JETIR.ORG

# ISSN: 2349-5162 | ESTD Year: 2014 | Monthly Issue

# JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

# **Environmental Taxation: Its role and Impact on** ecological Externalities.

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### **Abstract**

The study analyses the influence of environmental taxes, renewable energy, economic growth, green innovation and financial development on environmental sustainability in different OECD countries. The results confirm a negative relationship between environmental taxes and sustainability. Furthermore, it is evident that economic growth significantly improves environmental sustainability, supporting the "double dividend" hypothesis, which argues that revenues generated by environmental taxes can be used to finance tax reductions in other areas while contributing to the regulation of environmental degradation. Our findings also show that renewable energy and green innovations play a key role in improving environmental sustainability and have some positive and negative impacts of such variables.

Key words: environment, Taxation, sustainability, degradation

# Introduction

The earth confronts an unparalleled and significant risk of extreme climate alterations, including elevated temperatures, rising sea levels, cyclones, and hurricanes, principally induced by environmental degradation resulting from global warming and ozone layer depletion (World Economic Forum, 2025). Environmental degradation involves the exhaustion of critical natural resources such as air, water, soil, flora, fauna, and other biotic and abiotic elements crucial to Earth's ecosystems (World Economic Forum, 2025). By 2025, global average temperatures have increased approximately 1.6°C above pre-industrial levels, signifying a decade of unprecedented heat exacerbated by anthropogenic activities, including fossil fuel combustion, which further contribute to greenhouse gas accumulation and climate change (Earth.Org, 2025). This warming precipitates catastrophic events globally, such as extreme weather, biodiversity decline, and expedited melting of glaciers and ice sheets, resulting in sea-level rise that endangers coastal communities (United Nations, 2025). Notwithstanding global initiatives, greenhouse gas emissions persist at concerning levels, and the inability to effectively tackle climate action remains a significant long-term risk acknowledged by international organizations such as the World Economic Forum (World Economic Forum, 2025). Furthermore, ozone depletion exacerbates these issues by permitting detrimental ultraviolet light to impact ecosystems and climatic processes (European Environment Agency, 2024). The cumulative effect of these elements significantly endangers ecological equilibrium and human health, heightening the risks of food shortages, displacement, and worldwide socioeconomic vulnerabilities (Shavers, 2025). Prompt and significant decreases in emissions, along with synchronized environmental conservation efforts, are essential to alleviate these escalating dangers and safeguard Earth's life-support systems (United Nations, 2021; Committee on Climate Change, 2025; Charity Digital, 2025).

Environmental degradation refers to the decline of the Earth's environment due to the exhaustion of natural resources and the disruption of ecosystems, resulting in diminished biodiversity and general environmental health. It mostly arises from human actions, particularly the unsustainable utilization of natural resources propelled by increasing population needs (Maslin, 2025; Abdul-Nabi, 2025). Humans contribute to environmental degradation by inappropriate land utilization, habitat destruction, industrialization, excessive consumerism, and pollution. Approximately 55 billion tons of fossil fuels,

minerals, metals, and biomass are taken worldwide each year, placing considerable strain on Earth's systems (Sullivan, 2025). The loss of forests is severe, with approximately 375 square kilometers being lost daily, resulting in a total global reduction of about 34% since 2001, much of which is irreversible and greatly undermines ecosystem services (World Resources Institute, 2025; Global Forest Watch, 2025). Moreover, plastic waste presents a significant environmental concern, with maritime rubbish patches jointly estimated to be equivalent to the size of India, Europe, and Mexico combined. Current estimates suggest that between 75 and 199 million tons of plastic garbage are present in the oceans, with roughly 33 billion pounds entering each year, primarily from terrestrial sources, inflicting significant damage on marine life and ecosystems (Earth.Org, 2025; GreenMatch, 2025; Reef-World, 2025). The unsustainable pattern of resource extraction and waste accumulation highlights the critical necessity for cohesive environmental policy and sustainable resource management to cease and reverse current degradation trends.

