives of international experts. *Forest Policy and Economics*, 92, 210-219. DOI.org/10.1016/j.forpol.2018.01.001
22. Nojavan, M., Salehi, E., & Omidvar, B. (2018)[]. Conceptual change of disaster management models: A thematic analysis. Jàmbá: *Journal of Disaster Risk Studies*, 10(1)[], 1-11. DOI.org/10.4102/jamba.v10i1.451
23. Poudyal, B. H., Maraseni, T., & Cockfield, G. (2018)[]. Evolutionary dynamics of selective logging in the tropics: A systematic review of impact studies and their effectiveness in sustainable forest management. *Forest Ecology and Management*, 430,166-175. https://DOI.org/10.1016/j.foreco.2018.08.006
24. Prata, J. C., Silva, A. L. P., Da Costa, J. P., Mouneyrac, C., Walker, T. R., Duarte, A. C., & Rocha-Santos, T. (2019)[]. Solutions and integrated strategies for the control and mitigation of plastic and microplastic pollution. *International journal of environmental research and public health*, 16(13)[], 2411. https://www.mdpi.com/1660-4601/16/13/2411
25. Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., ... & Jinks, C. (2018)[]. *Saturation in qualitative research: exploring its conceptualization and operationalization. Quality & quantity*, 52(4)[], 1893-1907. DOI.org/10.1007/s11135-017-0574-8
26. Schober, A., Šimunović, N., Darabant, A., & Stern, T. (2018)[]. Identifying sustainable forest management research narratives: a text mining approach. *Journal of Sustainable Forestry*, 37(6)[], 537-554. DOI: 10.1080/10549811.2018.1437451
27. Shackleton, R. T., Shackleton, C. M., & Kull, C. A. (2019)[]. The role of invasive alien species in shaping local livelihoods and human well-being: A review. *Journal of environmental management*, 229, 145-157. https://DOI.org/10.1016/j.jenvman.2018.05.007
28. Tardella, F. M., Postiglione, N., Vitanzi, A., & Catorci, A. (2017)[]. The effects of environmental features and overstory composition on the understory species assemblage in sub-Mediterranean coppiced woods: implications for a sustainable forest management. Polish *Journal of Ecology*, 65(2)[], 167-182. DOI: 10.3161/15052249PJE2017.65.2.001
29. Thom, D., Rammer, W., & Seidl, R. (2017)[]. Disturbances catalyze the adaptation of forest ecosystems to changing climate conditions. *Global Change Biology*, 23(1)[], 269-282. DOI: [10.1111/gcb.13506](https://dx.doi.org/10.1111%2Fgcb.13506)
30. Wali, A., Alvira, D., Tallman, P., Ravikumar, A., & Macedo, M. (2017)[]. A new approach to conservation: using community empowerment for sustainable well-being. *Ecology and Society*, 22(4)[].12-30. DOI.org/10.5751/ES-09598-220406