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The Economic and Legal Basis of the Polluter Pays Principle

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Abstract

As a result of the rapid development of international environmental law aimed at providing greater protection for the environment, the polluter pays principle emerged as an effective instrument of environmental policy, with a view to encouraging the optimal and rational use of natural resources that are harmful to the environment. The principle evolved and developed at the European level before being recognized as a legal principle at the international level through various international organizations, gatherings, and conferences concerned with environmental affairs. The polluter pays principle is often defined as requiring the polluter to bear the costs arising from their polluting activities. However, such a definition constitutes an over simplification of a concept that encompasses several theoretical aspects and distinctive characteristics specific to this principle. Accordingly, this study will address the theoretical aspects related to the examination of the principle, taking into account the significant development it has undergone, particularly its transformation from an economic concept into a legal principle. This transformation represents the most distinctive characteristic that sets it apart from other principles of international environmental law. The study will then examine its legal nature and the extent to which it is legally binding.

Keywords: Polluter Pays Principle; Environmental Law; Environmental Economics; Externalities; Environmental Liability; Sustainable Development; Environmental Protection.

Introduction

Environmental deterioration has become one of the biggest problem facing contemporary authorities. Industry, urban extension, intensive farming, transportation, the expansion of energy generation, and the increasing consumption of natural resources played a role in air pollution, contamination of water, soil degradation, Loss of biological diversity, and climate change. These environmental problems generate costs that are not always reflected in the prices of goods and services responsible for causing them. As a result, individuals, companies, and economic activities may impose environmental costs on society without directly bearing the financial consequences of their actions.

Remedying to this issue, environmental legislators and economic theory have laid down strict principles to the prevention, reduction, and restore environmental degradation. The most important of these principles, the Polluter Pays Principle holds a prominent place. The principle is generally understood to mean that the person or entity responsible for causing pollution should bear the costs of preventing, controlling, and, where appropriate, remedying the pollution.

The polluter pays principle is based on a economic rationale ,because it is linked to the theory of externalities where pollution is considered typical example of this. Often ,the producer or factory responsible for pollution obtains economic benefits from carrying out its activities. Although it bears the costs of these activities, it transfers part of these costs to third parties and society as a whole. This is the main objective of the Polluter Pays Principle: incorporating environmental costs into the economic cost of the activity and ensuring that the price of the product reflects, as far as possible, the environmental costs resulting from it.

From a legal perspective, the principle has evolved from an economic recommendation into one of the fundamental principles of environmental law. It was first recognized in various international declarations, as well as in national and regional legislation. It has also found its way into judicial practice and has emerged within environmental liability regimes. Furthermore, the Polluter Pays Principle is closely linked to a set of complementary principles that have strengthened its role in international environmental law, including the prevention principle, the precautionary principle**,** the principle of environmental responsibility, and the principle of sustainable development.

The application of the Polluter Pays Principle is also criticized for the difficulty of identifying the polluter. Establishing a causal relationship between an activity and the resulting environmental damage can be particularly challenging. The issue of allocating responsibility also raises questions as to who the actual polluter is: the producer, the user, or the consumer. The problem becomes even more complex in cases of diffuse pollution, transboundary pollution, or historically accumulated pollution**,** which may contribute to global warming and climate change**.**

Importance of the Study :

The importance of this topic is the increasing role played by the polluter pays principle in protecting the environment and reducing pollution . The importance also lies in clarifying the economic and legal basis ,especially after it transitioned from being merely an economic concept into a principle of environmental law .The research contributes also to clarifying its legal nature and the extent of its binding force in international environmental law, and it also allows for accessing its effectiveness in making the polluter bear the costs of environmental damage and encouraging the rational and sustainable use of the natural resources.

Methodology :

The nature of this study required us to adopt the descriptive and analytical approach ,through which economic and legal foundations of the polluter pays principle was examined , so the study also relies on a legal doctrinal approach to examine the legal status of the polluter pays principle.