Over the past 170 years, humans have emitted approximately 2.4 trillion tons of CO2 into the atmosphere, with almost 50% of this increase occurring in the last 30 to 35 years (The World Counts, 2025). Deforestation contributes approximately 11% of global greenhouse gas emissions, mostly due to the combustion and breakdown of forest biomass and soil carbon (Goodman & Herold, 2014; Wikipedia authors, 2025). The primary characteristic of contemporary environmental issues is their predominantly human-induced nature, in contrast to previous environmental alterations that were primarily driven by natural forces. The primary factors contributing to anthropogenic climate change are the industrial revolution, accelerated population increase, and heightened desire for luxury goods. The burning of fossil fuels in industrial, transportation, and residential sectors emits substantial amounts of CO2 and other greenhouse gases, representing the principal cause of contemporary environmental degradation (EPA, 2025; World Resources Institute, 2025).

# **Corporate Social Cost Externalities**

An externality denotes a cost or benefit created by a producer that is neither incurred or received financially by the producer itself. Corporations concentrate on manufacturing goods and services by imposing charges solely for the direct costs required to yield profit; however, their operations impact society both positively (through innovation, product development, and research) and negatively (including pollution, unemployment, environmental degradation, deforestation, and health decline). The societal or overall production costs exceed private production costs. When social advantages surpass private benefits, a positive externality occurs; conversely, when social costs exceed private costs, a negative externality arises (International Monetary Fund [IMF], 2017; Corporate Finance Institute, 2023). Corporations frequently prioritize elements that enhance their profitability, disregarding social and ethical ramifications, which generates public concerns (Okafor et al., 2008). The social cost of carbon is defined in marginal terms as the extra social cost incurred by society beyond current levels, representing the extensive, frequently overlooked effects resulting from greenhouse gas emissions (Bertram et al., 2024). Efficient evaluation and alleviation of these externalities necessitate cohesive corporate social responsibility and clear accounting for environmental and social effects (Vo, 2024; Ehiorobo et al., 2025).

# Marginal Social Cost (MSC) = Marginal Private Cost (MPC) + Marginal External

The study focuses solely on the notion of negative social cost, which occurs when the marginal social cost (SMC) surpasses the marginal private cost (MPC), indicating that society incurs extra costs associated with well-being that producers fail to consider. In such instances, producers should indemnify society for the detriments arising from unsustainable production methods. A negative corporate externality denotes the detriment inflicted by a firm on third parties as a consequence of its commercial operations, exemplified by power plants releasing mercury without compensating for the ensuing health and environmental repercussions faced by adjacent communities (OECD, 2008; Economics Help, 2025). However, research and development focused on upgrading product quality and promoting worker and community health can yield positive externalities when the marginal social advantages exceed the marginal private benefits. A corrective tax is a public policy instrument designed to mitigate externalities, as suggested by neoclassical economist Arthur Pigou. He advocated for taxing activities commensurate with the marginal external damage per unit to internalize the externality; this tax effectively aligns the firm's marginal private cost (MPC) with the social marginal cost (SMC), thereby rectifying market failure. Pigouvian subsidies can be utilized to promote positive externalities by decreasing the marginal private cost (MPC) to correspond with the social marginal cost (SMC). Presently, India does not impose taxes on social cost externalities, leading enterprises to incur solely private expenses and thus intensifying environmental degradation. This study largely highlights the adverse ecological consequences of business operations rather than their positive outcomes (Pigou, 1920; OECD, 2008; IMF, 2017; Sharma & Singh, 2024).

# **Negative Eco Externalities**

Negative externalities primarily affect public resources and present in multiple forms, including air, water, noise, and land pollution, environmental consequences of livestock production, unemployment, secondhand smoke, traffic congestion, occupational health risks, and diseases linked to environmental factors. These adverse social cost externalities signify the burdens that society bears as a result of corporate business activities (Corporate Finance Institute, 2023; OECD, 2021). This study specifically emphasizes adverse ecological externalities, denoting social costs predominantly inflicted on the environment and global ecosystems. Addressing these environmental externalities is essential, since they represent a substantial fraction of overall social costs by encompassing key aspects of ecological damage (Sharma & Singh, 2025). Corporations, motivated by consumer demand, frequently emit harmful gasses, toxic effluents, and chemically contaminated industrial waste during production, negatively impacting humans, aquatic organisms, crops, and terrestrial flora. Corporate-induced adverse environmental externalities are primary contributors to worldwide environmental deterioration (World Economic Forum, 2025; UNEP, 2024). Negative externalities can be classified into two categories: production externalities and consumption externalities. Negative production externalities occur when the manufacturing process inflicts damage on unrelated third parties, and negative consumption externalities exist when the societal cost of purchasing a thing or service surpasses the private advantages obtained (IMF, 2017; Economics Help, 2025).

