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Impediments to Biodiversity Finance Implementation System: A Thematic Analysis

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Abstract

The global concern of biodiversity loss highlights the significance of sustainable practices protecting natural resources, which require massive investment. However, scarce resources often hinder this, particularly in emerging economies. Biodiversity finance can be an anticipated solution to this burning issue that can ensure the sustainable management of the ecosystem. Still, due to the evolving nature of the concept, its application is restricted to different stages. The current study explores the impediments to biodiversity finance implementation in emerging economies like Pakistan. It is based on a qualitative research design and is conducted in two stages. Initially, an extensive literature review was conducted to clarify the concept of biodiversity finance and identify the impediments reported by prior researchers. Later, twenty-five semi-structured interviews were conducted with the members of financial institutions, NGOs, agencies, policymakers, investors, and subject experts. Finally, the interviews were transcribed and analyzed using NVivo-14. The identified impediments were categorized into seven major themes: conceptual, social, environmental, finance, economic, framework-related, and territorial, and also suggest the future perspective of the concept. The findings suggest that the major hindrances in biodiversity finance adoption are lack of conceptualization, economic and political instability, inadequate funds, social injustice, environmental deregulation, and excess usage of natural resources. The findings will be helpful for financial institutions, NGOs, and agencies in policy-making and framework formulation for successfully applying the biodiversity finance system.

Keywords: Biodiversity finance, sustainable development goals, biodiversity loss, sustainable management, Pakistan.

1. Introduction

Industrial revolution and globalization improved the economic well-being of every nation. It benefits the country through added resources, cheap labor, and low cost of production, with the prospect of expanding the economic activities. But at the same time, it harms the natural process of the ecosystem instead of all global efforts to protect the natural environment (Dempsey & Suarez, 2016). Carbon emissions, burning fossil fuel, deforestation, climate change, disposal of chemicals, and waste materials create pollution and are directly causing biodiversity loss (Andres et al., 2023). Natural disasters, including floods, cyclones, forest fires, earthquakes, and tornadoes, lead to continuous natural disasters. Resource depletion negatively impacts economic growth, where considerable value generation depends on natural reserves and agricultural productivity (Borah et al., 2020). Biodiversity restoration and protection are required immediately to halt this global crisis (Shehzad & Khan, 2024a). The application of essential precautions and measures needs financial support to prevent biodiversity loss and achieve SDGs.

Biodiversity finance can be a specific solution for protecting natural resources from extreme climatic changes and destructive human actions. It focuses on raising and managing to ensure the sustainable management of biodiversity (Karolyi & Tobin-de la Puente, 2023). It is still in its emerging phase and requires in-depth investigation. Its' execution is gradually becoming common, but its diverse nature is linked with various subject areas, including social sciences, environmental sciences, finance, and economies, making it complicated to understand for different stakeholders. Social sciences highlight perceptions about sustainable development, social peace and justice, and social psychology (Li et al., 2021). Environmental sciences incorporate ecosystem conservation concepts, including ecological economics and agri-business processes. For generating capital and using financial incentives for sustainable management, biodiversity finance is promptly linked with finance. It focuses on raising and utilizing financial resources (Khan et al., 2023). Economic experts focused on the green economy, SDGs, and scarcity of resources in detail (Latruffe et al., 2016).

Likewise, there is no theoretical support for biodiversity finance. The concept still has its theoretical underpinning, and the theories of different subject areas are linked. The social responsibilities and obligations of the organizations are highlighted by the theories of social sciences (Friedman & Miles, 2002; Tarighi et al., 2022). These theories focus on the generation of positive social returns along with financial returns. The association of living creatures and their natural environmental conditions is presented through the theories of ecological sciences (Rosindell et al., 2011). Similarly, the financial returns generated from social investments, with their cost and benefit relations, are expressed by finance theories (Katsikopoulos et al., 2022). Finally, the management and balanced usage of resources to meet the supply and demand conditions are expressed by economic theories (Daugaard & Ding, 2022). Scholars believe biodiversity finance is a multilayered concept, and due to its

complex nature, it is essential to analyze it keenly. The multidimensional nature of biodiversity finance often becomes a hurdle in its adoption at various stages.

Prior literature has highlighted certain impediments to the biodiversity finance system (CCICED, 2021; Irvine-Broque & Dempsey, 2023). The lack of conceptualization and theoretical intervention in biodiversity finance is causing its misinterpretations. Limited studies have focused on its basic conceptualization and the primary measures of biodiversity finance. Some practitioners relate it to ESG funds, green bonds, social impact bonds, etc. (Khan et al., 2022). Researchers believe limited financial resources in emerging economies hinder the implication of sustainability projects and practices (Elliott, 2005). Some investors think that socially responsible investments generate low financial returns, which causes investors to be unconcerned. Similarly, the instability of political and economic conditions hinder biodiversity finance applications. Generally, the inadequate budget allocation impedes the protection of the natural ecosystem (Khan et al., 2024).

Financial institutions often face difficulty supporting biodiversity finance due to improper regulatory frameworks that negatively impact their policy-making (Sala et al., 2015). The hurdles in the implementation are not limited till here. The unavailability of complete biodiversity data causes problems in its calculations. There is no proper mechanism for examining biodiversity finance flows, which is essential for accurate estimation (Niesten et al., 2017). However, several factors still restrict the application of biodiversity finance, particularly in developing economies like Pakistan (Ansari et al., 2023). That is why it is essential to identify such obstacles impeding the implementation system. This study attempts to explore and highlight the issues behind the application of biodiversity finance. It is intended to add value to the existing body of knowledge by answering the following research question: What are the most important factors that influence biodiversity finance implementation?

The study will contribute to the emerging concept of biodiversity finance by identifying its impediments in the following way: first, it discusses the concept of biodiversity finance along with the linked study areas (social sciences, environmental sciences, finance, and economies) in detail, which will help in highlighting the multi-disciplinary significance of biodiversity finance. Second, it highlights the theoretical relevance of biodiversity finance, which will help identify the best-supporting theory. Third, it is one of the initial studies to identify the impediments to the biodiversity finance implementation system, which will assist in handling the challenges occurring in the future.

The following sections of the paper are organized as follows: section 2 presents the literature review and theoretical perspectives of biodiversity finance; section 3 focuses on materials and methods used for conducting the present research; section 4 discusses the key financings and discussion; and section 5 is presenting the conclusion, implications, limitations, and directions for the potential researchers.

2. Literature Review and Theoretical Perspective

2.1 Conceptualization of Biodiversity Finance

Biodiversity is significant for the efficient functioning of an ecosystem. It is essential for the natural processes of the environment (Johansson et al., 2013). Humans, animals, plants, aquatic life, and microorganisms work together to support life, ensuring the healthy process of this ecosystem (Gamfeldt et al., 2008). Living organisms depend on each other and their environment for food, air, water, medicine, clothing, shelter, etc., to form an ecosystem (Costello et al., 2018). The efficiently operating biological community plays a vital role in the economic well-being of a state. Around $44 trillion of the global financial value creation is highly or moderately dependent on nature (Hanley & Perrings, 2019).

Biodiversity is crucial for agriculture to ensure food security, health, and well-being of living organisms. Although biodiversity supports agribusinesses and contributes to economic growth, its protection, and restoration are still not considered (Meng et al., 2024). Environmental deregulation is leading to a decline in biodiversity faster than at any point in time. The causes of biodiversity loss, including invasive species, climate change, pollution, global warming, habitat loss, extensive chemical usage, etc., directly harm nature. The continuous biodiversity depletion is pulling land and water species toward extinction (Rubino, 2000).

The current situation of biodiversity loss requires the immediate protection and restoration of biodiversity, and proper financing is required for this practice. The need for funds allocation is highlighted by different studies present in the literature (Flammer et al., 2023). Karolyi & Tobin-de la Puente (2023) interpreted biodiversity finance as raising and managing capital and taking advantage of the financial incentives to ensure and support the sustainable management of biodiversity. Hence, it is the best possible and potential solution to protect biodiversity (Medina & Scales, 2023), emphasizing the generation and management of capital and using monetary benefits for well-being. The required funds are generated from diversified means: government budgets, utilities, agencies, and ministries are the public sources and bodies working on biodiversity finance implementation. Alternatively, corporate and household revenues, NGOs, commercial banks, and non-public companies are private means of biodiversity finance.