Problematic :

To what extent do the economic and legal foundations of the Polluter Pays Principle constitute an effective framework to protect the environment and ensuring that polluters bear the environmental costs arising from their activities, while striking a balance between the requirements of economic development and environment protection?

I. The Concept and Historical Development of the Polluter Pays Principle

This section addresses the emergence of the Polluter Pays Principle and traces its historical foundations and development**.**

1. Definition of the Polluter Pays Principle

The Polluter Pays Principle may be defined as the imposition on the polluter of the costs of pollution resulting from his or her activities. It aims to ensure that the costs of environmental damage are borne by the party responsible for causing the pollution. The Organization for Economic Co-operation and Development (OECD) has played an important role in promoting and developing this principle. (Elhadithi, 2016)

The objective of the Polluter Pays Principle is to ensure that environmental costs are incorporated into the overall costs, thereby compelling the polluter or producer to adopt environmentally friendly production policies. This confirms the principle's preventive and corrective natures. With regard to its preventive nature, one of its advantages is to avoid pollution so that it does not result in additional costs that would place a financial burden on the producer. As for its corrective nature, it requires the polluter or producer to bear the costs of addressing the damage and its effects caused by their activities.

The imposition of environmental costs on the polluter does not constitute a form of tolerance of the damage caused by the polluter. Rather, it is a means of holding the polluter responsible for causing the damage and requiring them to bear the associated environmental costs

2. Historical Origins

The origins of the Polluter Pays Principle can be traced to economic thinking concerning environmental externalities. However, the principle acquired its modern policy formulation during the 1970s. The Organization for Economic Co-operation and Development held a seminar from June to august ,1971in Paris en environmental economics where the polluter pats principle was the subject of several discussions .This was the first time that PPP was discussed in a big forum and in front of the representatives of industrialized states or the major polluting states ,thus after the decades of individual discussions and analysis Pigou's theory got international attention (OCDE, 1971) . The principle was reaffirmed in the Rio de Janeiro declaration on Environment in 1992 ,under principle 16,which recognizes ,that the polluter must bear the financial burdens resulting from pollution at the national level (Ouakouak, 2025) , whose Principle 16 states that national authorities should endeavor to promote the internalization of environmental costs and use economic instruments while taking into account the approach that the polluter should, in principle, bear the cost of pollution. (Soumia Bellamrabet, 2020)The principle is also considered one of the fundamental principles of environmental policy within the European union, and it has long been closely associated with the development of the EU's environmental policy as a whole.

II. The Economic Foundations of the Polluter Pays Principle

The Polluter Pays Principle entails requiring the polluter to bear the costs arising from the environmental damage caused by the exercise of their activities. Consequently, these costs should be incorporated into the costs of economic activities so that the burden is not transferred to society or the State. Therefore, it can be argued that the principle is fundamentally based on economic foundations.

1. Environmental Pollution as a Negative Externality

The primary economic foundation of the Polluter Pays Principle is the concept of the negative externality. its exists when the actions of an economic actor impose benefits or costs on other individuals who are not directly involved in the transaction. Environmental pollution is a typical example of a negative externality. Let us take the example of a factory that produces the goods X maximizing its profit, in order to decide the optimum level of production,the cost of production has be taken into account in the economic calculus ,if the factory can dispose freely of its waste in the environment ,without paying for it ,the cost of pollution is not taken into account when deciding the optimum level of production. As result ,the volume of production maximizing the producer's private profit is higher than that guaranteeing the social optimum (Centemer, 2009) . In conclusion ,it can be said that, , from an economic perspective, the polluter pays principle aims

to internalize the external environmental cost in all decisions made by the producer, facility owner, or polluter, as the case may be.

