

The Role of Environmental Levies in Encouraging Investment in Green Technology- Field Study of a Sample of Industrial Enterprises in Relizane Province

دور الجباية البيئية في تحفيز الاستثمار في التكنولوجيا الخضراء- دراسة ميدانية لعينة من المؤسسات الصناعية في ولاية غليزان

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Abstract:

This study examines the influence of environmental financial mechanisms, namely environmental taxes and incentives, on green technology investment decisions within the industrial sector. It also evaluates the role of these policies in promoting the adoption of innovative and sustainable technologies, based on field data collected from a sample of industrial enterprises in Relizane Province.

The findings reveal that environmental taxes raise the cost of polluting activities, thereby motivating establishments to pursue innovative solutions. However, despite the theoretical importance of environmental incentives, the study found no statistically significant impact of such incentives on green technology investment in the surveyed institutions, which may be attributed to their limited effectiveness or inadequate implementation.

Keywords: Environmental taxes, Environmental incentives, Green technology, Green investment, Industrial enterprises, Algeria.

JEL classification codes: H23 ; Q55 ; Q58 ; O13

ملخص:

تهدف هذه الدراسة إلى استكشاف أثر الآليات المالية البيئية مثل الضرائب البيئية والحوافز البيئية على قرارات الاستثمار في التكنولوجيا الخضراء في القطاع الصناعي، وتحديد دور هذه السياسات في تعزيز تبني التقنيات المبتكرة والمستدامة، من خلال إجراء تحليل ميداني أجري على عينة من المؤسسات الصناعية في ولاية غليزان.

تشير النتائج إلى أن الجباية البيئية تسهم في زيادة تكلفة الأنشطة الملوثة، مما يدفع المؤسسات إلى البحث عن حلول ابتكارية. غير أنه، وعلى الرغم من الأهمية النظرية للتحفيز البيئية، لم تظهر الدراسة وجود أثر ذي دلالة إحصائية لهذه التحفيزات على الاستثمار في التكنولوجيا الخضراء لدى المؤسسات المدروسة، وهو ما قد يعزى إلى محدودية فعاليتها.

الكلمات المفتاحية: الضرائب البيئية، التحفيزات البيئية، التكنولوجيا الخضراء، الاستثمار الأخضر، المؤسسات الصناعية، الجزائر.

تصنيف JEL: H23 ; Q55 ; Q58 ; O13

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1-Introduction

In light of the environmental challenges confronting humanity today, it has become essential to adopt strategies that protect the environment and mitigate the negative impacts of industrial activities. The Transition toward green technology is one of the key solutions to address these challenges, as these technologies contribute to reducing emissions and limiting environmental pollution, thus enhancing long-term sustainability. In this context, environmental taxation emerges as an effective tool that can play a pivotal role in driving this transition.

Environmental taxation refers to a range of fiscal policies designed to minimize negative environmental impacts by imposing taxes on polluting activities and providing incentives to companies that adopt environmentally friendly technologies. Although this type of policy may represent a financial burden for some companies, it can also act as a catalyst, encouraging increased investment in green technologies and supporting the balance between economic growth and environmental protection.

This study investigates the impact of environmental taxation on encouraging investment in green technology within industrial companies, highlighting the role of environmental taxes and incentives in influencing corporate decisions towards adopting more sustainable technological practices. Despite the growing global interest in these policies, the relationship between environmental taxes and investment in green technology remains underexplored, particularly in industrial contexts.

Research Problem:

In Algeria, the impact of environmental taxes on green technology investment remains ambiguous, highlighting the need for further empirical investigation in this context. While environmental taxes can increase environmental costs for businesses, environmental incentives could help mitigate these costs and promote investment in environmentally friendly technologies. Accordingly, the central research question is posed as follows:

To what extent does environmental taxation affect green technology investment decisions in industrial enterprises in Algeria?

Research Hypotheses:

H1a: Environmental taxes have a statistically significant effect on encouraging industrial enterprises to invest in green technology in Algeria.

H1b: Environmental incentives have a statistically significant effect on encouraging industrial enterprises to invest in green technology in Algeria.