Table 1: Subject Area for Biodiversity Finance

Study Area	Relevant Key Terms	Reference(s)
Social Sciences	Social responsibility investment, sustainable development, biodiversity conservation, social justice, cultural perspectives, social anthropology, political aspects, sociology, social psychology	(Dempsey & Suarez, 2016; Li et al., 2021; Shehzad & Khan, 2024a)
Environmental Sciences	Climate change, environmental economics, environmental protection, agriculture production, environmental finance, agribusinesses, marine conservation, ecosystem services, ecological governance, carbon finance, renewable energy	(Khan et al., 2024; Sharna et al., 2022; Spiertz & Ewert, 2009)
Finance	Conservation finance, agriculture finance, green finance, impact investment, capital flow, financial management, credit provision, risk assessment, green finance, international funding, climate finance, biodiversity investment, finance solutions for biodiversity, diversified portfolio, grants and subsidies, green tariffs	(Andres et al., 2023; Khan et al., 2023; Nedopil, 2023)
Economics	Environmental economics, agriculture economics, green economy, sustainable development goals, infrastructure investment, resource scarcity, economic incentives, cost and benefits, supply and demand	(Băndoi et al., 2020; Latruffe et al., 2016; Schumacher et al., 2020)

Biodiversity finance is discussed in diversified subject domains (social sciences, environmental sciences, finance, economics) explained in Table 1. Prior studies claimed that the most relevant terms of social sciences include social responsibility investment, which focuses on generating financial and social returns for every business stakeholder (Shehzad & Khan, 2024a). The other critical social sciences terms include sustainable development, biodiversity conservation, social justice, etc. Environmental economics is an area of study with the maximum interest of researchers presenting terms like climate change, environmental economics, environmental protection, etc. (Khan et al., 2024) . The finance study area includes terms that focus on the funds requirement and generation for protecting, conserving, and restoring biodiversity and the natural environment.

Environmental economics, agricultural economics, green economy, economic incentives, etc., are the most relevant terms to the study area of economics. Conceptual development and the association of subject relevance play an essential role in defining the current concept of biodiversity finance, which helps in its application in diversified fields.

2.2 Theoretical Perspective of Biodiversity Finance

Biodiversity finance is a multifaceted and cross-disciplinary concept that lacks theoretical and empirical grounding. Different theories from social sciences, environmental sciences, finance, and economics are applied by prior researchers (Naseem et al., 2023). The highlighted theories only cover one or two components of biodiversity finance, but no single theory properly narrates the concept of biodiversity finance. The present study attempts to narrate the relevant theories to explain the concept of biodiversity finance (see Table 2). These theories belong to social sciences (symbolic interactionism, stakeholder, CSR, corporate citizenship, social identity, engaged, and social exchange theories). The symbolic interactionism theory is the most relevant in social sciences, explaining the nature of the interactions among individuals and the variations in human nature occurring due to their surroundings (Ndhlovu, 2011).

Stakeholders' theory states that the purpose of the formation of any organization should not be limited to its' stockholders only (Laplume et al., 2008). A firm should work for the betterment and usefulness of every linked stakeholder, just like biodiversity finance, which ensures the protection of every living organism and its interacting environment (Ramoglou et al., 2023). CSR theory also emphasizes social and environmental protections rather than harming and polluting the natural environment. Ecological, metabolic, niche, environmental load and arousal theories are essential environmental sciences theories. Ecological theory can be the most suitable theory to express the concept of biodiversity finance, which emphasizes biodiversity conservation and restoration (Ng et al., 2023). The metabolic theory explains that living organisms depend on the resources absorbed and extracted from the natural environment. The food quality they consume affects the metabolic rates of living organisms, including their reproduction, survival, and growth (Schramski et al., 2015). According to niche theory, the ecological and habitat requirements are significant, allowing for offspring growth. These essential requirements are not fulfilled through biodiversity loss and can be covered through the sustainable management of biodiversity ensured by biodiversity finance (Takola & Schielzeth, 2022).

Table 2: Theoretical Underpinning of Biodiversity Finance

Study Area	Relevant Theories	Reference(s)
Social Sciences	Symbolic interactionism theory, Stakeholders theory, CSR theory, Corporate citizenship theory, Social identity theory, Engaged theory, Social exchange theory	(Benlemlih & Bitar, 2018; Carter & Fuller, 2016; Friedman & Miles, 2002; Tarighi et al., 2022)
Environmental Sciences	Ecological theory, Metabolic theory, Niche theory, Neutral theory, Environmental load theory, Arousal theory	(Chave, 2004; Leigh, 2007; Palmer et al., 1997; Rosindell et al., 2011)
Finance	Portfolio theory, Capital structure theory, Utility theory, Non-rational choice theory	(Katsikopoulos et al., 2022; Shehzad & Khan, 2024a)
Economics	ESG theory, Economic theory, Supply and demand theory, Keynesian economic theory	(Daugaard & Ding, 2022; Dolderer et al., 2021)

Portfolio, capital structure, utility, ratio analysis, and equilibrium theories are related to finance. Portfolio theory facilitates risk mitigation of stakeholders' concerns and focuses on maximizing returns or minimizing risks through diversification (Ando & Shah, 2016). Biodiversity finance focuses on collecting funds from both public and private sources. Hence, portfolio theory can be linked with biodiversity finance to select funds from both sources, considering their risks and returns (Cosma et al., 2023). Likewise, capital structure theory emphasizes fundraising from a merger of debt and equity. Utility theory explains the satisfaction levels of individuals gained by utilizing goods and services. Biodiversity finance emphasizes the use of financial incentives for the sustainable management of biodiversity, and it can directly be linked with utility theory.

Similarly, ESG, economics, supply-demand, and Keynesian economic theories are majorly used in biodiversity finance. ESG theory assists stakeholders in learning about the management of risks and opportunities related to environmental, social, and governance factors (Morrison, 2021). The proper management of these factors is possible through the adoption of biodiversity finance practices. Neoclassical economic theory states that resource allocation, consumption, production, and costs are linked with the supply and demand of resources (Petrick, 2005). Biodiversity finance focuses on the balanced consumption and usage of natural resources, preserving them for future generations (Hutchinson & Lucey, 2024). The multidimensional nature of biodiversity finance has encouraged researchers to link it with manifold theories. Its complex and emerging nature has shown that multidimensional theories can explain the concept more clearly and in-depth, providing a solid theoretical basis for conceptualization.

2.3 Impediments of Biodiversity Finance

Biodiversity finance is acknowledged internationally, but multiple factors hinder its application (Medina & Scales, 2023). Previous literature has highlighted some factors hindering the implementation of biodiversity finance. The identified impediments are concisely presented in Table 3. The present environmental conditions are compelling people towards sustainability, and the adoption of biodiversity finance is gradually becoming common. Biodiversity finance ensures the conservation and restoration of biodiversity and the natural environment. The knowledge gap is the foremost factor hindering its adoption. The practitioners are unaware of the significance of sustainable practices (Karolyi & Tobin-de la Puente, 2023). There is an immediate need for awareness and motivation to ensure the conceptual clarity of the concept. Long-term risky investments give less financial returns and keep private investors at arms' length (Filippini et al., 2024).

The limited grants, subsidies, and tax relaxations provided by the state compel cultivators, businesses, and organizations to use unfair and unhealthy means of production, directly hindering the practice of biodiversity finance (Shehzad & Khan, 2024b). Most financial institutions are not willing to implement biodiversity finance practices. The fundraising sources and intermediaries of developing economies have weak financial structures that form the mechanisms for sustainability management projects (Weber, 2017). The unavailability of funds and financial resource scarcity are also significant impediments to biodiversity finance adoption, including limits of the generating and managing capital and the usage of economic and financial incentives assisting environmental sustainability (Nikolaou et al., 2014). The political and economic instability, rising inflation rates, and unemployment may limit investors from implementing biodiversity finance (Hamilton et al., 2000). Insufficient budget allocation and financial plans also hinder the protection and restoration of biodiversity (Cuadrado-Ballesteros & Bisogno, 2022).

The lack of technical expertise and skilled personnel also hinders the implementation of sustainability projects. In parallel, the absence of sustainability experts and their valuable advice hinders formulating strategies for practicing biodiversity finance. Advanced AI techniques and tools may facilitate biodiversity and ecosystem conservation (Shivaprakash et al., 2022). The next major hindrance is the unavailability of global standards and criteria. International rules and regulations will ensure the protection and well-being of living organisms (Kopnina et al., 2024). The lack of pressures imposed by international and regional bodies allows the negligence of sustainability parameters through the application of harmful activities. The impediments of biodiversity finance are not limited to this point; the conflicting interests in the value chain of social investments and the investments towards the natural environment directly hinder its adoption (Shehzad & Khan, 2024a).

