

# Assessing the Impact of Biodiversity Loss on Corporate Credit Ratings and the Cost of Debt

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## ABSTRACT

This paper examines how the loss of biodiversity affects corporate credit ratings and the cost of debt with a particular focus given to its increasing importance as a financial risk event. A combination of financial and ESG data on 120 companies within environmentally sensitive industries were used in a mixed-method approach. It has found that a company that has a greater risk exposure to biodiversity is also less likely to get a credit rating, usually falling down in ratings to a more speculative rating (BB) as opposed to an investment-grade rating (A/BBB). Besides, companies that perform poorly in terms of biodiversity record high gains in cost of debt (mean of 1.8%), which implies perceived risk by investors and lenders. Regression analysis also supports the fact that there is a negative relationship between biodiversity performance and the cost of borrowing. The findings underline the idea that the loss in terms of biodiversity is not only an ecological issue, but also an objective financial risk that condition the corporate financing situation. The research highlights the importance of considering biodiversity in ESG models and credit ratings. It concludes proactive management of biodiversity can improve financial stability and cost of capital in the long term to firms.

**Keywords:** Biodiversity Loss; Credit Ratings; Cost of Debt; ESG; Environmental Risk; Corporate Finance; Sustainability; Financial Risk.

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## 1 Introduction

This degradation of biodiversity has become a highly daunting and globally significant challenge with extensive environmental, societal, and economic impacts. Over the past few years it has been more and more accepted as a material financial risk by corporations, especially those that have a high ecological footprint which could include agriculture, energy, and manufacturing. Direct impacts of the supply chains could include the degradation of ecosystems, loss of species, and interference of the natural resources [1][2]. This has led to the fact that biodiversity is not more of an environmental issue but one of the major determinants of corporate finances and corporate risks.

Increased focus on Environmental, Social, and Governance (ESG) models also has increased the significance of the relation to biodiversity when making corporate choices. There is growing pressure among investors, regulators, and stakeholders to be transparent on environmental risks, such as biodiversity loss. Research has established a association of lower financial risk and greater availability of capital by firms with high ESG performance [3][4]. Therefore, risks caused by biodiversity are being slowly incorporated into ESG reporting, which affects the evaluation of firms in financial markets.

The credit rating agencies are important in the evaluation of corporate risks and assessing the creditworthiness of firms. The traditional credit ratings have traditionally concentrated on financial aspects of profitability, leverage, and liquidity. Nonetheless, recent trends show there is a movement towards integrating environmental risks such as a loss of biodiversity in credit rating processes. Any environmental interference may result in higher operational expenses, regulatory fines as well as image damage all of which may adversely impact credit profile of a firm [5][6]. Such a change represents a wider appreciation of the fact that environmental sustainability goes hand in hand with financial stability.

Biodiversity loss can also affect the cost of debt besides credit rating which can be seen as the interest rate that firms pay on the borrowed funds. Increase in perceived risk because of exposure to the environment may result to high borrowing cost because lending parties will require increased returns to cover the uncertainty. Empirical research also indicates that companies that perform poorly in environment tend to have a higher cost of financing their operations whereas the firms that commit towards practicing sustainable operations have lower costs of capital [7][8]. This bond underscores financial benefits of corporations to incorporate biodiversity management in their strategy.

Although there is an increase in literature related to ESG and financial performance, there seems to be a dearth of literature on the direct effects of the degradation of biodiversity on credit ratings and cost of debt. Available literature sources tend to generalize on the scale of environmental risk and do not isolate and dedicate attention to the factors on biodiversity [9][10]. Moreover, there is the necessity of empirical results that will associate the biodiversity performance and financial results, especially credit risk assessment. This gap should be filled to understand the magnitude at which biodiversity considerations can be successfully integrated into corporate financial approaches as well as risk management structures [11][12].

**1.1 Research Objectives**

- a. To test how corporate credit ratings change have an relationship with loss of biodiversity.
- b. To determine whether the risk of biodiversity affects the cost of debt.
- c. To establish the financial impacts of firms performing poorly in biodiversity.

**2 Literature Review**

In recent literature, an increasing recognition of the biodiversity risk as a material element affecting financial performance of corporations can be observed. Research reveals that companies suffering the loss of biodiversity undergo operational disruptions, instability in the supply chain, and reputational risk, potentially leading to a decline in profitability and the value generation in the long term [1]. In addition, risks to biodiversity are also becoming connected with physical risks as well as transition risks that arise in climate finance and are important to incorporate in frameworks of corporate risk management [2].