Significance of the Study

This study is one of the few empirical investigations that explore the impact of environmental taxation on encouraging investment in green technology within the Algerian industrial sector, thereby offering both scientific and practical value.

Through a field analysis of selected industrial enterprises, the study aims to generate insights that may inform the refinement of environmental tax policies and align them more effectively with sustainability goals. Ultimately, this research aims to contribute to mitigating environmental degradation and facilitating the transition toward a more sustainable and innovation-oriented industrial sector.

2-Theoretical Framework of the Study

This section outlines the theoretical foundations underpinning the study's key variables. It examines environmental taxation, its components, objectives, and features, on the one hand, and green technology, its objectives, and branches, on the other. Additionally, it presents a selection of relevant previous studies that support the research context.

2-1. Environmental Taxation:

The economist Arthur Pigou (1877-1959), a professor of political economy at Cambridge University, was the first to introduce the concept of "environmental taxation" in his book, "The Economics of Welfare" (1920). He proposed imposing taxes as an effective means of combating pollution, with tax rates determined according to the quantity and severity of emissions. These are now commonly referred to as "Pigouvian taxes" (MAMMERI & MOURI, 2022, p. 234).

Numerous definitions have addressed the concept of environmental taxation. The OECD defines it as "a set of taxes, fees, and levies whose bases are determined by pollutants or products or services that are harmful to the environment" (Gilles, 2007, p. 108). The European Statistical Office (Eurostat) defines it as "the sum of all fiscal measures whose bases are focused on products, services, equipment, and emissions that have an impact on environmental quality" (Christophe, 2008, p. 182), and is defined as "a set of tax measures that have an impact on the environment. These measures include taxes, royalties, and incentive tax measures" (Conseil Français des Impôts, 2005, p. 02). Environmental taxation may also be viewed as a means aimed at providing financial resources allocated to environmental protection and pollution reduction, while influencing the behavior of polluters by motivating them to reduce pollution and contribute to environmental conservation.

The practical definition of environmental taxation relies on three main approaches:

- **Objective-based approach:** Taxation is considered environmental if it includes any legal measure aimed at improving the environmental conditions, provided that this measure is stated in the legal texts.
- **Behavior-based approach:** Any tax measure that creates economic incentives to improve the environment and reduce pollution is considered an environmental tax measure.

- **Base-oriented approach:** Taxation is considered environmental if its base is linked to factors that negatively impact the environment (BERRAHMOUN, 2019, p. 137).

2-1.1. Environmental taxation's components:

Environmental tax legislation includes three key components:

- **Environmental taxes:**

Include corrective fees or pollution taxes, which are imposed on each unit of pollution generated. Their purpose is to incorporate the costs of pollution into the price of the final product, thus encouraging producers to reduce environmentally harmful activities.

- **Environmental fees:**

These are charges imposed in exchange for services provided by the state to preserve and protect the environment, such as water treatment and purification services.

- **Financial incentives and exemptions:**

Include incentive mechanisms to support environmentally friendly activities. Such tools are essential for motivating industries to adopt sustainable technologies and production methods.(BOUHAZMA & MEDDAH, 2020, p. 326) .

2-1.2. Objectives of Environmental Taxation:

The objectives of environmental taxation can be summarized as follows:(MAMMERI & MOURI, 2022, pp. 235-236)

- Reducing pollution through incentive measures, including exemptions, taxes, financial fines, or punitive measures aimed at reducing environmental damage.
- Addressing market imbalances by correcting gaps resulting from polluting activities.
- Providing new financial resources to support waste removal and pollution reduction.
- Ensuring a healthy environment for all members of society, following various legislation.
- Promoting a culture of environmental awareness and environmental conservation for future generations.
- Preventing the damage caused by harmful human activities, including reducing their negative impacts on nature.
- Achieving environmental and economic efficiency through taxation that encourages reducing the cost of pollution, leading to lower prices in the long term.
- Supporting sustainable development goals by reducing the negative impact of industrial waste.
- Stimulating eco-technology to address environmental challenges and reduce harmful practices.