Table 3: Impediments of Biodiversity Finance Adoption

Impediments	Description	References
Knowledge gap	Practitioners are unfamiliar with the significance of biodiversity finance. Lack of knowledge and conceptual ambiguities distract the investors.	(IFC, 2023; Seidl, 2023)
Resource scarcity	In emerging economies, the unavailability of financial facilities for sustainability and conservation projects directly hinders investors' adoption of biodiversity finance options.	(Elliott, 2005; Klaassen & Opschoor, 1991)
Funds unavailability	The unavailability of funds will limit investments in projects that ensure biodiversity protection and environmental sustainability.	(Nikolaou et al., 2014; Pascal et al., 2021)
Low financial returns	Sustainability investments usually generate less financial returns on investment and require more investments, which causes investors to lose interest in ethical investments.	(Shehzad & Khan, 2024a)
Political and economic instability	A weak political economy increases poverty, inflation, unemployment, etc., and causes a hindrance to the application of biodiversity finance.	(Erb et al., 2012; Otero et al., 2020)
Insufficient budget allocation	Inadequate allocation to conserving biodiversity and natural resources limits their protection and restoration.	(Cuadrado-Ballesteros & Bisogno, 2022; Sisto et al., 2020)
Technical expertise and skilled personnel	Inadequate technological advancements and a lack of proficient people provide limited guidance for sustainability projects.	(Shivaprakash et al., 2022)
Role of regulatory framework	The lack of a framework and properly operating regulatory body directly hinders biodiversity finance practice.	(Robèrt, 2000; Sala et al., 2015)
Conflicts of interest within social investments	Limited and conflicting interests in social investment value chains directly hinder biodiversity finance adoption practice.	(Berry & Junkus, 2013; Shehzad & Khan, 2024a)

Improper risk management	Proper risk estimation is the primary concern of every investor before making any investment decision. Improper risk management is hindering the decisions of potential investors of biodiversity finance.	(Darus et al., 2014; Khan, Nasir, et al., 2022)
Low funds mobilization	Demobilization of funds and resources hinders the generation of capital for ecosystem protection.	(Michael R. W. Rands et al., 2010; Nair et al., 2019)
Biodiversity focal area projects	The lack of focal areas is a main hindrance in biodiversity finance application.	(Sterling et al., 2017)
Data Hindrances	The unavailability of complete and continuous financial data obstructs the calculation and measurement of sources investing in biodiversity finance; incomplete data generate queries for biodiversity finance investors.	(Montràs-Janer et al., 2024; Waldron et al., 2013)
Mechanism for tracking biodiversity expenditure	There is no proper mechanism for calculating the requirement and fulfillment of biodiversity finance expenditure.	(Karolyi & Tobin-de la Puente, 2023)
Inadequate supplementary information	The lack of support information and finance flow data raises concerns for investors while making investment decisions.	(García-Sánchez et al., 2019)
Institutional and research collaboration	The absence of mutual collaboration among global institutions limits the latest research in biodiversity finance.	(Niesten et al., 2017)

The lack of awareness about ethical investments limits investors' ability to decide between social and monetary returns. Proper risk management is the first and foremost priority of every investor. The improper risk estimations impact the investment decisions of potential investors (Darus et al., 2014). Limited biodiversity focal area, which ensures ecosystem conservation and sustainable use of biodiversity, hinders the biodiversity finance adoption system (Sterling et al., 2017). The unavailability of biodiversity finance data is also a significant impediment that restricts potential investors from making confident investment decisions. The gaps in financial data act as an impediment to the calculation of sources investing in biodiversity finance. The improper mechanisms for tracking biodiversity expenditures and the unavailability of supplementary information related to the finance flow data make the investors conscious of their investment decisions (García-Sánchez et

al., 2019). Lastly, the absence of collaborating institutions and researchers limits the latest experiments and explorations in biodiversity finance (Niesten et al., 2017).

3. Material and Methods

3.1. Study Design

This study identifies impediments to biodiversity finance implementation systems in emerging economies like Pakistan. It has adopted a qualitative research design to answer the research questions, and it was conducted in two phases. In phase 1, an in-depth literature review was done to identify the factors that directly or indirectly hinder the adoption of financing for the conservation and preservation of biodiversity. Multiple impediments were highlighted, and the interview protocol was designed based on the found hurdles. The second phase was initiated after designing a semi-structured interview protocol. The members and employees of different financial institutions, policymakers, agencies/NGOs, subject experts, and investors were interviewed. The purposive and snowball sampling technique was used to reach the study-related participants. Significance is the basic reason behind selecting and giving these sampling techniques a priority over random sampling. Purposive sampling technique is crucially used in qualitative research to reach out information rich respondents who can add comprehensive fact to the discussion. Secondarily, snowball sampling technique was applied to get access to the most related respondents, who would have been difficult to reach otherwise. A pilot test of 5 interviews was conducted initially to check the ability of respondents to understand and grasp the interview protocol questions and to validate the respondents' viewpoints. A few minor modifications were made to the initially designed interview protocol based on the pilot responses. The final interview comprises the study relevance questions. The complete methodology process performed for identifying impediments is presented in Figure 1.

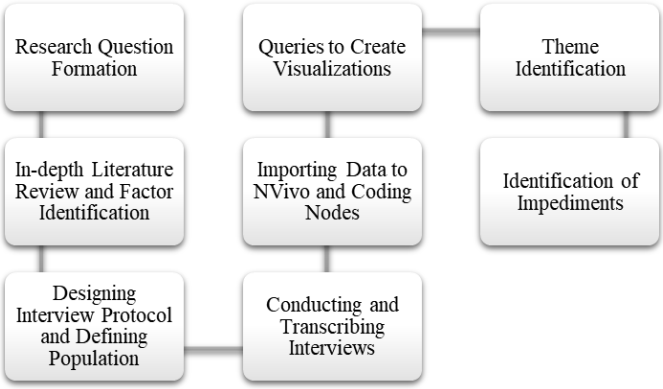

Figure 1: Visual Representation of Research Process

3.2 Sample Description

Twenty-eight semi-structured interviews were conducted to explore the hurdles in adopting biodiversity finance in detail. Interviews were conducted through telephonic calls, zoom meetings, and face-to-face interactions. After scrutiny, the final sample consisted of twenty-five interviews comprising members of financial institutions (8), NGOs (3), policymakers (3), subject experts (8), and active investors of the Pakistan Stock Exchange (3). According to Marshall et al., (2013) a sample size of twenty to thirty is adequate to get enough information to conclude qualitative studies. Therefore, twenty-five interviews are sufficient to understand the concept fairly (Khan, Nasir, et al., 2022). The three discarded irrelevant interviews emphasized specific political issues and included harsh negative comments about local and global frameworks that did not reflect the study objectives. The data was collected and recorded after getting proper consent from the interviewees, and the complete anonymity of respondents was ensured throughout the study process. The final sample included five females and 20 male members. Most of the respondents were well-qualified and highly experienced; 16 respondents had field experience of more than ten years. Study participants had good job positions and were experts in their respective fields, which helped them gain new insight through their valuable responses. Respondents' complete demographic profiles are presented in Appendix A.

3.3 Process of Data Analysis

The audio and video recorded interviews were translated into English and transcribed in MS Word format to analyze NVivo-14 software. The primary reason for selecting NVivo was its significance in qualitative data analysis (Curtin et al., 2022). NVivo is a considerable tool for getting in-depth insight into qualitative data to drive different interesting, unique findings and visual representations of data (Dhakal, 2022). The transcribed interviews were carefully examined, and data from twenty-five final interviews was imported into the latest version of the software. Respondents' viewpoints were analyzed in detail, and initial codes were designed. Each statement quoted by the study participants was assigned a code to organize and categorize the data. Once the qualitative data was arranged entirely and coded, it was ready to analyze and perform different queries to get the desired themes. Multiple data analysis techniques, including word frequency, project mapping, cognitive mapping, and hierarchy charts, were performed to get the visual presentations of the extracted data.