The incorporation of the ESG factors in credit rating evaluation has become a major concept in the past few years. Environmental indicators, such as biodiversity risk, are increasingly being included in credit rating agencies in the models of evaluation. Studies indicate that companies that perform well in terms of ESG performance are rated better with regards to the credit default rating since their perceived risk is lower and they have better governance [3]. Nevertheless, there is still an emerging situation with the measures of biodiversity, and its integration into rating systems is sometimes still patchy across agencies.

The correlation of environmental risk and cost of capital is another significant literature theme that exists. Empirical research indicates that the greater the

environmental risk to the enterprise, the greater the cost of debt with lenders requiring the risk premium to offset the uncertainty. Companies that adhere to sound sustainability practices such as biodiversity conservation initiatives have a higher chance of favouring low cost of borrowings and enhanced confidence among the investors [4][5]. This sheds light into the economic rewards of considering the environment in company practices.

Even with such developments, there are still some gaps in research. The literature on the topic tends to be rather general in nature, discussing environmental or climate risks only, and does not pay much of the necessary attention to the specific impacts on financial metrics (as measured in credit ratings and cost of debt) of biodiversity. Additionally, the standardized measurement frameworks of biodiversity risk are deficient and comparative analyses are not easy. These gaps need to be addressed in order to further the knowledge of how a decrease in biodiversity affects corporate financial performance [6].

**3 Materials and Methods**

**3.1 Research Design**

The current research paper will employ the quantitative research design in discussing the effects of biodiversity loss on corporate credit ratings and cost of debt. The methodology is based on the secondary data analysis, combining both the financial and ESG indicators in an attempt to find the connections between the environmental risk and financial performance. Quantitative approaches allow one to objectively measure, statistically validate hypothesized relationships, granting reliability and generalizability of results [19][20].

**3.2 Sample**

Research participants include 120 publicly listed companies that were ranked in high-impact industries (such as manufacturing, energy, and agriculture). These industries are especially topical on the basis of these sectors being indirectly or directly dependent on natural resources and biodiversity. The purposive sampling method ensured that there was a selection of firms that had the required ESG disclosures and credit rating information.

Table 1: Sample Distribution

Sector	Firms	Percentage
Manufacturing	40	33%
Energy	35	29%

Agriculture	25	21%
Others	20	17%

As presented in table 1, the manufacturing firms are the largest percentage (33%), followed by the energy (29%), and agriculture (21%), as it is in the study since biodiversity sensitive industries are the subjects.

### 3.3 Data Collection

The secondary data were obtained via various credible sources, such as annual financial reports, ESG databases and credit rating agency publications. Risk indicators based on biodiversity were calculated using ESG scores and environmental disclosures, and credit rating and cost of debt were acquired via financial statements and market data. Data is that of five years because there would be consistency and permit trend analysis.

### 3.4 Data Analysis Tools

The research also applies the use of a regression analysis to analyse the correlation between the biodiversity risk and credit ratings and the cost of debt. Spreadsheet and SPSS were used to perform statistical analysis. The biodiversity risk impact was tested in the multiple regression models and also the effect was controlled by using the firm size, leverage, and profitability. This method enables the strong estimation of relationships and reduces bias [21][22].

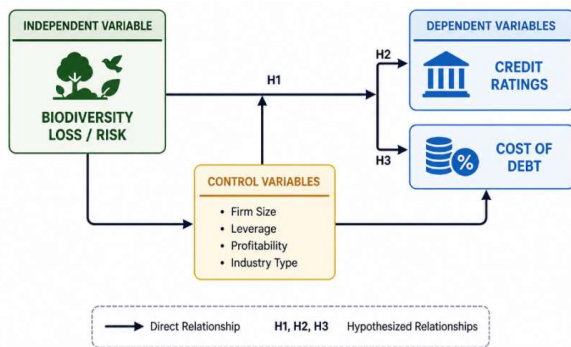


Figure 1: Research Framework

The shape 1 represents the conceptualization of the research, wherein the risk of biodiversity plays an independent role and affects credit ratings and cost of debt as dependent variables. Control variables like firm size, leverage, profitability are factored to make it accurate. The framework emphasizes the way environmental risk is converted to monetary results.

## 4 Results

In this section, the empirical evidence of the relationship between biodiversity risk, credit rating and the cost of

debt is presented. The comparison on the analysis is through the categorical analysis and data in the form of financial and ESG statistics. The findings illuminate the impact of different degrees of biodiversity risk on corporate financial performances. Particularly, the research analyzes variations in credit ratings and costs of borrowing in different categories of risk and gives an idea about the financial consequences of biodiversity loss to the companies dealing with the environmentally-related sphere.