2. The Theory of Pigouvian Taxation

The economic foundations of the Polluter Pays Principle are strongly connected with the work of British economist **Arthur Cecil Pigou**. He argued that markets may fail to produce socially optimal outcomes when economic activities generate external costs. In such circumstances, governments can use taxes or other economic instruments to bring private costs closer to social costs. A Pigouvian tax is therefore designed to make an economic actor take into account the external costs generated by its activity (Sadeleer, 2001). To eliminate the effect of such external cost inflicted on the society the divergence between the social and private costs should be eliminated. Polluters should be forced to internalize external costs of pollution that they generate. But how should be done has become the attractive topic for environmental economists from Pigou on wards. Solutions vary from taxing the polluter to internalize the cost of the external effects (Pigouvian model) to assigning property rights (Coase theorem). The most important presumption of the Pigouvian model is that environmental damage has a cost, and that this should be reflected in economic decisions by facing the participants with a price. Moreover, to the extent that taxes rather than subsidies are utilized, there is a presumption in favour of the PPP (Munir, 2013).

3. Internalization of Environmental Costs

The internalization of environmental costs means taking the external costs of pollution of the environment as part of the producer costs included in the total costs of the product to make the environment as important as capital ,labor ,resources ,technology and other factors of production .The reason of external diseconomies of environmental issues is that private costs is translated into social costs ,the most effective way to solve this problems is making the private costs of the producers transformed into its own production costs ,named the internalization of private costs. As the social costs far outweigh the private costs ,the internalization of the private costs is the best choice for the society to reduce the economic loss.

III. Economic Instruments for Implementing the Principle

The Polluter Pays Principle can be implemented through several economic instruments.

1. Environmental Taxes

Environmental taxes impose financial costs on activities that generate pollution. The advantage of environmental taxation is that it can provide a continuous economic incentive to reduce pollution. A company that reduces emissions may reduce its tax liability. However, the effectiveness of an environmental tax depends on the level of taxation, the availability of cleaner alternatives, monitoring capacity, and the responsiveness of producers and consumers (Abed, 2019).

2. Pollution Charges and Fees

Pollution fees originated from the Pigouvian tax theory. That is, the government can internalize the negative externality costs of enterprises by levying taxes on polluting enterprises, thereby stimulating the environmental responsibility awareness of enterprises and motivating and guiding enterprises' environmental protection behavior (Zhe Yang, 2022).

3. Tradable Emission Permits

The tradable permit system is a system in which the government establishes a specific level of permissible emissions and issues permits accordingly. Each permit allows a facility to release a predetermined amount of emissions. Facilities can also trade these permits by selling them when they have successfully reduced their emissions below the permitted level. The permits can then be sold to other facilities, allowing them to

carry out their activities and emit the specified amount of pollutants without incurring liability, as they possess the legal right to emit through these permits. (Saliha, 2019)

4. Environmental Liability and Compensation

Liability and compensation arise when there is a victim, i.e. someone who has suffered damage and someone who is responsible for the damage. When applied to environmental damage, it is noted that most cases do not give rise to liability claims because damage to the environment may not affect humans or other living beings. If pollution causes specific damage to a person or group, that person or group is considered to be harmed by the pollution, such as a person who drinks contaminated water or inhales polluted air and contracts certain diseases. (Roumaissa, 2026)

IV. The Legal Foundations of the Polluter Pays Principle

The polluter pays principle has evolved over time and has been incorporated into the national legislation of many countries after being enshrined in numerous international conventions and recognized as one of the fundamental principles of international law. It places responsibility on the polluter for the environmental damage resulting from the exercise of his activities. The principle has also established itself as a basis for environmental liability and has come to be regarded as an effective means of ensuring adequate compensation for those who suffer harm.