3.4 Word Frequency

The transcribed data was used to generate word clouds and tree maps, displaying the information related to biodiversity loss, biodiversity finance, and SDGs. Figure 2 presents the word cloud, highlighting the most frequent words used by study respondents related to the factors hindering the adoption of biodiversity finance. The extracted words include environment, biodiversity, natural resources, and sustainable financial management, which are used mainly by the study participants. They highlighted how plastic and other harmful

materials impact the natural environment and agriculture sector. They also explained how states can handle issues and use financial resources to ensure the accomplishment of SDGs.

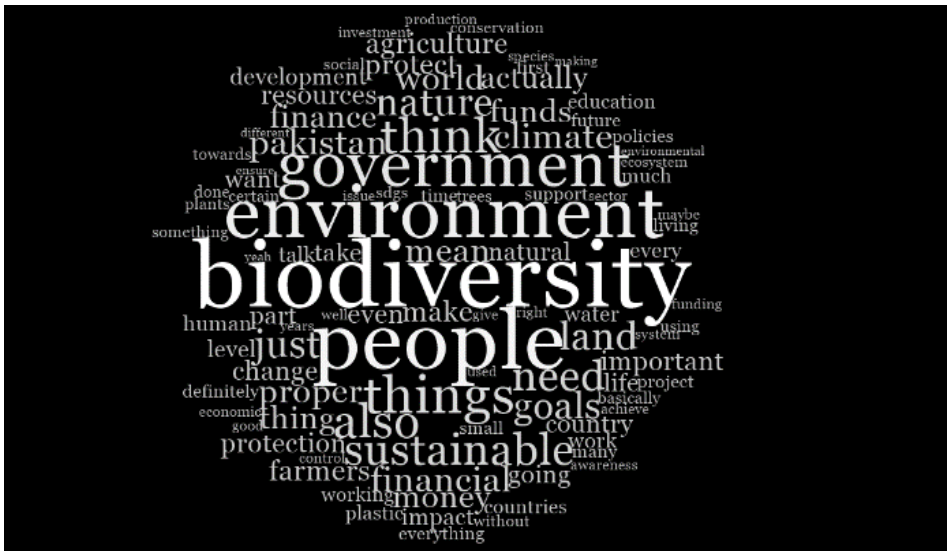

Figure 2: Word Frequency-Biodiversity Finance

Figure 3: Text Mining-Biodiversity Finance

The same query was performed again after excluding irrelevant words to get the best readable information related to the impediments to the biodiversity finance adoption system (See Figure 3). Text mining shows that government, sustainable management, environment protection, awareness, finances, and different climatic factors can play critical roles in adopting biodiversity finance. The extracted words, including protection, government, and sustainable future related to Pakistan, etc., present that the governments of under-developed agricultural economies should contribute to ensuring the sustainable management and protection of the natural environment. Proper funds, education, and motivation are required to strengthen the agriculture sector and protect the economy and future generations.

3.5 Coding for Interview Transcripts

The sentence-by-sentence coding was done to identify the desired themes from 1196 coded references. These references were coded under major themes, their multiple sub-themes, and their child codes. The comprehensive project map presenting the maximum themes is presented through Figure 4, which shows the harmful human activities leading to biodiversity loss comprised of carbon emissions, deforestation, global warming, extensive usage of natural resources, harmful production means, hunting and overfishing, air, water, and land pollution occurring due to the production and usage of harmful chemicals, plastics, and synthetic products. Similarly, it highlighted the economic factors and major economic hindrances that limit the application of biodiversity finance practice. According to the participants, the economic hindrances in applying biodiversity finance are debt servicing burden, heavy debts on underdeveloped economies, inflationary pressures, lower financial gains and interest rates, opportunity costs, resource and technology scarcity, low purchase power, etc. They also reported a few social and governance factors, like the absence of governance and its adverse consequences and the significance of contributions required by the government of an underdeveloped state.

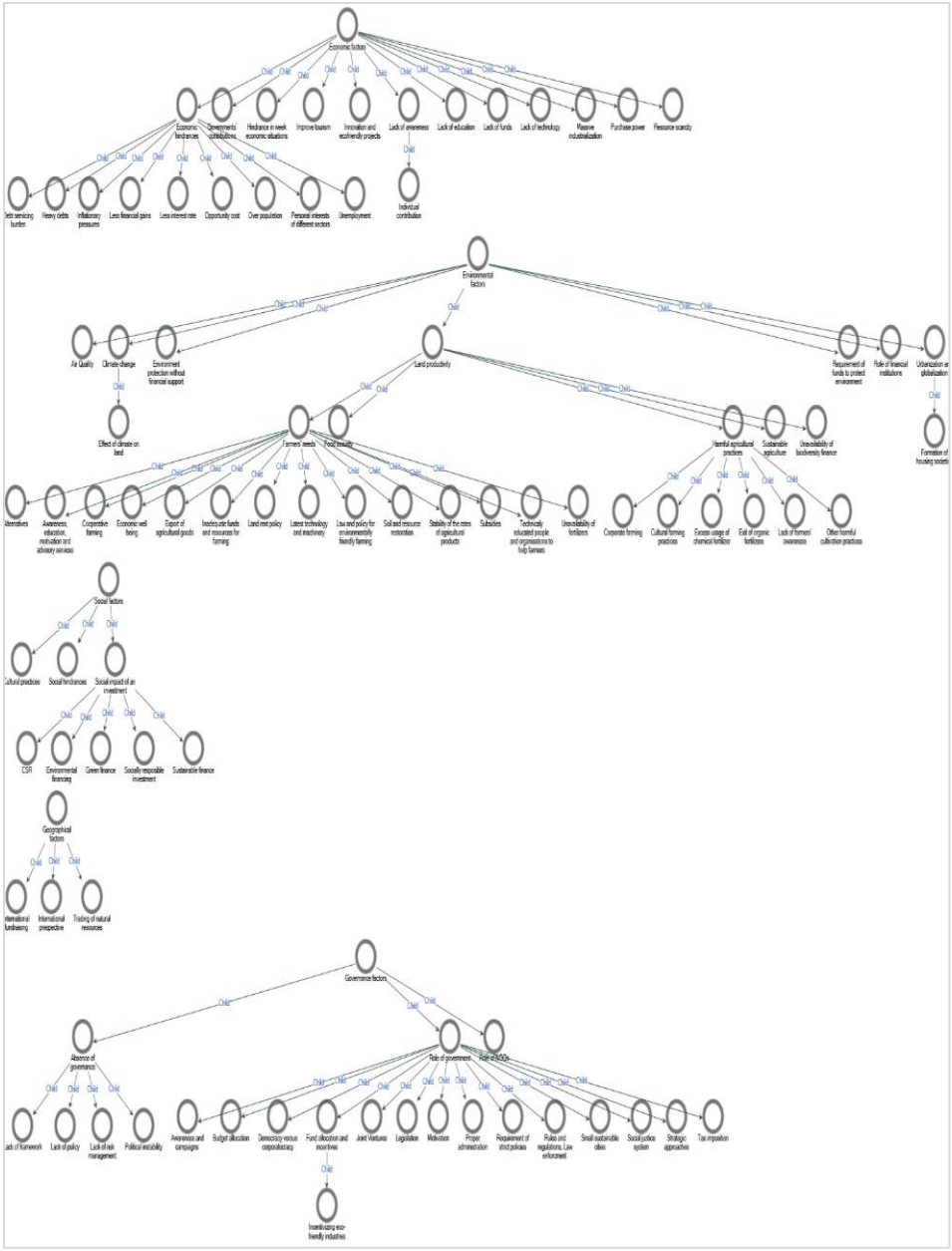

Figure 4. Comprehensive Project Map

Environmental factors have the highest references from the study participants, with a maximum number of codes presented in Figure 5. Land productivity depends on environmental factors and is positively or negatively affected by beneficial and harmful agricultural practices. Cultural farming practices, lack of farmers' awareness and education, excess usage of chemical fertilizers, corporate farming, and extinction of organic fertilizers are harmful agricultural practices that lead to biodiversity loss. Similarly, there are multiple needs of farmers that should be fulfilled to enhance agricultural productivity, which requires biodiversity finance and will ultimately lead to the protection and well-being of living organisms. The facilities required by farmers include laws and policies for environment-friendly farming, stability in the rates of agricultural products, technically educated experts and organizations to support farmers, availability of organic fertilizers and subsidies, export of agricultural goods, cooperative farming, land rent policy, and many others. The unavailability of these facilities or the negligence of farmers' needs will hinder biodiversity finance adoption.

