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Innovative practices and environmental management systems as drivers of economic gains in EU industries

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Abstract

Contemporary technical and industrial advancements, in addition to its economic ramifications, have profoundly influenced the environment. Consequently, nations have begun to implement environmental fees designed to incentivize industries to diminish emissions. This phenomenon has garnered the interest of researchers, scholars, politicians, and environmental activists globally. Alongside environmental levies, international norms and diverse procedures exist to regulate air quality specifically. To minimize taxes and enhance environmental performance, companies implement environmental management systems, employing many strategies to safeguard the environment. This paper analyzes European Union legislation and includes measurements from an innovation point of view designed to purify contaminated air. This novel technique significantly reduces taxes for enterprises and industries, offering an opportunity to enhance environmental quality and aid in ecosystem preservation. This study significantly contributes to global authorities, businesses, and industries.

Keywords: innovation, environmental management, EU.

1. Introduction

In recent decades, industrial expansion and technological advancement have expedited economic progress while simultaneously exacerbating environmental strain. Greenhouse gas emissions, air pollution, unsustainable resource exploitation, and hazardous waste creation have emerged as significant concerns impacting ecosystems, public health, and quality of life (UNEP, 2022). To mitigate environmental impacts, numerous countries have enacted economic policies including environmental levies designed to diminish industrial emissions and encourage sustainable behaviors.

In this context, technical breakthroughs and Environmental Management Systems (EMS), such as ISO 14001, have emerged as critical elements in enhancing air quality and fostering sustainable growth. ISO 14001 offers a framework for the systematic

identification, monitoring, and mitigation of environmental consequences (ISO, 2015). These systems enable firms to establish explicit policies, processes, and objectives for addressing environmental concerns, frequently incorporating them into comprehensive management systems that encompass quality, safety, and environmental aspects. The growing recognition of the enduring impacts of pollution and climate change has stimulated measures from governmental bodies and increased involvement from the corporate sector in developing solutions that mitigate pollution and enhance environmental performance. Scientific inquiry and the use of clean technology are crucial for transitioning to a low-carbon economy, whereas EMS systems assist enterprises in attaining regulatory compliance, enhancing operational efficiency, and minimizing costs through improved resource management.

Porter and van der Linde (1995) assert that innovation spurred by environmental rules enhances the environment and can yield economic advantages for enterprises. Consequently, examining the interplay between technological innovation and environmental management is crucial for comprehending how firms may effectively enhance air quality and safeguard the environment overall.

2. Methodology and study limitations

Innovations signify products or services that yield tangible economic and social advantages for enterprises and society at large. Nonetheless, not all innovation initiatives provide the anticipated outcomes; at times, substantial expenditures fail to deliver quantifiable advantages or fall short of the predetermined objectives.

In this perspective, Joseph Schumpeter (1934), a prominent theorist of innovation, describes innovation as a "new combination of resources" that induces alterations in the production process and the economic structure. He delineates five essential categories of innovation: novel goods, innovative production techniques, new markets, alternative sources of raw resources, and new organizational structures. Peter Drucker (1985) defines innovation as "the specific tool of entrepreneurship," characterizing it as a means to generate new sources of profit. For him, innovation is an essential element for survival and success in the competitive marketplace.

Environmental Management Systems (EMS) is a novel strategy within public environmental policy for tackling environmental challenges. The evolving nature of environmental challenges necessitates a modification of strategies: transitioning from an initial emphasis on "remediating" heavy industrial pollution (e.g., from power plants, refineries, or the textile sector) to a more holistic approach that addresses diffuse pollution originating from sources such as households, transportation, and agriculture. These novel pollutant types are more diffuse, challenging to detect, and possess long-term and scientifically ambiguous consequences (Steger, 2000).

This paper analyzes the European Union's legislation on environmental levies and the effects of a novel air purification mechanism as a specific case. The findings demonstrate that this novel technique substantially aids in diminishing air pollution and enhancing its quality. This positively affects the alleviation of the budgetary burden from environmental fees and enhances the overall quality of life for society.