1. From Economic Principle to Legal Principle

The development of the Polluter Pays Principle from an economic principle into a legal principle of environmental protection was progressively pursued, both at the level of the Organization for Economic Co-operation and Development (OECD) and at the level of the European Community, over three decades, before the principle became enshrined in numerous international environmental agreements and international declarations, ultimately becoming a legally recognized principle at the international level. In 1974, the Organization for Economic Co-operation and Development (OECD) issued its second recommendation, No. 74/223, dated November 14, 1974, which provided guidelines for the implementation and application of the Polluter Pays Principle among the Organization’s member states. Under this recommendation, the OECD called upon its members to implement the Polluter Pays Principle as a legally binding principle for all its members. (Djilali, 2055)

V. The Polluter Pays Principle in International Environmental Law

The polluter pays principle first emerged within the OECD, was subsequently reaffirmed in the Rio Declaration on Environment and Development of 1992, and was eventually incorporated into various international environmental laws and legal instruments**.**

1. OECD

Under the 1972 and 1974 OECD Recommendations, the Polluter-Pays Principle means that the polluter should bear the "costs of pollution prevention and control measures", the latter being "measures decided by public authorities to ensure that the environment is in an acceptable state". In other words the polluter has to bear the cost of steps that he is legally bound to take to protect the environment, such as measures to reduce the pollutant emissions at source and measures to avoid pollution by collective treatment of effluent from a polluting installation and other sources of pollution. (OCDE, The Polluter Pays Analyses and Recommendations Environment Directorate OCDE /ED 92/81, 1992)

2. Rio Declaration

the polluter pays principle was established and formally recognized at the international level through this conference, particularly through Principle 16, which provides:

"National authorities should endeavor to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment." This text affirms the polluter pays principle**,** which was presented in the Rio Declaration as an economic principle. According to this document, the cost of pollution is regarded as one of the environmental costs that must be incorporated into the cost of production. The rationale behind incorporating environmental costs into production costs and imposing them on polluters is to encourage and motivate them to use environmental resources rationally. Consequently, the cost of pollution is not limited to the costs of pollution prevention, monitoring, control, and mitigation measures. (Abouhidjara, 2026)

3. Other International Environmental Instruments

The application of the Polluter Pays Principle has extended to numerous fields, beginning with transboundary pollution, marine pollution, and industrial pollution. It has also been applied to biodiversity protection, climate policy, and waste management. Environmental responsibility has relied on this principle in developing its principles and foundations progressively, ultimately reaching its current form. Accordingly, it can be argued that the Polluter Pays Principle has permeated international environmental law and has served as one of its fundamental pillars, despite its fluctuating status as a legally binding rule in many international treaties.

VI. The Principle in European Union Environmental Law

The idea expressed by the Council of Ministers and the Governments of the Member States on 9 February 1971 is considered the first step towards affirming the Polluter Pays Principle. It stated that the economic policy of the European Community should not be limited solely to economic growth, but that such growth should take place under sound and clean environmental conditions that ensure a healthy and suitable environment for living. (Prieur Michel, 1996)
In the same year, in June 1971, a statement concerning the European Community's environmental policy was issued, through which a future action plan was established.
Taxes are also imposed at the European Union level in order to strengthen the Polluter Pays Principle and to incorporate the costs of remedying environmental damage into the price of the product. They also seek to provide an incentive for producers and consumers to modify activities that have negative impacts on the environment.
In many European Union countries, environmental taxes are generally classified into four main categories: taxes on energy sources and energy products; taxes on air, water, and soil pollution; taxes on transport; and taxes on natural resources**.**

1. The Environmental Liability Directive

By virtue of Directive 2004/35/EC on environmental liability, and with regard to the prevention and remedying of environmental damage, the European Community has developed a legal framework for liability for threat of environmental damage or the occurrence of environmental damage. Its provisions have also determined the duty of the Member States concerning the implementation of regulations necessary to force through the provisions of the above-mentioned act of union law by 30 April, 2007. Such a state of affairs extorts actions, the aim of which is to settle contentious matters which will make the introduction of necessary legal changes possible. Due to the lack of consensus both among the academic representatives in Polish legal circles and other Member States as to the kind of responsibility (which was used by the EC legislator in the Directive), the issue undoubtedly belongs to the group of problems indicated above. On the other hand, the relevance of the issue for the process of effective realization of the aim of the legal act being established, the law unequivocally recommends that its settlement should have priority. (E.K.Czech, 2007)