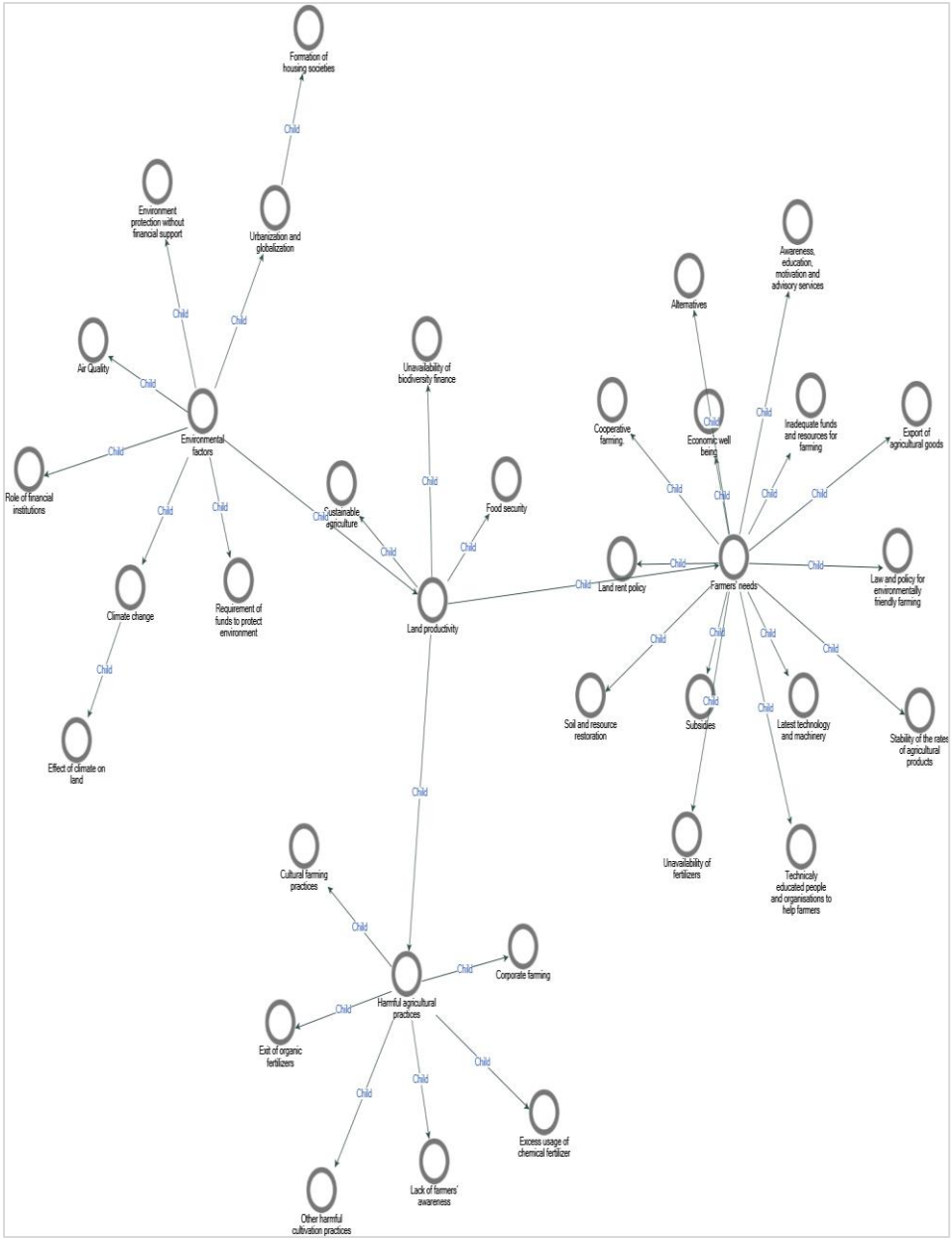

Figure 5: Cognitive Map of Environmental Factors

3.6 Hierarchy Chart Scanning

The main factors influencing the application of biodiversity finance are presented through hierarchy chart analysis (see Figure 6). The visual representation of the factors clearly shows that lack of conceptual clarity and different environmental factors majorly lead to biodiversity loss and hinder the adoption of biodiversity finance. The study participants highlighted different harmful human activities, including the excess usage of natural resources, global warming, deforestation, pollution, and carbon emissions. The complete list of harmful human activities is presented in Figure 7. The governance and economic factors have equal proportions and influence the application of biodiversity finance. The derived hierarchy cart also presented respondents' concerns related to the application of biodiversity finance in the future, which will lead to accomplishing SDGs. Furthermore, social, cultural, and geographic factors are the least dominant factors that may obstruct biodiversity finance in emerging economies like Pakistan.

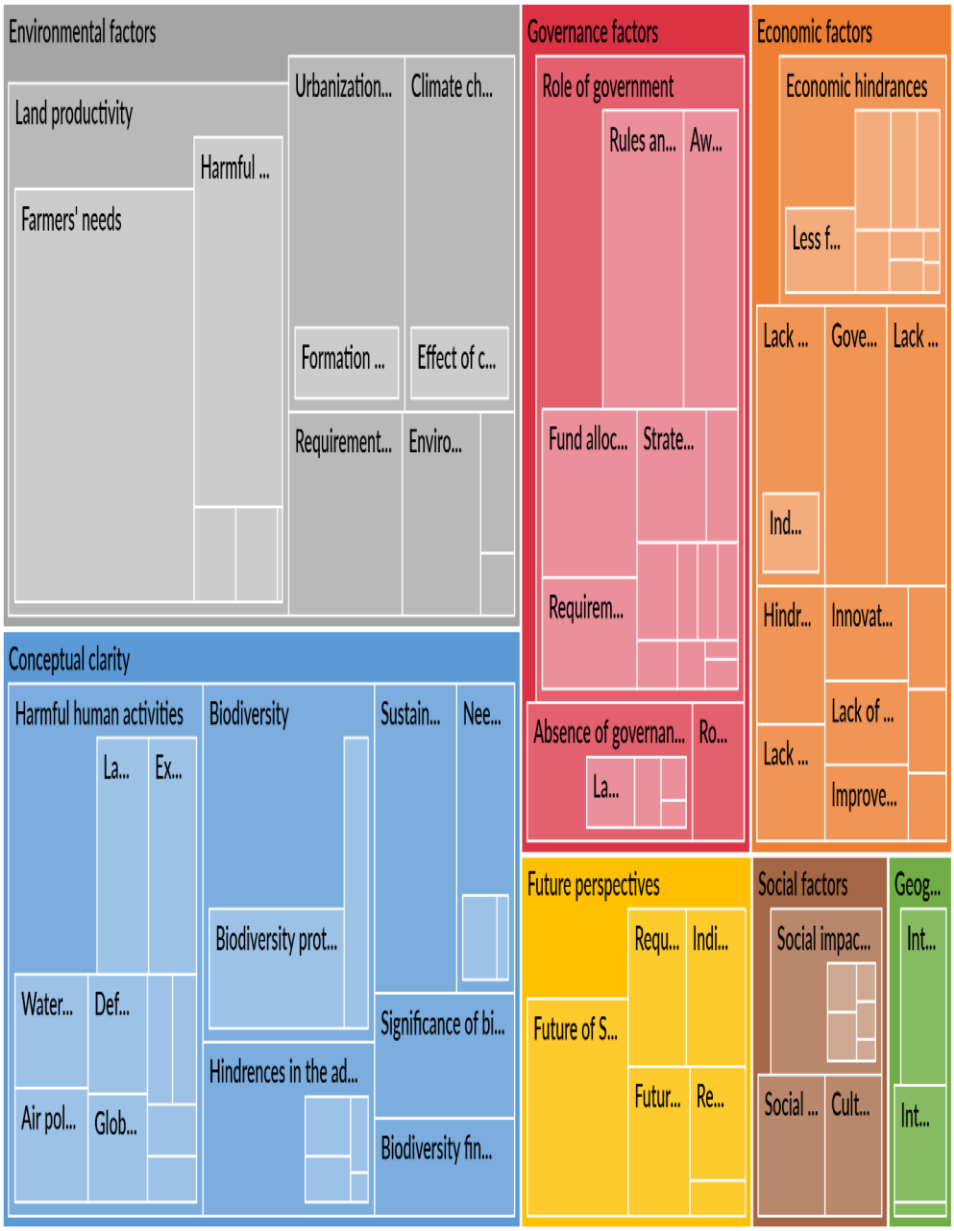

Figure 6: Visualization of Dominant Factors

The excess burning of resources, including oil, coal, and gas, is directly raising the ratio of carbon dioxide in the atmosphere and is leading to carbon emissions. Climate change, the burning of fossil fuels, and poor industrial manufacturing are causing global warming. Dumping waste materials in natural water bodies and on land increases the number of pollutants. Along with this, the lack of technological advancements and air filters is affecting air quality standards, which are harmful to the health of living organisms. Overhunting and overfishing are reducing some species' varieties. Similarly, the unfair and excess usage of natural resources is reducing their ability to reproduce and their preservation for the next generations. All these harmful human practices adversely affect our natural environment and the reproduction of living creatures. The control and restoration of biodiversity loss requires proper funding mechanisms through biodiversity finance.