- Encouraging scientific research to develop innovative solutions that reduce the effects of pollution, with a focus on the areas that most threaten the environment.

2-2. Green Technology (Sustainable Technology)

The term green technology, also known as sustainable or clean technology, has become very popular. It refers to environmentally friendly technology developed and used in a way that preserves the environment and does not harm or deplete natural resources (DANIEL, 2024).

2-2.1. Definition of Green Technology:

This concept spans four main sectors: energy, transportation, water, and materials. It encompasses any product or process that helps reduce negative environmental impacts. It includes technologies that aim to mitigate and adapt to the effects of climate change, optimize the use of energy and available resources, and manage waste sustainably. (SAIFI, 2020, p. 09), as defined by the United Nations Environment Programme (UNEP) as: "A set of scientific applications and technologies designed to reduce negative environmental impacts by improving resource efficiency and reducing waste and harmful emissions. It aims to achieve sustainable development through the use of renewable energy, resource recycling, and the design of environmentally friendly products and technologies." (UNEP, 2024)

Green technology is thus a means of meeting current needs without compromising the ability of future generations to meet theirs. (Mohd, Moh, & Hooman, 2017, p. 938). Green technology includes all products, technologies, and applications that have the following characteristics (Monu & Neelam, 2015, p. 1957)):

- They reduce factors leading to environmental degradation.
- They do not produce any emissions or toxic materials, are safe to use, and provide a safe and healthy environment.
- They minimize waste and promote the efficient use of energy and natural resources.
- They encourage the use of renewable resources.

2-2.2. Branches of Technology Green:

Green technology encompasses several innovative areas, including green energy, green chemistry, green buildings, and green information technology (Hafied & LAGGOUN, 2021, p. 1086).

- Green buildings (sustainable buildings):

Buildings constructed using renewable materials and incorporating sustainable energy strategies to ensure comfort and environmental efficiency for occupants. (BEN MOUSSA & GUEMMAN, 2019, p. 111).

- Green chemistry:

A research and engineering philosophy in chemistry that encourages the design of products and processes aimed at reducing the use and generation of hazardous substances. As a comprehensive chemical philosophy, green

chemistry applies to various branches, including organic chemistry, biochemistry, analytical chemistry, and even physical chemistry(Umakant, 2014, p. 9558).

- **Green energy (renewable energy):**

According to the U.S. Energy Information Administration, green energy refers to resources whose natural flow is replenishable and inexhaustible, although potentially finite. These resources include biomass, water, geothermal energy, wind, and oceans, including the movement of waves and tides. The Intergovernmental Panel on Climate Change defined it as energy that is naturally replenished at a rate equal to or exceeding its consumption(AHCENE & ABASSI, 2018, p. 98).

Renewable energy includes solar energy, hydropower, geothermal energy, hydrogen energy, wind energy, biomass energy, and nuclear energy(KESSIRA & MESTOUI, 2015, pp. 151-152). Green energy sources are characterized by being continuously renewable and inexhaustible, meaning they are sustainable, unlike some other energy sources such as coal, oil, and gas. They also have many environmental benefits because they are clean and produce few greenhouse gases(Ahmed Elhour Ahmed & Mohamed Osman, 2016, pp. 8-9).

- **Green Nanotechnology:**

Nanotechnology encompasses various research and technological developments at the atomic and molecular levels to explain and understand phenomena and materials at the nanoscale, which are created and used in unique combinations due to their small size (HARBA & MERHAJ, 2017, p. 87).

2-3. Previous Studies:

Numerous previous studies have examined environmental taxation as an independent variable and its impact on various dependent variables. Two particularly relevant studies are summarized below:

- (ABDELBAKI & BELHADJ , 2019): This study explored environmental taxation as a mechanism for promoting green technology adoption. It sought to answer the question: How does environmental taxation contribute to encouraging green technology adoption? One of its key findings is that environmental taxation enhances the adoption of green technology by establishing regulatory frameworks that raise awareness of their importance.
- (KARMAKER, HOSAN, CHAPMAN, & SAHA, 2021): This study investigated the role of environmental taxes in fostering technological innovation".It revealed significant cross-sectional dependence among environmental taxes, green innovation, economic growth, and R&D. While all variables were initially non-stationary, they became stationary at the first difference. Using Pedroni, Kao, and Westerlund cointegration tests, the researchers

confirmed a long-run relationship among these variables, suggesting that environmental taxes positively influence green technological innovation. The study concluded that ecological taxation is a viable policy instrument to accelerate green innovation, reduce emissions, and support sustainable development.