VII. The Relationship Between the Polluter Pays Principle and Environmental Liability

The principle reinforces the concept of risk theory as a basis for international liability in determining compensation for damages caused by polluting activities. It is, therefore, a practical application of the principle "who benefits must also bear the burden" (glory comes with burden) . What is new in this principle is that it obliges the polluter responsible for environmentally harmful activities to bear all expenses and the costs of preventive and remedial measures decided by public authorities before the occurrence of damage, in order to prevent that damage from exceeding certain limits or thresholds .So the Polluter Pays Principle should be distinguished from traditional civil liability(generally focuses on damage suffered by an identifiable victim). (Ouakouak, The Polluter Pays Principle as a Basis for international liability for environmental damage , 2025)

VIII. The Relationship with the Prevention Principle

The Preventive principle it requires the prevention of environment harm before it occurs.

It also intersects with the polluter pays principle, insofar as the latter makes pollution a costly burden for the operator, which may lead them to cease their activities. This, in itself, constitutes a form of prevention. Thus, the environmental tax imposed under the polluter pays principle has both a remedial and a preventive dimension. In other words, the application of such taxation has a proactive preventive character, as the prospect of bearing the financial burden of the tax may encourage operators to take preventive measures and reduce or avoid polluting activities.

IX. The Relationship with the Precautionary Principle

The Precautionary Principle plays a proactive role in preventing environmental harm from occurring or mitigating it as much as possible, whereas the Polluter Pays Principle has a remedial role aimed at repairing the damage after it has occurred. Although this is a valid connection between the two principles, it is not sufficient to fully explain their relationship.
A deeper examination of the Polluter Pays Principle shows that it shares with the Precautionary Principle the same fundamental concern, namely, the adoption of a precautionary approach. Accordingly, the polluter is required to bear the costs associated with preventive measures intended to anticipate the occurrence of environmental harm and limit it before it occurs.
Furthermore, applying the Polluter Pays Principle through economic instruments that contribute to directing activities and behavior in advance toward the adoption of environmentally clean and sound alternatives can strengthen the precautionary approach underlying the Polluter Pays Principle. (Daas, 2016)

X. The Polluter Pays Principle and Sustainable Development

The relationship between the principle of sustainable development and the polluter pays principle is reflected in their shared concern with the rational and sustainable use of natural resources. Accelerated exploitation processes will lead to additional costs for the current generation, and these costs will become even more significant for future generations due to the increasing costs of extraction and exploration, as well as the environmental costs that will emerge in the future as a result of the loss of natural resources, the decline in the volume of reserves, or their scarcity. In addition, there are the costs of environmental degradation caused by pollution resulting from the use of these resources in industrial processes.
This situation may deprive future generations of opportunities and force them to rely on resources that are more costly to exploit and of lower quality. Therefore, the polluter pays principle seeks to determine an appropriate monetary value and pricing structure, for example by imposing user fees as a means of regulation and control, thereby ensuring the availability and sustainable use of resources for future generations. (Nacef, 2008)

XI. Determining Who Is the “Polluter”

Although what a polluter should pay has now been clarified, the identity of the polluter is not always self-evident. This point was virtually ignored in the early OECD texts(1)(2), because the polluter was quite clearly the person whose activity had given rise to the pollution. At Community level, the polluter was defined in 1975as the person who directly or indirectly causes deterioration of the environment or establishes conditions leading to its deterioration. For pollution from an industrial plant, the polluter is usually the plant operator. Cases of pollution linked to transport and consumption are more difficult to decide. On grounds of economic efficiency and administrative convenience, it is occasionally appropriate to identify the polluter as the economic agent playing a decisive role in the pollution, rather than the agent actually originating it. Hence a vehicle manufacturer could be deemed the polluter, although pollution results from the vehicle's use by its owner. Similarly, a pesticide producer could be the polluter, even though the pollution is the outcome of proper or improper use of pesticides. (OCDE, The Polluter Pays Principle , 1992)