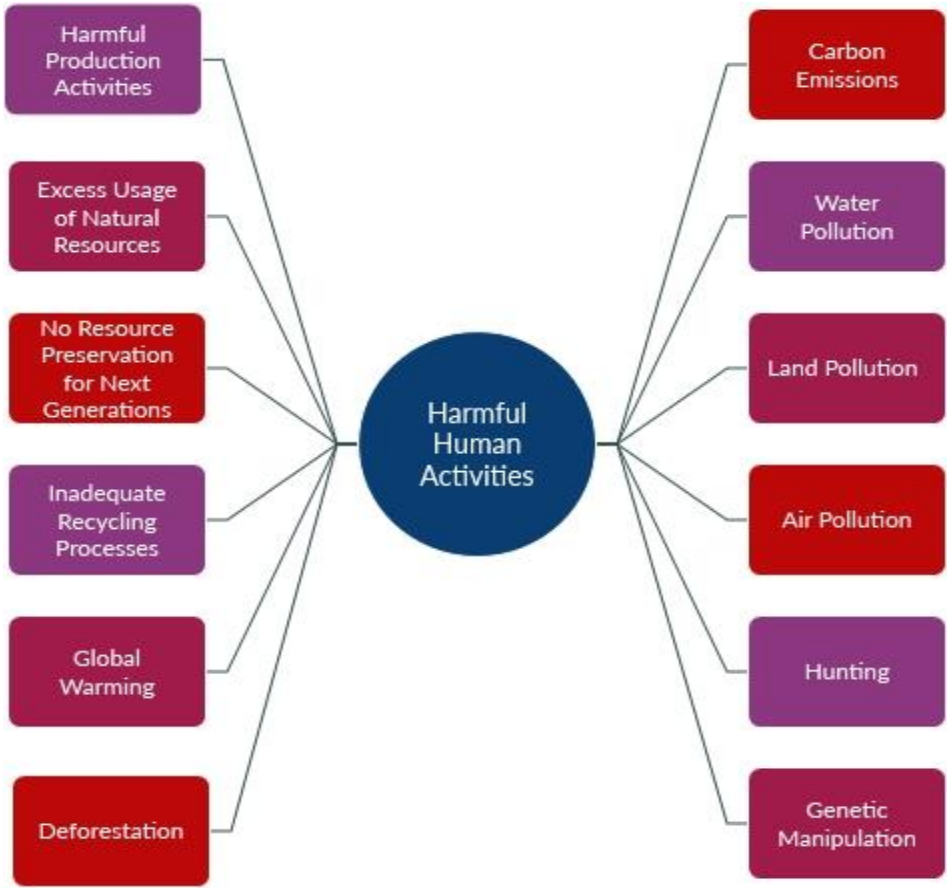

Figure 7: Human Activities Harming Nature

4. Findings and Discussion

The problem of biodiversity loss is currently a global concern that requires the universal sustainable management and protection of biodiversity. Every country enforces laws and regulations to protect and conserve natural resources for its current and future generations. Prior studies reported different barriers initially faced when implementing a biodiversity finance system. However, these barriers vary globally, particularly from a developmental context. The present study is conducted to enlist the factors that impede the biodiversity finance system. It followed the qualitative study design and conducted twenty-five interviews with the members of different financial institutions, NGOs, subject experts, agencies, investors, and policymakers to highlight the hurdlers in adopting biodiversity finance in the agricultural, forestry, and fisheries sectors. The identified factors reflect different issues, practices, and factors that were neglected to ensure its smooth future implementation.

The literature stated that sustainable practices are of utmost importance but were hindered globally due to the adverse influence of urbanization, overpopulation, excess usage and wastage of natural resources, increasing poverty, economic and government instability, war and terror, etc. (Gomiero et al., 2011; Liu et al., 2020). The study participants have also highlighted and discussed their problems in this practice, like increasing pollution ratios, overhunting, fishing, carbon emissions, improper recycling processes, and many other human factors harming the natural environment. The conceptual clarity is the primary constraint in its adoption. Biodiversity finance is an emerging concept that is still in the conceptual clarification phase. People who have limited knowledge of the concept are misinterpreting the concept.

The misconceptions of people are compelling them to understand biodiversity finance as the practice of protecting human beings. Some respondents consider it to be spending or expenditure made to protect human beings only. They do not consider it a practice of raising and managing capital and using financial incentives to ensure the sustainable management of biodiversity. It includes the protection of life on earth, including plants, animals, and all other forms of life present on land and below water, along with the fundamental interactions among them. Further, respondents related it with other concepts, including environmental loans, green finance, and sustainable finance. A respondent stated that,

> *"...I think biodiversity finance is the spending or the cost we bear to protect human beings or the investments in the agriculture sector to grow crops for human food."*

One of the other study respondents shared,

> *"...to be honest, we don't know what it is; most of us are unfamiliar with this technique. If I am unfamiliar with this concept, how will I implement it, and how will I further influence my friends and colleagues toward this practice? Who is there to*

guide us? No one. We are still hunting, and we are polluting this land. We don't know how to protect nature… "

One of the other study participants gave a unique answer and highlighted capitalism as the main issue hindering biodiversity finance adoption. He added,

"…the biggest problem is capitalism, and the solution doesn't lie with the scientists. We must turn towards the philosophers…"

The lack of social justice and peace directly harms all life forms and the natural environment. In alignment with the argument, a study respondent said that people are unaware of their social responsibilities towards nature. Self-centralization is a significant hurdle in the application of biodiversity finance. He further said,

"…chemical and biological attacks are already harming human life and nature. Similarly, now people are focusing on themselves for generating more and more financial returns, rather than generating any social return…"

The current nuclear war scenario is causing the most significant harm to the life of this ecosystem. This situation directly destroys biodiversity and its ability to reproduce and generate offspring. An environmentalist stated that,

"We are entering the era of third world war, in this current scenario where nations are already very harsh against each other. So it can be considered an obstacle which is removing the goal of protecting this biodiversity…"

The unavailability of biodiversity finance will limit the cultivation of crops and prevent farmers from adopting the latest farming tools and techniques. There is a lack of rules and regulations to support and assist the farmers, there is no export of agricultural and forestry products, and ultimately, farmers don't get enough returns against their efforts. The same is true of fish exports; a significantly smaller portion of fisheries' generation benefits from exports. According to an interviewee,

"Those with substantial land holdings are taking their economic growth, which is more towards the accumulation of finance. Once you have funds to give the farmers, it will make a difference…"

Major themes were identified by integrating sub-nodes and their child nodes and multiple sibling nodes. All these were incorporated by the remarks and comments shared by the respondents of the present study (see Table 4). The first identified major theme is conceptual factors including several sub-nodes. There are multiple human activities including deforestation, nuclear bombing, waste disposal systems, habitat destruction etc. Individuals are still not aware of the harms they are directly or indirectly creating for natural environment and biodiversity. Further, they are not familiar with the required sustainable acts and investment techniques which are essential to protect ecosystem. Lack of knowledge related to biodiversity finance is majorly impeding its' successful implication. According to the majority of the study respondents they were unfamiliar with

the significance of biodiversity finance. Social factors were highlighted as second major theme, highlighting the social and cultural practices which are generally followed. Majority of the individual investors and organizations are unfamiliar with CSR and other socially responsible investment techniques. Social psychologies also play a major role and amend the investment practices, and hinder biodiversity finance.