3-Methodology

The study adopted a descriptivemethodologycombined with an analytical approach to examine how environmental taxes and incentives influence investment decisions related to green technology in the industrial sector.

3-1. Methods of Collecting and analysing Data:

Based on previous studies, a questionnaire was developed for data collection. The first section focused on the respondent's demographic information, while the second comprised 31 statements distributed across two main axes. The first axis focused on environmental taxation and was assessed through two key dimensions: environmental taxes and environmental incentives. These dimensions were designed to gauge respondents' awareness and satisfaction regarding these two mechanisms. The second section addressed the dependent variable, investment in green technology, to measure the extent to which institutions are shifting towards this sustainable approach.

A five-point Likert scale was employed to assess trends in respondents' answers, and statistical analysis was conducted using the SPSS software.

3-2. Sample of the study:

The study was conducted on a sample of industrialenterprises operating in the state of Relizane, in western Algeria, as presented in the Table below:

Table 1. Sample of the study

No.	Company Name	Type of Activity
01	SARL KITCHEN Style	Manufacturing of aluminum kitchenware
02	SARL SOUIPANEL	Manufacturing of double frames and desert housing units
03	MEGA STEL ALGERIE	Iron and concrete manufacturing
04	SARL MAGHREB INOX	Manufacturing of stainless steel pipes
05	ORSIM SPA	Mechanical industries and accessories
06	SARL TIDLAOUI INDUSTRIE	Manufacturing of electric wires and generators
07	EXPO-CUIR	Manufacturing and export of semi-processed leather and wool
08	MED-CABLS	Manufacturing and recycling of electric cables
09	TAYAL SPA	Textile manufacturing
10	AGP Ets FETTUH	Aluminum industries

11	SARL BADR Biscuiterie	Biscuit manufacturing
12	SARL SIKAYA	Brick manufacturing
13	ALGEMATCO STEEL	Building materials and adhesive cement
14	SARL SPIPTICI	Brick manufacturing
15	SARL Moulins Benabdellah	Pasta manufacturing
16	EURL NOVO Sac	Packaging materials manufacturing
17	EURL LUXE	Wooden furniture manufacturing
18	D.N.C SPA	Reinforced concrete building materials manufacturing
19	ETANCHAL SPA	Waterproofing materials manufacturing
20	E.P.E DICOPA SPA	Roasting and packaging of coffee and dry legumes
21	LA BOOM SPA	Textile manufacturing (Relizane unit)
22	SARL MALTEX	Yarn and textile manufacturing
23	SPA ENASEL	Table salt manufacturing (Relizane unit)

Source:Authors' compilation(2025).

Out of 80 questionnaires distributed, 63 valid responses were retrieved, representing 78.75%of the total distributed forms. After reviewing and examining the returned forms,13 questionnaires representing 16.25%of the total distributed forms were excluded for not meeting the study's inclusion criteria. As a result, a sample of 50valid questionnaires was retained, representing 62.5%of the total distributed forms. The summary of this distribution is presented in the following table.

Table 2.Distributed questionnaires to the study sample

Description	Distributed Forms	Retrieved forms	Cancelled forms	Valid forms
Number	80	63	13	50
Percentage	100%	78.75%	16.25%	62.5%

Source:Authors' compilation (2025)

4-Results and Discussion:

4-1. Reliability and Validity of the Study Instrument:

The reliability and validity of the questionnaire were evaluated using Cronbach's alpha coefficient:

Table 3. Stability and validity coefficient

Axis	N	Cronbach's alpha
Axis 1	20	0.666
Axis 2	11	0.657
All axis	31	0.734

Source: Authors' compilation based on SPSS (version 22) outputs.