# **Negative Production Externalities:**

# 1.Air Degradation

Air pollution, chiefly resulting from industrial emissions, discharges detrimental substances such as carbon monoxide and carbon dioxide into the environment. These contaminants adversely affect agriculture, infrastructure, and human wellbeing. Increased greenhouse gas levels exacerbate global climate change, leading to severe heat waves, rising sea levels, powerful hurricanes, deteriorated air quality, and droughts (World Economic Forum, 2025; United Nations Environment Programme, 2024). The emission of harmful gases disproportionately impacts at-risk groups, including children, the elderly, and those with respiratory and cardiovascular conditions such as asthma and heart disease (World Health Organization [WHO], 2024; U.S. Environmental Protection Agency [EPA], 2025). Exposure to air pollution in these populations is associated with heightened risks of respiratory infections, stroke, lung cancer, and the aggravation of chronic diseases, thereby elevating morbidity and mortality rates (Minnesota Pollution Control Agency, 2025; American Lung Association, 2024). The social impact of air pollution underscores the pressing necessity for coordinated policies and initiatives to mitigate emissions and safeguard public health, especially for vulnerable groups (Demoury et al., 2024).

# 2. Water Degradation

Industrial effluents released into public rivers severely contaminate these ecosystems, inflicting considerable damage on humans, aquatic fauna, and flora reliant on these water supplies. Industrial discharges frequently contain hazardous substances, including heavy metals and persistent organic pollutants, which are detrimental to aquatic life and disrupt aquatic ecosystems, leading to biodiversity loss and jeopardizing the livelihoods of fishermen dependent on these waters (Oladimeji et al., 2024; Genesis Water Technologies Inc., 2025). Contaminated water negatively impacts plants reliant on pure water for growth, further destabilizing ecological balance. Consuming water contaminated with industrial waste presents significant health hazards to humans, including waterborne illnesses, developmental abnormalities, and, in extreme instances, death (Alazaiza, 2024; Minnesota Pollution Control Agency, 2025). The elevated levels of industrial contaminants such as nitrogen, phosphorus, and hazardous heavy metals result in eutrophication, bioaccumulation, and prolonged environmental deterioration, highlighting the critical necessity for sustainable wastewater management and stringent regulation of industrial effluents (Peng et al., 2025; Oladimeji et al., 2024).

# 3.Farm Animal Production

Raising farm animals can have harmful effects on third parties, especially those living near farms. One significant concern is the misuse of antibiotics in animal husbandry, which fosters the development of antibiotic-resistant bacteria that can spread beyond the farm environment, causing diseases in other animals and humans (Pruden et al., 2025; Tian et al., 2025). Moreover, the accumulation of animal waste can contaminate rivers and streams, introducing pathogens, nutrients, and chemical residues that render water unsafe for human consumption and ecological health (Oladimeji et al., 2024; Mdolo et al., 2025). Such environmental contamination poses risks to biodiversity, aquatic life, and public health, emphasizing the critical need for sustainable livestock management and antibiotic stewardship to mitigate environmental and health impacts (World Health Organization, 2024; United Nations Environment Programme, 2025).

# The Urgent Need for Mitigation

With the survival of human and natural systems at stake, mitigating negative eco-externalities is now an undeniable imperative. Unsustainable environmental impacts threaten not only present livelihoods and public health but also the prospects for future generations. Ecosystem services vital for life—such as clean air, potable water, and arable soil—are rapidly diminishing (IPCC, 2021; Kumar et al., 2021).

Global milestones attest to the urgency and increasing sophistication in global environmental governance

The UNFCCC (United Nations Framework Convention on Climate Change) and the Paris Agreement have spearheaded international efforts to limit global warming and encourage national commitments for emissions reduction. India, as a signatory, aims to reduce its emissions intensity by 33-35% by 2030 and expand its renewable energy capacity (United Nations Framework Convention on Climate Change [UNFCCC], 2015).

The Montreal Protocol represents a historic and effective agreement to phase out ozone-depleting substances (United Nations Environment Programme, 2020).

The United Nations Sustainable Development Goals (SDGs)—notably goals on clean energy, sustainable cities, responsible consumption, climate action, and biodiversity—provide a universal blueprint for sustainable growth (United Nations, 2015).

