The Economic Costs of Environmental Degradation and Methods to Measure Them

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Abstract:

Environmental deterioration is a gradual process. It is a result of resources mismanagement. Its hazards range from diseases affecting humans, animals, and plants to the destruction of various environmental components, reducing their efficiency or depriving them altogether. This leads to significant economic and social damages. Therefore, the focus of this research paper revolves around the most important quantitative measurement methods for the costs of environmental deterioration. Since it is impossible to eliminate pollution, we also addressed the optimal economic level of environmental pollution. It attempted to reduce the expected damages through balancing between benefits, the amount of pollution, and determining the social cost and the private cost.

Keywords: Environmental deterioration, Economic costs, optimal pollution level.

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Introduction:

Environmental issues within the limits of economic systems are complicated and, in many cases, include unconfirmed results, such as the total deficit of the future of human welfare regarding the effects of environmental deterioration.

The environment is a comprehensive concept of development processes, but the increasing urgency of the requirements of developmental life led to the misuse and deterioration of the natural environment resources. This may be due to many reasons, including the failure of some policies by pricing natural resources and the failure of markets. It does not consider the costs of using environmental assets within the costs of production, where they are followed. The policy of irrationality drains resources and uses the environment as a waste warehouse. We find that it is impossible to continue development based on the deteriorating environment resources, as the environment cannot be protected, if development is neglected at the cost of environmental deterioration. Moreover, one of the goals of using economic values to determine the costs of environmental deterioration is to reach the optimal level of pollution and efficiency in using natural resources.

In this context, we make the following main inquiry: What does environmental deterioration represent from the economic aspect? What are its costs and techniques of assessing them?

To answer the question posed, we divided the study into the following elements:

First - environmental deterioration

1- The concept of environmental deterioration: Environmental degradation is defined as "the occurrence of a defect in the relationship of the matrix of elements of the ecosystem, and the dangers or damages that result from this deficiency, directly or indirectly, currently or in the future, both foreseeable and unforeseeable" (Abdul Maqsoud Zein al-Din, 2000)

He also defined environmental degradation as "every quantitative or qualitative change that occurs in one or all of the elements of the natural, social, biological, or cultural environment, diminishing it, changing its characteristics, or disturbing its balance to a degree that affects the organisms that live in this environment, most notably humans, with an unwanted effect."(Hussein Abdel Hamid Ahmed Rashwan, 2006)

In the 1992 Earth Summit Report, land deterioration was defined as "the reduction in biological and economic productivity due to complications affecting pastoral and agricultural areas in arid and semi-arid regions due to land uses or because of a combination of processes resulting from human activities and settlement patterns." (Nasr al-Din Bakhit, 2008)

Environmental decay also represents a type of disparity in the various elements that forms ecosystems, the deterioration of their vital characteristics, and the decline in their production to the point where these systems become incapable to provide the necessary life requirements for humans and animals, which ultimately forces them to migrate to a better area. Under these conditions, a series of degradative changes begin in Vegetation, soil, and local climate change create new, more subtle, fragile conditions.

Through these definitions, it can be said that the concept of environmental deterioration refers to a group of considerations, which are:

- Changes in the environment or one of its resources.

-These changes may result from humans or natural causes such as volcanoes and earthquakes.

- They may lead to an alteration in the ecosystem or one of its structures, which might disturb the environmental equilibrium.

-These changes have an unwelcomed negative impact on the living and non-living beings.

2- Economic causes of environmental deterioration

There are several economic reasons that worsens environmental decay, they include:

2.1 Failure of the market mechanism: There are two types of market failures, which are more common in the case of environmental pollution, which are "public goods and external effects."

2.1.1 The environment as a public good: Public goods differ from private goods in many characteristics. The lack of competition is a characteristic in their consumption and the inapplicability of the principle of exclusion on them. The feature of lack of competition on good's consumption indicates that the benefits associated with its consumption do not need fragmentation. One individual's consumption of this commodity does not prevent another person from consuming it at that time. (Suhair Ibrahim Hajim Al-Hiti, Responsibility, 2008)

As for the inapplicability of the principle of exclusion, it means that it is not possible to prevent others from participating in obtaining the profits subsequent from the consumption of that good. Considering the environment as a communal good, indicating that there is no specific owner of natural assets, the market mechanism fails to provide this good efficiently.

2-1-2 External effects: An external effect occurs when the actions of one person or institution affect another unit. Therefore, the external costs borne by society appear without reference in the institution's accounts or national economic accounts.

-The failure of the governmental sector in integrating external costs encompasses numerous factors. This failure pertains to how the government handles environmental issues, as discussed in (Schars and Kolstad's 'Environmental Economics' 2005).

-One aspect involves the insufficient or inaccurate information available for tracking the full effects of specific activities or policies. Additionally, governmental environmental policies may clash with other crucial policies that significantly influence short- and medium-term economic performance.

-Another challenge lies in the difficulty of translating established policies into practical procedures due to a lack of expertise capable of implementing these policies. Subsidy policies and other pricing strategies further diminish the efficiency of the market mechanism in determining prices.