The Cronbach's alpha values for the first and second axes were 0.666 and 0.657, respectively. These values exceed the commonly accepted threshold of 0.60, indicating acceptable internal consistency for the corresponding items. Moreover, the overall Cronbach's alpha for all axes combined was 0.734, which reflects a satisfactory level of reliability for the entire questionnaire, supporting its suitability for the purposes of this study.

4-2. Statistical Analysis of the Questionnaire Data:

Table4. Personal data of the sample

Variables	Categories	N	%
Gender	Male	35	70
	Female	15	30
Age	20 to 30 years old	5	10
	31 to 40 years old	17	34
	More than 40 years	28	56
Academic Qualification	Bachelor's degree	23	46
	Master's degree	22	44
	Magister degree	3	6
	Doctorate (Ph.D.)	2	4
Professional experience	Less than 6 years	6	12
	From 6 to 10 years	6	12
	More than 10 years	38	76

Source: Authors' compilation based on SPSS (version 22) outputs.

The sample is predominantly male, with 70% of respondents being men and 30% women, reflecting a notable gender imbalance.

In terms of age, the majority of participants are experienced professionals: 56% are over 40 years old, 34% are aged 31 to 40, while only 10% fall in the 20 to 30 age group, suggesting that the sample is largely composed of older, more experienced individuals.

Educationally, the sample is well-qualified: 46% hold a Bachelor's degree, 44% have a Master's, and a smaller portion have earned a Magister degree (6%) or a Doctorate (Ph.D.) (4%).

In terms of professional experience, the sample is highly seasoned: 76% of respondents have more than 10 years of experience, while 12% have 6 to 10 years, and another 12% have less than 6 years. This strong representation of experienced professionals adds depth and credibility to the findings.

4-3. Statistical Analysis of the Questionnaire Statements

In this section, we analyse the responses and attitudes of the study sample regarding the two main axes of the research.

4-3.1. Presentation and Analysis of Environmental Taxation Results

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This section presents the tables and analyses the participants' responses regarding the two dimensions of environmental taxation: environmental taxes and environmental incentives.

4-3.1.1. Environmental Taxes

The following table summarizes the analysis of participants' responses to the statements related to environmental taxes:

Table 5.Responses of the Sample Regarding Environmental Taxes

No.	Statement	Mean	Std. Dev.
1	You have sufficient knowledge about the laws and regulations governing environmental taxes in your sector.	4.06	0.867
2	Environmental taxes lead to increased compliance with reducing environmental harm in your institution.	4.20	0.571
3	Environmental taxes encourage you to adopt environmentally friendly raw materials.	4.20	0.495
4	Environmental taxes are fairly imposed and proportionate to the pollution levels generated by your institution.	4.10	0.544
5	Environmental taxes can reduce long-term costs through improved energy efficiency.	3.92	0.634
6	Environmental taxes lead to increased operational costs for the institution.	4.00	0.782
7	The effectiveness of environmental taxes is high compared to environmental incentives.	3.76	0.771
8	The imposition of environmental taxes has led to a change in your institution's pricing policy.	3.76	0.870
9	The financial burden of environmental taxes hinders the adoption of new sustainable technologies.	3.82	0.774
10	Environmental taxes contribute to stimulating innovation in green technologies.	3.88	0.799
Environmental Taxes		3.97	0.711

Source: Authors' compilation based on SPSS (version 22) outputs.

The general mean score for the environmental taxes dimension was 3.97, indicating a high level of agreement among respondents, with a standard deviation of 0.711, suggesting consistency in responses. This supports the findings of the theoretical framework which emphasized that environmental taxes serve as a catalyst for reducing environmental impact and promoting green transformation.

The highest-rated statement was:

“Environmental taxes encourage you to adopt environmentally friendly raw materials” (Mean = 4.20, SD = 0.495), reflecting a clear awareness of the role taxation plays in shifting organizational behavior.

Conversely, the lowest-rated statement was:

“The imposition of environmental taxes has led to a change in your institution’s pricing policy” (Mean = 3.76, SD = 0.870), suggesting mixed perceptions regarding the direct effect of taxation on pricing strategies, potentially due to market-related factors such as pricing flexibility or customer segmentation.