In India, the effects of climate change and pollution are acute. The nation is home to 39 of the world's 50 most polluted cities (by air quality), with rapidly deteriorating water and soil conditions and a continuing loss of biodiversity (World Air Quality Report, 2023; Bashir et al., 2022).

# Review of literature

A robust review of literature sets the academic foundation for doctoral research, helping to identify key themes, methodological trends, and critical research gaps. In the context of environmental taxation, particularly regarding corporate social cost externalities and policies for negative ecological externalities, the field has evolved rapidly in response to mounting environmental and policy challenges worldwide. This review synthesizes bibliometric analyses, landmark studies, and thematic findings across several subdomains: the conceptualization and measurement of social cost externalities, the impacts and design of environmental/carbon taxes, their implementation in various jurisdictions, and the persistent research gaps, with a special focus on the Indian context.

# 1. Growth and Scope of Environmental Tax Research

Research on environmental and carbon taxation has expanded significantly in the past two decades, as evidenced by a surge in publications and the emergence of interdisciplinary approaches. Bibliometric analyses (Davidescu et al., 2022; Kumar et al., 2021) leverage databases such as Scopus to chart the trajectory of scholarly output—showing exponential growth, especially post-2010, with 52% of relevant articles published in the last five years. The literature is dominated by economics, finance, and business management perspectives but remains inherently interdisciplinary, often incorporating environmental science and policy analysis.

Notably, countries such as China, the United States, the United Kingdom, and Canada represent the bulk of research output and citations. In contrast, India's contribution—both in terms of volume and impact—is nascent, highlighting a significant geographic and policy research gap.

# 2. Conceptual Foundations: Social Cost Externalities

The theoretical basis for environmental taxation lies in the economics of externalities (Pigou, Coase). Negative ecoexternalities arise when the private cost of production (borne by corporations) diverges from the social costs (borne by society at large), manifesting as pollution, resource depletion, and health effects. Pigovian theory advocates for corrective taxes equating to the marginal external cost, incentivizing internalization of social costs by producers.

Recent critiques (Coase, 2007) suggest that while government intervention through taxation or regulation is justified, rigid or poorly designed policies may impair growth. Conversely, newer studies (Laudal, 2012; Johnston, 2012, 2021) argue for integrating robust Corporate Social Responsibility (CSR) practices, suggesting that voluntary or hybrid approaches may sometimes outperform exclusively fiscal or regulatory regimes when tackling externalities. Measurement and

monetization of externalities—via cost-benefit analysis or marginal cost approaches—remain critical challenges, often impeded by scientific, methodological, and uncertainty-related constraints.

# 3. Empirical Evidence on Environmental/Carbon Taxation

A substantial strand of literature empirically assesses the impact and optimal design of environmental and carbon taxes. Meta-analyses and country-level studies report that environmental taxes, when properly structured, can substantially reduce greenhouse gas emissions and other pollutants (Meng et al., 2013; Guo et al., 2014; Bashir et al., 2022)1. Rates and structures are context-specific: for example, a carbon tax rate of €10 per ton is suggested for a 10% CO₂ reduction in Europe (Freire-Gonzalez & Ho, 2019), while in British Columbia, Canada, a revenue-neutral carbon tax reduced emissions with minimal economic distortion (Elgie & McClay, 2013; Xiang & Lawley, 2019).

# **Research Design**

The study employs an empirical analysis to satisfy its research objective. The objective uses quantitative techniques by analyzing panel data across OECD countries.

## **Data Sources**

Secondary data: All data is sourced from reputable international and national organizations, including the World Bank, OECD, Climate Watch Data, United Nations, and Sustainable Energy for All databases

Data is extracted for variables such as total GHG emissions, environmental taxation (as % of GDP), GDP per capita, renewable energy consumption, urban population %, energy intensity, and degree of industrialization<sup>[1]</sup>.

# Sampling

**Empirical analysis:** A judgmental sampling technique is adopted, focusing on 34 OECD countries with consistent datasets spanning 2000– latest data available.

# **Objectives of the Study**

Currently, India does not have a specialized environmental tax explicitly designed to address its rising emission levels. The primary intent is to furnish policymakers with robust guidance for instituting effective taxation policies that can meaningfully reduce environmental harm. Toward this end, the study is structured to systematically explore and accomplish the following research objectives:

- 1.To studythe role of eco-externalities, and its positive impacts.
- 2.To quantify the magnitude of negative eco-externalities, thereby providing a solid empirical foundation for designing environmental taxes.