XII. The Problem of Causation

Establishing the causal link is one of the elements that raises numerous difficulties in the context of liability for pollution-related damage, as the sources of pollution do not always produce identical effects. Moreover, natural conditions play an important role in this regard. Consequently, it may sometimes be difficult to determine the cause that led to the harmful result, particularly in cases where several factors interact to cause environmental damage.
Accordingly, establishing the causal link under such circumstances involves a number of difficulties and obstacles, the most significant of which are as follows:
01 – Difficulties Related to the Multiplicity of Sources of Environmental Pollution
02 – Difficulties Related to the Nature of Environmental Pollution Damage
Scientific uncertainty creates significant challenges in determining environmental liability, particularly with regard to the burden of proof, monitoring requirements, and specialized environmental assessment procedures. (Boufeldja, 2015)

XIII. Historical Pollution

Historical or legacy pollution constitutes another challenge to the application of the Polluter Pays Principle. The question that arises is: who should bear the costs of removing or remediating the historical pollution? Should the responsibility fall on the original polluter, the new owner or operator of the facility, the legal successor, or should the responsibility be shared? The choice of the most appropriate solution largely depends on the legal framework governing this issue in each country, which represents one of the most significant limitations and challenges in applying the Polluter Pays Principle.
In the case of the original polluter, who bears historical liability, they may be held fully responsible for the costs of remedying the damage caused during the period in which they operated the facility, even where the hidden defects were not disclosed. As for the new operator, if they had prior knowledge of the existing damage, they may also be held liable.
Some other legal systems, particularly those based on strict environmental liability laws, allow environmental authorities to require the new owner to remedy the damage in order to protect public health. The new owner may then seek recourse against the original owner and bring legal proceedings to recover the costs incurred in carrying out the remediation.

XIV. Diffuse Pollution

Diffuse pollution is defined as a type of pollution that does not have a readily identifiable source and accumulates in the soil, resulting from the movement of pollutants through air-soil-water systems. It arises from various activities, such as the use of agrochemicals and the indiscriminate release of wastes, and has significant impacts on human health and the environment.

Therefore, in cases of diffuse pollution, authorities resort to using environmental taxes, product charges, licensing systems, and agricultural regulations as mechanisms to address this type of pollution.

XV. The Principle and Climate Change

It is not enough to refer to the obligation of "the polluter" to pay. The causation requirement may make it necessary to identify who is the polluter in order to be able to apply the principle. Causation has already led to discussions in climate change policy on the relative contribution to carbon emissions of producers and consumers (in domestic trade), as well of exporters and importers (in international trade). For example, the contribution of a country to climate change depends on whether the greenhouse gases released in its territory in the production of goods for export are ascribed to that country or to the importing countries. (Dirk Heine, 2020)

XVI. Advantages of the Polluter Pays Principle

The Polluter Pays Principle offers several important advantages.

1. Economic Efficiency: Incorporating environmental costs into market decisions improves economic efficiency, and this is due to the Polluter Pays Principle**.**

2. Pollution Prevention: The polluter pays principle creates incentives for businesses and economic operators to reduce pollution .

3. Technological Innovation: The Polluter Pays Principle encourages businesses to invest in environmentally friendly technologies in order to avoid environmental costs.

4. Fairness: The Polluter Pays Principle places the environmental costs resulting from economic activities on the actual polluter, thereby relieving society of these costs and promoting a certain degree of fairness..

5. Public Finance: Environmental taxes and charges can generate public revenues that may be used for environmental protection or other public expenditures .

6. Sustainable Development: The Polluter Pays Principle supports the integration of the environmental dimension into economic development plans.