Environmental factors directly harm and reduce land productivity, creating problems for living organisms and economic growth. Inadequate funds and resources allocated for farming sector is the major problem for agriculture sector. This problem creating concerns for farmers and agriculturalists and is compelling them to adopt harmful practices. The reduction in agriculture outputs is decreasing the export of agricultural products, limiting the economic growth of agricultural countries like Pakistan. Economic instability impact the risk appetite of individual investors and limit the investments in sustainable practices including biodiversity finance. Financial factors are the most important factors influencing the sustainable investment practices. Unfamiliarity with green and sustainable investment mechanisms imped the adoption of biodiversity finance. Furthermore, the positive role of state and financial institutions is also significant for eco-friendly practices.

Emerging countries with weak economic systems with resource scarcity, heavy debt burdens, limited investment opportunities, and low financial returns limit the investment practices of local and foreign investors. Similarly, political stability and governance is essential for protecting stakeholders' interests. There is an urgent need of global laws and rules to protect environment for all living creatures in a sustainable way. SDGs are a significant contribution in this situation, and the successful accomplishment of these goals is highly depending on the adoption of biodiversity finance. Some unique findings were also extracted from the comments of the study participants. One of the patriot participants, who has worked on sustainability projects for the last 14 years, shared his philosophy of life as,

> *"...don't let what you can't do stop you from what you can do."*

He says financial support comes second, and environmental protection and self-awareness come first. Knowledgeable and concerned citizens prioritize natural resources and land first. Based on his patriotic thoughts, he said,

> *"...I'll be honest: why do we need the UN to tell us what to do in a country like Pakistan? Why is there a need for sustainable development goals before our act? Why do we not know that we are planet Earth's custodians and must protect the environment?"*

Prior literature has highlighted that weak economic situations may hinder the adoption of socially responsible and sustainable investment practices (Spiertz & Ewert, 2009). Agriculture significantly contributes to supporting life through food and the economy by trade. Therefore, economic factors play a significant role in promoting and managing agriculture, forestry, and fisheries. According to the participants' viewpoints of the present

study, the purchasing power of people and weak economic situations are the foremost economic factors that hinder sustainable practices. Individuals with less additional capital will not invest in social perspectives, which will result in less financial returns and more social returns. One of the study participants highlighted that people will always prefer their hunger over the protection of the environment. He also said that.

> *"The current scenario of purchasing power is considered to be very important; inflation is considered to be hype, and the prices of everything are higher than ever before. So, people are left with less disposable money to spend on biodiversity protection. Green finance or any other form of investment, like sustainable finance, environmental finance, or social responsibility investments, should be made to provide environmental and financial benefits."*

The lack of proper framework and governance is a significant obstacle to the smooth application of biodiversity finance. The government is crucial in accomplishing biodiversity finance, leading to SDGs. As SDGs are to be accomplished on all levels, individual roles will lead to country-level achievement, ensuring global transformation. Almost every study respondent highlighted that government support is the key to protecting and restoring biodiversity. A policymaker said that,

> *"The fund availability for biodiversity conservation is not widely available. We have to search and find that the volume is still low. The reason is that the central banks worldwide have not added biodiversity maintenance in their underlying policies; there is no specific framework…"*

He further discussed that,

> *"Once funding percentage for biodiversity is compulsory, everything will be fine, nature will be protected, life will be secured, animals will be protected, and our environment will be safe to live. It will not only protect us, but it will also bring economic growth through tourism and the export of crops, fruits, and many more."*

The government should make people aware of the usefulness and significance of biodiversity protection. Previous researchers highlighted a lack of awareness and education as the leading hindrances to adopting sustainability practices (Singh, 2009). Many of the study respondents called attention to the need for strict laws to limit the harm created by human activities. According to them, heavy fines, duties, and taxes should be imposed to restrict factories that emit pollutants and chemicals that cause land, air, and water pollution. Member of an environment conservation agency argued that,

> *"The protection of biodiversity including land and below water life is not possible without the involvement and support of government."*

The study participants debated whether investments should be made today or in the future. Individual investors should contribute equally to the government to protect and restore nature and biodiversity. According to them, today's investments will benefit the next generations. Some respondents were very devoted and argued that rather than depending

on SDGs and other attractive terms, they strongly believe in social responsibilities and are particular about the future based on their upbringings. They shared that:

> *"…our generation is liable for future generations. We can protect this land and life without SDGs and will do it for our children."*

The critical arguments shared by the respondents summarize the significance and urgent need for sustainability practices like biodiversity finance. It is considered essential for the protection and well-being of the ecosystem. The accurate conceptualization of biodiversity finance will facilitate the practitioners and will assist in attracting potential investors.

Table 4: Themes and Nodes with Respondents' Exposition

Major Themes	**Sub-nodes**	**Child-nodes**	**Associated Respondents' Remarks**
Conceptual Factors	Harmful human activities, need to protect the environment, biodiversity and its loss, SDGs, Biodiversity Finance	Harmful production systems, Excess usage of natural resources, lack of awareness, education, motivation, and advisory services, Inadequate recycling process, Global warming, Carbon emissions, Pollution, Hunting and deforestation, Biodiversity conservation, Biodiversity protection, Hindrances in the adoption of SDGs, Significance of biodiversity finance	*"…first you need to protect, then you need to conserve. Protection cannot be achieved without conservation. And if you talk about the biodiversity, if you conserve the environment at some level, then you can talk about the conservation of the biodiversity."* *"We are spoiling the balance of nature and are changing the system developed by nature through human impacts. Commercial interests are getting more important for us than our role."*
Social Factors	Unawareness of the social impact of an investment, Social and cultural practices	Lack of CSR, socially responsible investments, social psychologies, lack of social justice and peace	*"…I would again reiterate that a multinational company earning billions of rupees, but the road in front of their office is broken or the sewer is not working properly. So it is their social responsibility to fix that instead of lying or blaming the government or any other authority for not doing that."* *"…from Pakistan's perspective, there are hardly any investments going to the social welfare of the ecosystem or biodiversity. There is no concept of social investment, and as far as we are not going to emphasize CSR more, nothing is going to come, no investment will come for the social and environmental protection."*
Environmental Factors	Reduced land productivity,	Inadequate funds and resources for farming,	*"…our farmers are cash-starved; unavailability of biodiversity finance*

	negligence of farmers' needs, urbanization and globalization, Climate change, Air quality, Environment protection without financial support	Unavailability of fertilizers, Instability of the rates of agricultural products, lack of latest technology and machinery, No land rent policies, No soil and resource restoration mechanisms, Low export of agricultural goods, Cooperative farming, Excess usage of chemical fertilizers, Exit of organic fertilizers, Lack of sustainable agricultural practices	*will be an obstacle for the agricultural sector."* *"We are using artificial fertilizers, the ph. level of the soil is being harmed due to these fertilizers."* *"…one day it's' up to you, it's everyone's responsibility, our and governments we should protect our ecosystem, biodiversity and natural environment, law enforcement should be there, deforestation should be controlled. As a nation, we all are supposed to work together."*
Financial Factors	Requirement of funds to protect the environment, role of financial institutions, lack of sustainability funds	Lack of resources, Lack of green finance, sustainable financing, environmental financing, Unavailability of biodiversity finance, Lack of subsidies and alternatives	*"As far as we invest any amount of money in the right direction, it can help groom the things that can lead to the upbringing of human beings, plants, and everything. So we can help with the sustainable development of this ecosystem by investing the required funds."* *"There are few resources in developing countries like Bangladesh, Pakistan, Nepal, and Sri Lanka. So this is going to have a direct impact in achieving sustainability goals and protecting biodiversity…"*
Economic Factors	Governments' contributions, Weak economic situations, lack of technology and development, Promotion of tourism, Innovation and eco-friendly projects, Massive industrialization	Unemployment, Personal interests of individual sectors, Low financial gains, Low interest rates, Opportunity costs, Debt servicing burdens, Inflationary pressures, Heavy debts, Resource scarcity, Individual emigration, Overpopulation	*"… short-term policies, which are not prioritized. Yes, like in the agriculture sector, if we had a sustainable agriculture policy for a long time, we could overcome our food problems and even our financial problems. So, it will bring prosperity to the country. But we don't make a policy for agriculture. Farmers of wheat are crying, but nobody is purchasing their wheat. Even the government does not purchase from them. If this is the economic position, how can we fulfill the dream of sustainable development? Like subsidies and fiscal policies, these things hinder when you have limited resources and funds."*
Framework-related Issues	Absence of governance, Role of government, agencies, and NGOs	Lack of framework, Political Instability, Lack of policy, Lack of risk management, Lack of strict policies, rules, regulations, and law enforcement, No	*"We need proper strategies and strategic planning to protect nature, preserve biodiversity, increase land productivity, and ensure economic stability. It is the government's job to maintain the law and order, and the government should reinforce the law."*