# **Role of Environmental Taxation:**

For green taxes to be successful, public support is crucial. Future developments will likely emphasize transparency and public engagement, ensuring that taxpayers understand how their money is being used to foster sustainability. This could involve clear reporting on the environmental benefits achieved through tax revenues.

- 1. Environmental taxation has become an important tool in the policy framework of OECD countries, serving several critical roles in promoting sustainable development and addressing environmental challenges.
- 2. One primary function of environmental taxes is to incentivize businesses and consumers to adopt greener practices. By placing a price on pollution and resource use, these taxes encourage firms to innovate and invest in cleaner technologies. For instance, carbon taxes can lead to significant reductions in greenhouse gas emissions by making fossil fuels more expensive relative to renewable energy sources.
- 3. Moreover, environmental taxation can generate substantial revenue for governments, which can be reinvested in environmental initiatives or used to offset other taxes. This creates a dual benefit: it helps fund public goods, such as renewable energy projects and conservation efforts, while also making environmentally harmful practices less appealing.
- 4. Another advantage is that environmental taxes can help internalize the external costs associated with environmental degradation. When companies or individuals pay taxes that reflect the true cost of their

environmental impact, it aligns economic decisions with ecological sustainability. This process is fundamental for transitioning towards a circular economy, where resources are reused and recycled.

- 5. Additionally, these taxes can play a role in climate change mitigation strategies by targeting specific pollutants. By adjusting tax rates based on the severity of the environmental impact, governments can prioritize reductions in the most harmful activities.
- 6. In terms of social equity, it's essential for policymakers to consider the regressive nature of some environmental taxes. To address this, many OECD countries implement rebate systems or use tax revenues to support low-income households, ensuring the burden of taxation is shared fairly.
- 7. In summary, environmental taxation is a multifaceted strategy that helps OECD countries move towards sustainability. By incentivizing responsible behavior, generating public revenue, internalizing environmental costs, and promoting social equity, these taxes are integral to effective environmental governance.

# **Challenges and Criticisms of Environmental Taxes**

Environmental taxes, often hailed as a powerful tool for promoting sustainability, come with their own set of challenges and criticisms. While the intention behind such taxes is to encourage environmentally friendly practices by making harmful activities more expensive, the reality of implementing and managing these taxes can be complex. Critics argue that environmental taxes can disproportionately affect lower-income households, creating a regressive impact where the less affluent end up shouldering a heavier financial burden relative to their income. Moreover, businesses may pass on the costs to consumers, potentially leading to higher prices for goods and services.

Here are some in-depth points that further elaborate on the challenges and criticisms of environmental taxes:

- 1. **Economic Impact**: Critics argue that environmental taxes can slow down economic growth by increasing production costs. For example, a carbon tax on industries might lead to increased costs of manufacturing, which can reduce competitiveness in the global market.
- 2. Social Equity: There's a concern that environmental taxes can be regressive, impacting lower-income individuals more severely. For instance, a fuel tax raises the cost of transportation, which can be a significant portion of a low-income household's budget.
- 3. Administrative Complexity: Implementing and enforcing environmental taxes can be administratively burdensome. Tracking emissions or waste, for example, requires robust monitoring systems, which can be costly and complicated to manage.
- 4. **Political Feasibility**: Environmental taxes can be politically challenging to implement. They often face opposition from industry lobbyists and can be unpopular with voters, making them a difficult sell for policymakers.
- 5. **Border Tax Adjustments**: To prevent businesses from relocating to countries with laxer tax regimes, border tax adjustments might be necessary, but these can lead to trade disputes and require complex international negotiations.
- 6. **Unintended Consequences**: Sometimes, environmental taxes can lead to unintended negative effects. For example, a tax on plastic bags might reduce their use, but if not properly managed, it could lead to an increase in the use of alternative materials that are equally harmful or even worse for the environment.
- 7. **Effectiveness in Behavior Change**: The success of environmental taxes in changing behavior is mixed. While taxes on cigarettes have been shown to reduce smoking rates, it's less clear how effective environmental taxes are at reducing pollution or encouraging green technology adoption.
- 8. **Revenue Use**: There's debate over the best use of the revenue generated from environmental taxes. Some advocate for it to be used to fund environmental initiatives, while others suggest it should be returned to taxpayers to offset the regressive nature of the tax.

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