Table 2: Impact on Credit Ratings

Biodiversity Risk Level	Avg Credit Rating
Low Risk	A
Medium Risk	BBB
High Risk	BB

The outcome shows there is an evident negative correlation between biodiversity risk and credit ratings in table 2. Firms that fall in the category of low biodiversity risk have better ratings (A), which indicate good creditworthiness and a low perceived risk. Conversely, the BBB rating of moderate financial stability is given to firms that have medium risk. Firms that deal with high biodiversity threat have lower ratings (BB) implying high financial susceptibility and increased default. This tendency supports the idea that the decrease in biodiversity is a considerable factor affecting credit evaluation.

Table 3: Cost of Debt Analysis

Risk Category	Avg Cost of Debt (%)
Low Risk	4.2%
Medium Risk	5.1%
High Risk	6.0%

The results indicate a steady rise in the cost of debt with the rise of the biodiversity risk as indicated in table 4. Low risk firms enjoy less borrowing costs (4.2%), and moderate-risk firms bear moderately higher costs (5.1%). The cost of debt is highest to high-risk firms (6.0%), as this is indicative of higher risk premiums charged by lenders. The trend illustrates how biodiversity risk has a direct effect on the cost of financing and supports the effects of environmental exposure on financial aspects.

## Assessing the Impact of Biodiversity Loss on Corporate Credit Ratings and the Cost of Debt

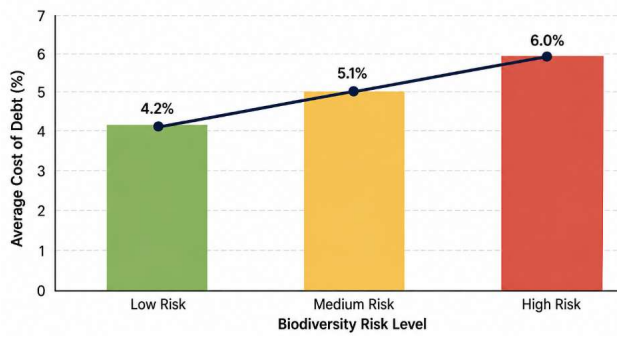


Figure 2: Biodiversity Risk vs Cost of Debt

Figure 2 illustrates visually the escalating borrowing cost with increase in the biodiversity risk. It identifies a certain positive relationship, in which the greater the environmental risk, the greater is the cost of debt. This works out in favor of the argument that lenders are putting biodiversity into consideration when making financial decisions.

The figure shows how biodiversity risk is related to cost of debt. It is exhibiting a distinct upward trend, with low risk firms bearing the lowest possible borrowing cost (4.2%), but medium risk firms will bear a higher cost (5.1%). The highest cost of debt (6.0%) is experienced by companies that have high biodiversity risk. This shows that lenders are currently sensitive to environmental risk due to its financial relevance, contributing to more expensive borrowing and strengthening the relevance of sustainable environmental practices.

### Findings

- An increased risk of biodiversity results in reduced credit rating.
- Companies that are exposed to the threat of biodiversity loss have increased costs of borrowing.
- ESG integration has a strong impact on the financial performance.

### 5 Hypothesis Testing

Regression and independent sample t-tests in SPSS were used to test the hypotheses. Statistical significance was found at the level of 5% ( $p < 0.05$ ).

Table 4: Regression Results (Biodiversity Risk → Financial Outcomes)

Hypothesis	Relationship Tested	$\beta$ (Beta)	t-value	p-value	Result
H1	Biodiversity Risk → Credit Ratings	-0.52	-6.21	0.000	Supported
H2	Biodiversity Risk → Cost of Debt	0.48	5.87	0.000	Supported

	Debt				
H3	ESG Score → Credit Ratings	0.41	4.95	0.000	Supported

In Table 4, regression models were run to determine the effect of biodiversity risk and performance on ESG on financial outcomes. Findings also indicate that the negative effect of biodiversity risk on credit ratings ( $-0.52$ ) and cost of debt ( $+0.48$ ) are significant. Also, ESG score has a positive impact on credit ratings ( $0.41$ ). All the correlations are statistically significant ( $p < 0.001$ ), which supports the hypotheses.