4-3.1.2. Environmental Incentives

The following table presents a summary of responses related to environmental incentives:

Table 6. Responses of the Sample Regarding Environmental Incentives

No.	Statement	Mean	Std. Dev.
11	You are well-informed about the laws and regulations governing environmental incentives in your sector.	4.06	0.470
12	Some obstacles hinder your institution from fully benefiting from environmental incentives.	4.00	0.452
13	Environmental incentives contribute to reducing your institution’s operating costs.	4.06	0.712
14	Environmental incentives play a major role in improving your institution’s environmental performance.	4.14	0.729
15	Environmental incentives influence the decisions of your institution’s top management.	3.88	0.799
16	Environmental incentives are a key factor in making investment decisions in eco-friendly technologies.	3.84	0.650
17	Environmental incentives help reduce the financial risks associated with green technology investment.	3.82	0.560
18	Your institution receives incentives or financial support to adopt environmentally friendly practices.	3.82	0.720
19	Current environmental incentives are sufficient to drive a shift toward sustainable practices in your institution.	3.64	0.827
20	You believe that environmental incentives enhance competition based on environmental sustainability.	4.00	0.571
Environmental incentives		3.93	0.649

Source: Authors’ compilation based on SPSS (version 22) outputs.

The average rating for environmental incentives was 3.93, indicating a high level of agreement, with a standard deviation of 0.649, confirming a strong consensus on the perceived effectiveness of incentives. The top-rated statement was:

“Environmental incentives play a major role in improving your institution’s environmental performance” (Mean = 4.14, SD = 0.729), demonstrating clear awareness of the positive impact of incentives.

The lowest-rated statement was:

“Current environmental incentives are sufficient to drive a shift toward sustainable practices in your institution” (Mean = 3.64, SD = 0.827),

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suggesting that respondents perceive existing incentives as insufficient. This may explain the lack of statistically significant relationships between incentives and green technology investments as indicated in the hypothesis testing.

4-3.2. Presentation and Analysis of Sustainable Technology Investment Results

The next table presents a summary of responses to the statements under the dependent variable: investment in sustainable technology.

Table 7. Responses of the Sample Regarding Investment in Sustainable Technology

No.	Statement	Mean	Std. Dev.
1	Investment in sustainable technology is an essential part of your institution's strategy.	4.20	0.495
2	Sustainable technologies reduce long-term operating costs.	3.96	0.638
3	Sustainable technology is a profitable long-term investment.	3.96	0.570
4	Sustainable technology is expected to improve the quality of your institution's products or services.	3.90	0.614
5	Investing in sustainable technology enhances your institution's relationship with the community and the environment.	4.16	0.548
6	Your institution has future plans to increase investment in sustainable technology.	3.94	0.620
7	Sustainable technology is a strategic solution to reduce dependence on conventional resources.	4.16	0.548
8	Investing in green technology improves your company's market reputation.	4.20	0.728
9	Investment in green technology reduces the company's negative environmental impact.	4.02	0.685
10	Lack of government support influences decisions to invest in green technology.	3.98	0.685
11	Investing in green technology enhances your institution's competitiveness.	4.06	0.550
Sustainable Technology Investment		4.05	0.607

Source: Authors' compilation based on SPSS (version 22) outputs.

The overall mean score for this dimension was 4.05, indicating a very high level of agreement, with a standard deviation of 0.607, reflecting consistent responses. These results highlight that employees recognize the effectiveness of sustainable technology investment and its role in achieving institutional goals and competitiveness.

The highest-rated statement was:

“Investment in sustainable technology is an essential part of your institution’s strategy” (Mean = 4.20, SD = 0.495), indicating strong strategic alignment.

The lowest-rated was:

“Sustainable technology is expected to improve the quality of your institution’s products or services” (Mean = 3.90, SD = 0.614), revealing cautious optimism regarding tangible quality improvements, potentially due to implementation challenges or the time required to observe results.