The study's shortcomings mostly stem from insufficient precise data regarding the practical application of innovative procedures in certain EU member states, along with difficulties in assessing their long-term effects on air quality and socio-economic expenses.

3. Environmental taxes in the EU

European Union governments garnered 317.2 billion euros in revenue from environmental levies. This value constituted 2.0% of the European Union's gross domestic product (GDP) and 4.8% of total government revenues from taxes and social contributions (TSC) inside the EU. In 2022, a substantial 76.5% of the EU's environmental tax income originated from energy taxes. Transport taxes constituted 19.2%, whereas the proportion of taxes on pollution and resources was minimal at 4.3% inside the EU. The tax burden differed based on the type and sector of environmental taxes. In 2022, corporations bore the predominant portion of energy taxes at 57.2%, while households faced a significant burden of 38.7%. Nonetheless, households constituted the primary contributors to transport taxes (67.6% in 2022) and bore a greater share of pollution and resource taxes.

Total environmental tax revenue by type of tax and tax payer, EU 2022

2022	Million Euro	% of total environmental taxes	% of GDP	% of total government revenue from taxes and social contributions (TSC)	% of (specific type of) environmental tax revenue (by tax payer)		
					Corporations	Households	Non-residents
Total environmental taxes	317 190	100.0	1.99	4.8	51.8	44.9	3.1
Energy taxes	242 765	76.5	1.53	3.7	57.2	38.7	3.8
Transport taxes	60 821	19.2	0.38	0.9	31.5	67.6	0.8
Taxes on Pollution/Resources	13 605	4.3	0.09	0.2	45.5	53.4	1.0

Note: The shares by 'payer' do not necessarily add up to 100% owing to a small share of 'Not allocated taxes'.

Source: Eurostat (online data codes: env_ac_taxind2 , gov_10a_taxag ,nama_10_gdp)

eurostat

Economic mechanisms for pollution control and natural resource management are a crucial component of environmental policy in EU Member States. The various instruments encompass, among others, environmental taxes, fees, tradable permits, deposit refund systems, and subsidies.

Data supplied by the European Union indicates that environmental levies impose a considerable cost on enterprises and industries, particularly in sectors characterized by high emission intensity.

The creation and implementation of novel strategies to enhance air quality offers a tangible and sustainable solution for mitigating environmental effect and augmenting the economic advantages for commercial companies. One such mechanism is the novel

air purification system, registered with the World Intellectual Property Organization (WIPO) with the number MKI2019000030, which has exhibited significant efficacy in mitigating air pollution in urban and industrial environments.

The outcomes of the mechanism are displayed in Chart 2 and 3. Chart 2 presents the air pollution levels recorded over a 24-hour period without the mechanism's activation, whereas Chart 3 depicts data for the identical timeframe with the system operational. The disparity between the two measures signifies a substantial decrease in pollution, hence illustrating the beneficial effect of the mechanism on enhancing air quality.

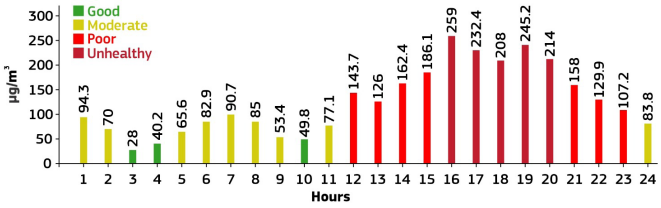

Chart 2. Results of pollution in the external environment
Source: WIPO - MKI2019000030 / 2019

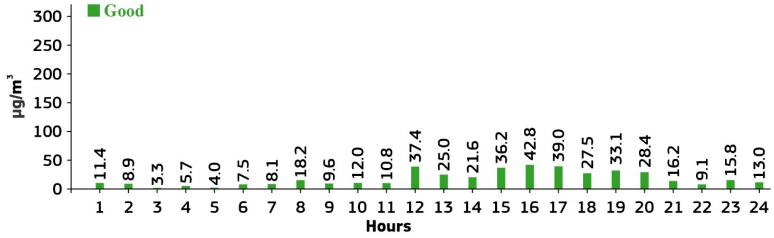

Chart 3. Results of the external environment during the operation of the innovative mechanism Source: WIPO - MKI2019000030 / 2019

Charts 4 and 5 present the pollution readings within a 5-kilometer radius, respectively, without and after the activation of the mechanism. The results demonstrate a substantial decrease in polluting parameters.