XVII. Criticisms and Limitations

Despite its importance, the Polluter Pays Principle is not without criticism.

1. Difficulty of Valuing Environmental Damage

One criticism of the Polluter Pays Principle is that some environmental resources do not have a clearly defined market price.

Damage to the ecosystem as a whole cannot be easily assessed.

It is difficult to assess and quantify the loss of biodiversity.

Therefore, all these factors make the assessment of environmental damage almost impossible..

2. Risk of "Paying to Pollute"

The Polluter Pays Principle should not be understood as granting a right to pollute or as implying that pollution is permitted. Therefore, when designing an environmental tax or fee, it is important to take into account the corresponding measures for repairing environmental damage and preventing pollution. The payment made by the operator, or the polluter, should rather be considered as part of a broader system of prevention, management, regulation, and liability aimed at protecting the environment as a whole.

3. Social Inequality

Including the costs of environmental taxes and fees increases the price of products, which means that low-income households ultimately bear the actual burden of these payments. It is also important to note that the revenues generated from these taxes and fees go into the public treasury, from which the government may allocate funds to support vulnerable households. However, this may ultimately contribute to social inequality.

4. Transboundary Pollution

The application of the Polluter Pays Principle raises difficulties in cases of transboundary pollution involving more than one or two countries. Consequently, determining jurisdiction and allocating responsibility can be extremely challenging.

XVIII. The Polluter Pays Principle in National Environmental Law

The national implementation of the Polluter Pays Principle is carried out through environmental protection laws, as well as financial legislation through taxes, charges, and royalties. It may also be implemented through environmental standards, tradable permits, the determination of liability, obligations relating to environmental restoration, environmental impact assessments, and administrative sanctions. The status of the Polluter Pays Principle varies according to the legal system of each country. In some legal systems, it is regarded as a constitutional or statutory principle, while in others, it serves primarily as a principle guiding public policy.
In general, in order to ensure the effectiveness and efficiency of the Polluter Pays Principle, the environmental authorities should make use of all available administrative, legal, and economic instruments to achieve its intended objectives.

XIX. The Role of the State

Since the Polluter Pays Principle is enforced at the domestic level, the State is responsible for establishing the necessary framework to identify polluting activities, introduce taxes and charges, and monitor compliance with them. It is also responsible for developing and establishing environmental standards, as well as tradable permits. Furthermore, the environmental authorities are responsible for determining liability and ensuring that the application of this principle does not lead to unintended or undesirable consequences, particularly when the charges imposed are disproportionate to the degree and severity of pollution. In such cases, these charges may become merely symbolic amounts that do not prevent the continuation of polluting activities.

XX. The Role of Companies

The application of the Polluter Pays Principle to economic enterprises encourages them to adopt decision-making processes that integrate environmental risks, as well as to develop clean technologies and production methods aimed at reducing pollutant emissions. It also promotes the reduction, treatment, and safe disposal of waste, while ensuring continuous monitoring of pollution levels without neglecting the importance of environmental insurance.
Therefore, the application of this principle contributes to a shift from the model of "produce first and remedy later" toward a model based on assuming environmental responsibility, avoiding environmental harm, and preventing it**.**

XXI. The Role of Environmental Insurance

Environmental insurance is defined as a business insurance form for the companies and protects them from the unexpected environmental obligation that may be encountered from their business activities. Somehow,

this kind of insurance is different from other insurances of property, accident or labor; the doers of the activities should also be able to restore the environmental functions to what it is, so that they need to provide the funding. The amount of funds that must be spent is beyond the companies' capabilities in order that the risk can be transferred to other parties in the form of insurance. This type of insurance arises because of the principle of environmental liability, which based on the law, it is on the doers without any prior evidence for that, or known as strict liability. As a result, all the doers of activities that impact on the environment should make an effort to bring back the environmental function that has been damaged without waiting for the court verdict. It is deniable that not all development activities will impact on and destroy the environment; but the impacts and damages are potential that may occur years after the activities have been implemented. (Yuniar Rahmatiar, 2018)