4-4. Hypothesis Testing:

4-4.1. Testing the First Sub-Hypothesis:

H1a: There is a statistically significant effect at the ($\alpha \leq 0.05$) significance level of environmental taxes in motivating industrial enterprises to invest in sustainable technologies within industrial institutions in Algeria.

The following table presents the results of the simple linear regression analysis:

Table 8. Results of regression analysis testing the effect of environmental taxes on motivating industrial enterprises to invest in sustainable technologies

Variable	R²	R	F Cal.	F Tab.	Sig. Level
Environmental Taxes	0.091	0.302	4.802	4.085	0.033
Constant	3.042	/	6.595	0.00	1
Environmental Taxes	0.254	0.302	2.191	0.033	48

Source: Authors’ compilation based on SPSS (version 22) outputs.

From the table above, a weak but positive correlation is observed with a Pearson correlation coefficient of 0.302. The coefficient of determination $R^2 = 0.091$ indicates that environmental taxes explain 9.1% of the variance in investment in sustainable technologies, while the remaining percentage is attributed to other factors not included in the model.

Furthermore, the significance level (Sig. = 0.033) is less than the threshold ($\alpha \leq 0.05$), indicating a statistically significant effect of environmental taxes on encouraging industrial enterprises to invest in sustainable technologies. This is supported by the calculated F value (4.802), which is greater than the tabulated F value (4.085).

This confirms the statistically significant impact of environmental taxes on motivating industrial enterprises to invest in sustainable technologies. That is:

H1a: There is a statistically significant effect at the ($\alpha \leq 0.05$) level of environmental taxes in encouraging industrial enterprises to invest in sustainable technologies within industrial institutions in Algeria.

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In other words, for each one-unit increase in environmental taxes, the motivation of industrial enterprises to invest in sustainable technologies increases by 25.4%.

The regression equation derived from the table is:

$$\gamma = 3.042 + 0.254X_1$$

$$\text{Investment in Sustainable Technologies} = 3.042 + 0.254 (\text{Environmental Taxes})$$

4-4.2. Testing the Second Sub-Hypothesis:

H1b: There is a statistically significant effect at the ($\alpha \leq 0.05$) level of environmental incentives in motivating industrial enterprises to invest in sustainable technologies within industrial institutions in Algeria.

The following presents the results of the simple linear regression analysis:

Table 9. Results of regression analysis testing the effect of environmental incentives on motivating industrial enterprises to invest in sustainable technologies

Variable	R ²	R	F Cal.	F Tab.	Sig. Level
Environmental incentives	0.056	0.237	2.845	4.085	0.098
	B	B	t Value	Sig. Level	Freedom Deg.
Constant	3.097	/	5.474	0.00	1
Environmental incentives	0.242	0.237	1.687	0.098	48

Source: Authors' compilation based on SPSS (version 22) outputs.

From Table No. 09, a weak positive correlation is observed with a Pearson coefficient of 0.237, and a coefficient of determination $R^2 = 0.056$, indicating that environmental incentives explain 5.6% of the variance in investment in sustainable technologies. The remaining percentage is explained by other factors outside the model.

However, the significance level (Sig. = 0.098) is greater than ($\alpha = 0.05$), indicating no statistically significant effect of environmental incentives on encouraging industrial investment in sustainable technologies. This is supported by the calculated F value (2.845) being less than the tabulated F value (4.085).

Thus, we conclude that there is no statistically significant effect of environmental incentives on encouraging industrial enterprises to invest in sustainable technologies. That is:

H0b: There is no statistically significant effect at the ($\alpha \leq 0.05$) level of environmental incentives on motivating industrial enterprises to invest in sustainable technologies within industrial institutions in Algeria.

4-4.3. Testing the Main Hypothesis:

After addressing the sub-hypotheses and their results, we now turn to the main research hypothesis:

H1: There is a statistically significant effect at the ($\alpha \leq 0.05$) level of imposed environmental taxation in motivating industrial enterprises to invest in sustainable technologies within industrial institutions in Algeria.