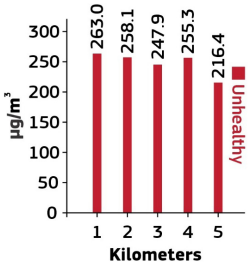

Chart 4. Results of the external environment up to 5 km
Source: WIPO - MKI2019000030 / 2019

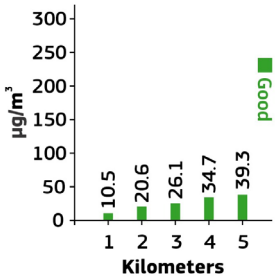

Chart 5. External environment results up to 5 km during the operation of the innovative mechanism
Source: WIPO - MKI2019000030 / 2019

This empirical data indicates that the innovative air purification mechanism is a viable and scientifically validated solution that enhances environmental quality and may qualify for subsidies from European institutions, thereby connecting environmental advantages with economic benefits.

Table 2
Measurements for the parameters of the innovative mechanism for cleaning polluted air

Measured parameters		**t**	**O2**	**CO**	**SO2**	**NOx**	**CO2**	**Solid particles (dust)**	**Gas flow volume**	**Gas flow rate**	**Throttle speed**
Measured values		C	%	ppm	ppm	ppm	%	Mg/m3	Nm3/h	Kg/h	m/s
	1*	21	21.5	0	0	0	0	1	24 392	31374.4	22.8
	2*	24.8	22.3	0	0	3	0	0	26 289.8	33836	24.9
Mg/Nm3	1*					0		0.08			
	2*					6.2		6.2			
ELV Mg/Nm3 % O2	1*										
	2*										
Amount of emissions Kg/h	1*							6.39			
	2*							0.16			

1 measurements without the installation of filters in the mechanism.*
2 measurements with filters in the mechanism.*
Source: Central Laboratory for Environmental Life, reference 14-041/2025.

In May 2025, we conducted specialized measurements in partnership with the Central Laboratory for Environmental Life at the Ministry of Environment and Spatial Planning of the Republic of North Macedonia to assess the efficacy of the unique air purification mechanism. The measurements are recorded in the official

report bearing reference number 14-041/2025. The efficiency evaluations of the new mechanism indicated its effectiveness in purifying dirty air, with the filters serving as a crucial component, as seen by the data presented in Charts 2 and 3. This technique can be utilized by authorities to promote a cleaner environment or by enterprises and industries to mitigate environmental fees by maintaining a cleaner operational environment.

4. Conclusion

The European Union and many nations worldwide are persistently involved in mitigating infrastructural and environmental degradation. Diverse initiatives are underway in nations including the Netherlands, China, and Pakistan, resulting in favorable outcomes for air quality enhancement. Nonetheless, inventive advancements continue to be pursued to assist the industry and authorities, creating chances for enhancing environmental and social situations. Environmental taxes should be regarded not as punitive measures, but as instruments to incentivize the industry to embrace sustainable methods, simultaneously offering prospects for enhanced economic advantages. This method can establish equilibrium between environmental conservation and economic development. This paper aims to demonstrate that innovations and environmental management systems are critical factors that motivate industries and businesses to formulate policies and strategies designed to create opportunities for enhancing living conditions and the environment. Technological advancements and climatic alterations will remain significant influences on the environment. The development of innovative and efficient products and services can foster a cleaner, more equitable environment, while also facilitating prospects for sustainable technical and economic advancements in the future.

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