XXII. The Future of the Polluter Pays Principle

The future applications of this principle are moving toward a radical transformation, from being merely an economic tool for compensating for environmental damage to becoming a proactive legal and technological pillar that requires the full integration of environmental costs into economic activities.
These applications should include carbon pricing, extended producer responsibility, the imposition of charges on plastic pollution, the establishment of environmental liability funds, and the determination of a real price for greenhouse gas emissions. They should also involve the effective expansion of extended legal responsibility by requiring producers to bear the costs associated with the entire life cycle of their products.

Conclusion

The Polluter Pays Principle is considered one of the most important legal instruments for environmental protection. This principle aims to make the polluter bear the social costs of the pollution caused by their activities, both as a form of compensation and as a deterrent to those responsible, in a manner that ensures that the effects of their activities are consistent with the principles of sustainable development, which is regarded as the only model that enjoys broad international acceptance and consensus.
The principle first emerged in its legal form through the recommendations of the Organization for Economic Co-operation and Development **.** It was subsequently incorporated into several international conventions and later reaffirmed in domestic legislation as one of the general principles governing environmental protection.
The proper application of the Polluter Pays Principle can effectively curb pollution, prevent its occurrence, encourage technological innovation, and consequently contribute to environmental protection. However, its effectiveness depends on its application in conjunction with other principles, such as the Prevention Principle, the Precautionary Principle, the Principle of Sustainable Development, and the Principle of Environmental Responsibility**.**
Nevertheless, the application of the principle faces several obstacles, including the difficulty of identifying the actual polluter, namely the party truly responsible for the damage, as well as determining how to deal with complex and diffuse sources of pollution and transboundary pollution**.**
It should be noted that the principle aims to modify the economic behavior of polluters by incorporating environmental considerations into the costs of production. It has therefore acquired a legal dimension aimed at achieving sustainable development and environmental protection**.**

Recommendations

Based on the economic and legal analysis of the Polluter Pays Principle, the following recommendations can be proposed:

1. States should expressly incorporate the Polluter Pays Principle into their environmental legislation and, where appropriate, constitutional and regulatory frameworks in order to give it a clear and enforceable legal basis.

2. Establishing clear rules that determine the liability of individuals and entities responsible for causing environmental damage, while requiring the polluter to bear the costs of environmental restoration, remediation of the damage, and its prevention.
3. Imposing environmental taxes and pollution charges, introducing carbon pricing and charges on various emissions, as well as waste fees on a proportional basis, with the aim of incorporating environmental costs into the prices of products that generally contribute to pollution.
4. Preventing environmental damage before it occurs, rather than relying on compensation after the damage has occurred. For this purpose, environmentally friendly activities should be encouraged, while other activities should be subject to effective environmental standards, monitoring and control systems, and licensing requirements.
5. Encouraging investment in environmentally friendly technologies, reducing the use of polluting energy sources and replacing them with renewable energy, using natural resources efficiently, and recycling them.
6. Strengthening the monitoring of polluting activities by environmental protection authorities and providing them with all the necessary material and technical resources, as well as financial resources and qualified human personnel, while ensuring the enforcement of environmental legislation and imposing penalties for violations.
7. Developing scientific and economic methods for accurately assessing the costs of environmental damage.
8. Imposing a tax or fee on transboundary and multi-source pollution, and exploring ways to establish solidarity among the states responsible for causing it..
9. Raising environmental awareness and encouraging everyone to take responsibility, including institutions, companies, and individuals, because everyone is responsible for protecting the environment, which is a shared responsibility.
10. Experience has shown that applying the Polluter Pays Principle separately from other principles reduces its effectiveness. Therefore, all these principles should be applied together in order to ensure effective environmental protection.

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