		awareness campaigns and motivations, Improper fund allocation, and incentives Requirement of: Tax impositions, Budget allocation, social justice systems, Proper administration, Joint ventures, Small sustainable cities, legislation, incentivizing eco-friendly businesses	*"…let's say our regulator, state bank, introduced certain green banking guidelines and environmental and social risk management guidelines, which banks were already doing. But then there came the regulator aspect and a regulatory thing. Yes, sectors, industries, and people hinder it because of what they do."*
Territorial Factors	Trading of natural resources, Difficulties in international fundraising, international practices	Inadequate funds allocation to resource-rich areas, lack of international laws to protect areas	*"We normally wait for aid from the International Bank for Reconstruction and Development, World Bank, International Finance Corporation, Asian Development Bank, or friendly countries. Only that aid is diverted towards attaining the objective of biodiversity and environment protection. Financial incentives are essential to motivate people towards the protection of life."* *"Some countries have made spillwater canals to control the floods, but what we have done we have planted trees in canals."*
Future Perspectives	The future of SDGs' accomplishment, sustainable investments, requirement of financial systems, and natural solutions	Individual contributions, SDG fund requirements, and preserving nature for future generations.	*"…we are moving towards disasters; we are moving towards the default scenario. We need some great leaders to change the gear…"* *"We can make the world a better place to live."*

5. Conclusion

The present study explores the barriers to adopting biodiversity finance in Pakistan. The study conducted an intensive literature review to report the barriers to developing the interview protocol to interrogate the members of different NGOs, agencies, financial institutions, subject experts, policymakers, and active investors. NVivo 14 was used to analyze the transcribed data generated from audio and video-recorded interviews. The data was used to perform different queries to present the findings visually and report the hurdles to the biodiversity finance implementation system. The findings revealed many conceptual, social, environmental, financial, economic, framework, territorial-related factors, and future perspectives of the concept. They presented biodiversity finance as a critical source to ensure the protection and restoration of biodiversity, the natural environment, and

sustainability. It also suggested that the smooth and secure implementation of biodiversity finance will ensure the accomplishment of SDGs.

5.1 Implications

The study has revealed the growing interests of stakeholders in biodiversity finance and suggested various implications for them. The current study will be beneficial for scholars, researchers, regulators, and policymakers, the implications of the study are as follows:

5.1.1 Theoretical Implications

Researchers can get help from the content of this study to create a conceptual and theoretical consensus. It will help to understand the concept of biodiversity finance and identify theories supporting its mechanism. The explored impediments will assist the subject experts in multiple fields, including social sciences, environmental sciences, finance, and economies. It will help area experts analyze the comprehensive concept of biodiversity finance from different fields' perspectives.

5.1.2 Practical Implications

Highlighting regulators' impediments will help understand the issues hindering biodiversity finance practically. The study will help government and administrative governing authorities analyze the problems and make future policies accordingly. It will help them formulate new strategies and amend the existing strategies. Fund unavailability is always an issue for emerging economies where public and private investors avoid long-term investments with less financial returns. The explored impediments will assist in handling the problem of scarce resources and help financial institutions make easy green loan policies for claimers. It also has implications for active investors and financial authorities when formulating and implementing frameworks to attract potential investors.

An understanding of the future perceptions of biodiversity finance will facilitate exploring its contributions to the successful accomplishment of SDGs, specifically in developed states. Ethical and environment-friendly policies are required immediately to conserve and restore biodiversity. National and international organizations, agencies, and NGOs operating to protect life can take help from the study content. This research will cooperate with them to target the hurdles limiting the flow of funds toward nature. Lastly, the present study has highlighted the problems the agriculture sector faces. It will help farmers get bank loans and shift towards environment-friendly cultivation practices. Restraining from the identified impediments and adopting biodiversity finance will help the farmers improve their crop quality and quantity. It will promote the export of agricultural goods and ultimately bring well-being on an individual and national level.

5.2 Limitations and Future Directions

The present study has highlighted the concept, prior literature, theories, and issues related to biodiversity finance adoption. However, it still faces certain limitations that assist future scholars in exploring it further. First, biodiversity finance is an evolving topic, and many

are unaware of its significance. This knowledge gap limits the respondents from freely expressing their viewpoints about it. It will attract potential researchers to analyze the concept in the future and report some unique and exciting findings that will help expand the boundaries of the concept. Second, the data of the present study is collected from a limited number of respondents, including a few policymakers, and a limited number of the members of NGOs and agencies participated in this study. So, in the future, the researchers can increase the study population and target the population of multiple countries to get a detailed insight. Third, this research is explicitly conducted from the perspective of emerging economies, foreign investors, and the members of renowned NGOs and agencies. It can be targeted to analyze the investors' sifting interests towards sustainability. The analogous study of developing and underdeveloped countries will be beneficial from a future perspective.

Fourth, a new interview protocol can be designed based on the current study's findings, which will help future researchers explore more impediments. Fifth, the present study explored the hurdles of biodiversity finance by analyzing the qualitative data. Different techniques like interpretive structural modeling, regression, and correlation analysis can be performed to analyze and investigate the relations among the highlighted factors. Further, future researchers can add country-wise secondary data on the variables to conduct secondary or mixed-method research. Country-wise data can be compared to analyze the adoption and practice of biodiversity finance in different world regions. It will provide directions to potential researchers to explore the concept and its implementation in the context of their respective countries. Finally, this study has opened multiple dimensions to explore the concept of biodiversity finance. This research contribution focuses extensively on biodiversity finance only, limiting its relation or comparison with other concepts, including green bonds, sustainability finds, impact bonds, etc. This practice will further assist in fully conceptualizing biodiversity finance.

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Appendix A: Demographic Profiles of Study Respondents

Sr. No.	Anonymous ID	NVivo ID	Interview Mode	Gender	Marital Status	Qualification	Experience (years)	Nature of Respondent
1	ZI***	R1	Telephonic	Female	Married	MS	11	Subject Expert

2	KJ***	R2	Face-to-Face	Male	Unmarried	MS	13	Member of Financial Institution
3	RI***	R3	Telephonic	Female	Married	MS	10	Subject Expert
4	RE***	R4	Face-to-Face	Male	Married	BS	29	Member of Financial Institution
5	AK***	R5	Telephonic	Male	Married	MS	29	Policymakers
6	DW***	R6	Zoom	Male	Married	PhD	15	Subject Expert
7	RA***	R7	Face-to-Face	Male	Married	MS	25	Policymakers
8	DU***	R8	Telephonic	Male	Married	PhD	13	Subject Expert
9	MA***	R9	Telephonic	Male	Married	MS	32	Policymakers
10	AR***	R10	Zoom	Male	Unmarried	BS	6	Member of Financial Institution
11	DA***	R11	Zoom	Male	Married	MS	14	Subject Expert
12	SS***	R12	Telephonic	Male	Married	BS	5	Subject Expert
13	SF***	R13	Telephonic	Male	Unmarried	BS	8	Member of Agency/NGO
14	FM***	R14	Face-to-Face	Male	Married	MS	20	Member of Financial Institution
15	IB***	R15	Telephonic	Male	Unmarried	MS	12	Member of Financial Institution
16	MK***	R16	Telephonic	Male	Unmarried	BS	6	Member of Financial Institution
17	MN***	R17	Telephonic	Female	Unmarried	BS	5	Member of Agency/NGO
18	HJ***	R18	Telephonic	Male	Unmarried	BS	6	Investor
19	US***	R19	Telephonic	Male	Unmarried	BS	11	Member of Financial Institution
20	KK***	R20	Telephonic	Female	Married	MS	6	Subject Expert
21	RF***	R21	Face-to-Face	Female	Married	MS	17	Member of Financial Institution
22	MT***	R22	Telephonic	Male	Unmarried	BS	8	Investor
23	MU***	R23	Zoom	Male	Unmarried	MS	5	Investor
24	AA***	R24	Zoom	Male	Married	PhD	30	Subject Expert
25	MH***	R25	Face-to-Face	Male	Married	MS	10	Member of Agency/NGO