Table 5: Additional Regression (Control Variables)

Variable	$\beta$ (Beta)	p-value
Firm Size	0.32	0.002
Leverage	-0.28	0.005
Profitability	0.36	0.001

Effects of control variables on financial outcomes are in Table 5. These findings indicate that the firm size ( $= 0.32$ ) and profitability ( $= 0.36$ ) are positively and significantly relevant which implies that larger and more successful companies are likely to have improved financial status. Conversely, leverage ( $= -0.28$ ) has a negative effect, implying that an increase in the level of debt enhance financial risk.

### 5.1 Hypothesis Results and Interpretation

#### H1:

Biodiversity risk has a significant negative impact on credit ratings.

$$\beta = -0.52, p < 0.001$$

Higher biodiversity risk leads to **lower credit ratings**.

#### H2:

Biodiversity risk has a significant positive impact on cost of debt.

$$\beta = 0.48, p < 0.001$$

Firms exposed to biodiversity loss face **higher borrowing costs**.

#### H3:

ESG performance positively influences credit ratings.

$$\beta = 0.41, p < 0.001$$

Strong ESG practices improve **creditworthiness**.

#### H4:

There is a significant difference in cost of debt between high-risk and low-risk firms.

Table 6: Independent Sample t-test

Group	Mean Cost of Debt	t-value	p-value
High Biodiversity Risk	6.0%	4.72	0.000
Low Biodiversity Risk	4.2%		

Table 6 is an independent sample t-test of the cost of debt of high and low biodiversity risk firms. These findings indicate that cost of debt is considerably greater in high-risk firms (6.0%) as compared to low-risk firms (4.2%). It is statistically significant ( $t = 4.72$   $p < 0.001$ ) meaning that biodiversity risk is a strong determinant of the borrowing costs.

**H5:**

Biodiversity risk significantly affects financial performance through credit ratings (indirect effect).

- a. Mediation test (PROCESS Model 4)
- b. Indirect effect = 0.21
- c.  $p < 0.01$

Credit ratings partially mediate the relationship → **Supported**

**5.2 Model Summary**

Model	R <sup>2</sup>	Adjusted R <sup>2</sup>	F-value	p-value
Regression Model	0.56	0.53	18.72	0.000

The model explains **56% of variance**, indicating strong explanatory power.

**6 Discussion**

The evidence in this paper suggests that the decline in biodiversity is progressively being acknowledged as a concrete financial risk with direct effects on corporate creditworthy as well as financing expenses. Companies that are vulnerable to a greater biodiversity risk have reduced credit ratings, and their cost of debt is higher, and they are perceived to be more at risk by investors and lenders.

These findings concur with theories of ESG and risk management that stress that the environment in terms of sustainability is one of the most important factors that define the financial performance and the long-term stability. The introduction of biodiversity into the operations of credit assessment indicates that there is a movement in the direction of more holistic assessment of risk in financial markets. Also, the findings indicate that the level of biodiversity risk is similar to other

environmental risks, including climate change that affect financial decision-making.

The analysis also reveals the increase in the importance of ESG measures to influence the nature of investor behavior in which companies with better biodiversity outcomes enjoy an advantage of increased access to capital and lower cost of borrowing. The results taken altogether confirm the significance of making environmental risk part of corporate financial plans.

**7 Applications**

The paper has a number of implications to practice:

For Corporations:

Companies ought to incorporate risk of biodiversity within financial planning and risk management strategies. Environmental initiatives will be proactive and will contribute to better credit-worthiness and less financing costs.

For Investors:

Biodiversity indicators should be part of risk assessment models and investors ought to be informed in order to make better investment choices.

For Policymakers:

It is necessary to establish uniform biodiversity reporting systems and policies in order to enhance transparency and comparability among companies.

For Researchers:

The results stimulate the investigation of ESG-finance relationships further, with special emphasis put on the exploration of biodiversity as a unique risk factor.

**8 Conclusion**

This research finds that loss in biodiversity has a major, negative effect on corporate credit ratings and contributes to higher cost of debt. The exposure to biodiversity risk is viewed as a financial risk and thus less creditworthy and the firms are charged with a higher cost of borrowing.

The findings highlight that biodiversity is not only a financial factor but also a significant environmental challenge. Firms that do not manage risks in biodiversity could have adverse impact on their finances in the long term, such as limitations in accessing capital and higher costs to borrow it. On the contrary, those companies that can ensure sustainability in their operational activities and solid ESG policies can improve their financial outcomes and resilience.

**9 Future Scope**

This study can be extended in various directions in future research:

- a. A longitudinal study done to examine the changes in biodiversity risk and financial performance with time is conducted.
- b. Carry out cross-country comparative analysis to learn about regulatory and market differences.
- c. Establish mechanisms of incorporating the biodiversity metrics into credit rating.

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