The following presents the results of the simple linear regression analysis:

Table 10. Results of regression analysis testing the effect of environmental taxation on motivating industrial enterprises to invest in sustainable technologies

Variable	R ²	R	F Cal.	F Tab.	Sig. Level
Environmental Taxes	0.112	0.335	6.077	4.085	0.017
	B	β	t Value	Sig. Level	Freedom Deg.
Constant	2.543	/	4.155	0.00	1
Environmental Taxes	0.381	0.335	2.465	0.017	48

Source: Authors' compilation based on SPSS (version 22) outputs.

Table No. 10 indicates a weak but positive correlation, with a Pearson coefficient of 0.335 and a coefficient of determination $R^2 = 0.112$, meaning that environmental taxation explains 11.2% of the variance in investment in sustainable technologies. The remainder is due to other unexplained factors.

The significance level (Sig. = 0.017) is lower than ($\alpha = 0.05$), confirming a statistically significant effect of environmental taxation on motivating industrial enterprises to invest in sustainable technologies. This is also supported by the calculated F value (6.077) being higher than the tabulated value (4.085).

Therefore:

H1: There is a statistically significant effect at the ($\alpha \leq 0.05$) level of imposed environmental taxation in motivating industrial enterprises to invest in sustainable technologies within industrial institutions in Algeria.

That is, a one-unit increase in environmental taxation is associated with an 11.2% increase in the motivation of industrial enterprises to invest in sustainable technologies.

The corresponding regression equation is:

$$Y = 2.543 + 0.381X$$

$$\text{Investment in Sustainable Technologies} = 2.543 + 0.381 (\text{Environmental Taxation})$$

5. Conclusion

This study, consistent with previous studies, underscores the importance of environmental taxation in steering economic institutions, particularly industrial institutions, to invest in green technology. Its added value lies in its contextual focus on Algeria, through a field-based analysis of a sample of industrial institutions operating in the province of Relizane.

We divided the environmental taxation variable, as an independent variable, into two sub-dimensions: environmental taxes and environmental incentives, measuring the impact of each separately, along with their overall impact on the dependent variable, investment in green technology.

We concluded that environmental taxes represent an incentive to encourage industrial institutions to reconsider their practices and technologies. However, their impact, while positive, remains relatively weak.

Conversely, despite their theoretical relevance, environmental incentives did not demonstrate a statistically significant impact within the studied sample, this suggests a need to re-evaluate their design and implementation mechanisms. Previous literature has also indicated the need for integrated environmental mechanisms (environmental taxes, incentives, and tax controls) to effectively influence firms' environmental behavior toward more sustainable practices. This may explain the weak impact of taxes given the weak effectiveness of environmental incentives, which leads to a reduction in the overall impact of environmental taxation on green investment.

The study's most prominent findings can be summarized in the following points:

- Environmental taxes have a statistically significant effect on encouraging industrial establishments to invest in green technology.
- Environmental incentives did not show a statistically significant effect in the study sample, reflecting their weak effectiveness or flawed implementation.
- Respondents demonstrated strong awareness of green technology and viewed it as a strategic organizational priority.
- There was a high consensus among respondents on the importance of environmental taxation and green investment, as reflected in high mean scores and low standard deviations.
- Environmental taxation (including its dimensions: taxes and incentives) explains only a limited portion of the variation in investment decisions, indicating the presence of other influential factors.

In light of these results, it is necessary to enhance the effectiveness of environmental incentives by offering adequate financial, technical, and logistical support to companies transitioning toward sustainable technologies. Furthermore, environmental tax laws should be reviewed to ensure equitable application that reflects each company's actual pollution levels.

Complementing legislative reforms, awareness and training programs within industrial companies should be strengthened regarding the long-term benefits of investing in green technology, while encouraging public-private partnerships to create an ecosystem investment that supports environmental innovation.

It is worth noting that this study's findings remain limited due to the small sample size and its restriction to companies operating in the province of Relizane. Therefore, it would be worthwhile in future studies to expand the sample to include industrial companies across various regions for greater generalization and comparison. The study could also be directed towards a deeper dimension that includes analyzing the relationship between environmental taxation and the level of technological innovation within industrial institutions, or expanding to analyze the potential mediating or moderating role of environmental governance in the link between environmental taxation and green investment.

6. References

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