-Economic growth emerges as the most striking feature of the last century, particularly in industrialized nations. Significant advancements underpinned this growth across various industrial sectors, occurring during a period marked by relative abundance in the world's natural resources and their intensive, uncontrolled utilization.

Elements of natural environment, such as water, air, and land. They utilized low-priced sources of production as dumping grounds for various wastes.

The ultimate outcome of this economic growth was an increase in average per capita production but a simultaneous deterioration in environmental conditions. As economic activity stands as the

primary cause of environmental degradation, their interrelation becomes evident in the following figure."

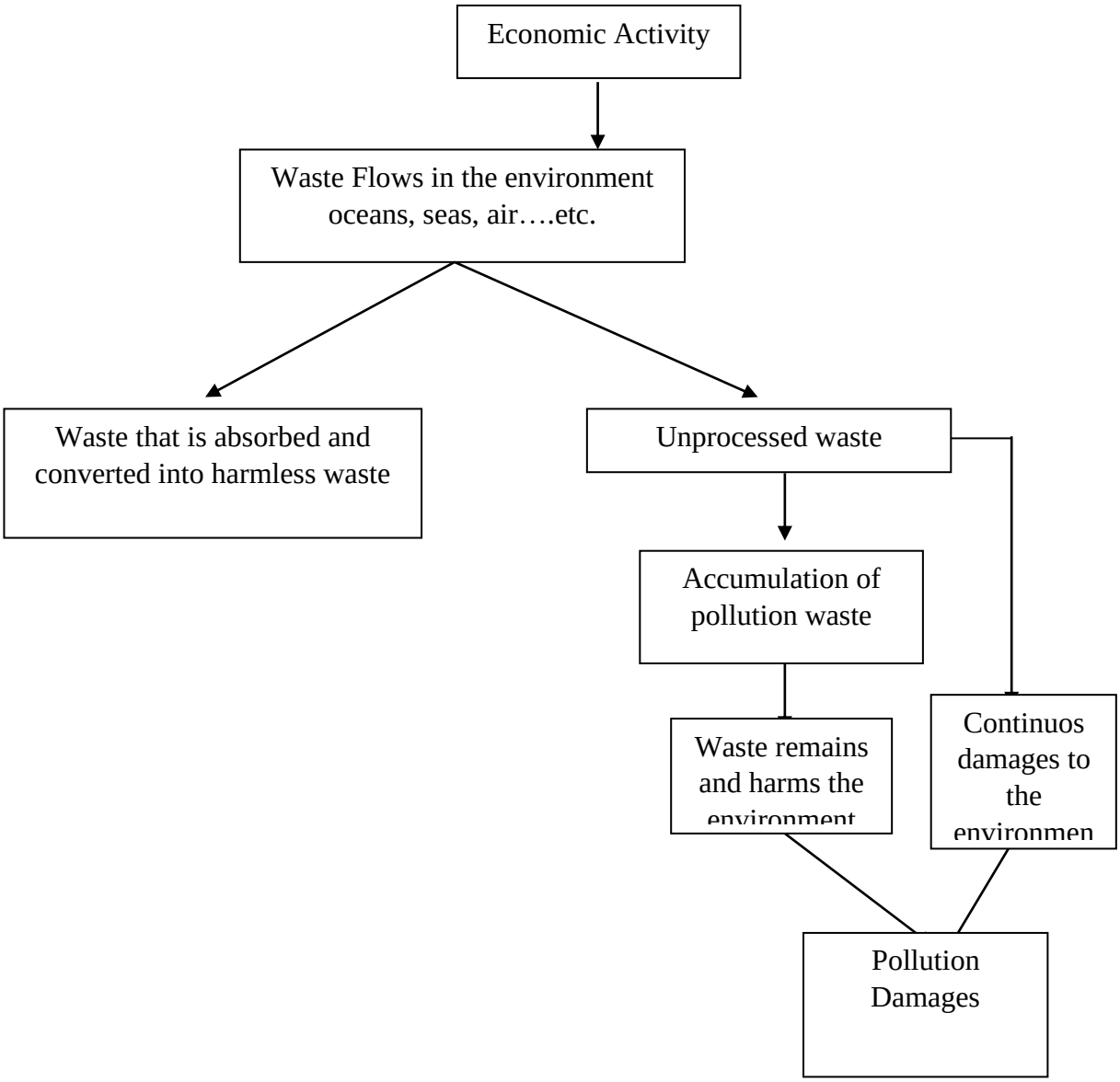

Figure (01): The relationship between economic activity and environmental deterioration

Second: Environmental costs

1- The concept of environmental costs: Researchers did not reach consensus in defining the concept of environmental costs. Some defined the notion "the monetary expenditures and obligations that are spent on everything that would lead to the preservation of the ecosystem, including tools and other things, and what proves the institutions' commitment to standards for protecting and improving the environment." (Christioer, H. Stinson1997). Others see it as "a measure of eliminating the damage that befalls society as a result of the economic unit carrying out its activity, that is, the negative internal and external effects that are reflected on society as anoutcome of the economic unit practicing its activity."Expert working group (2001)

Others see it as "those expenses that the organizationpays in order to satisfy its environmental protection obligationsthrough adherence to national environmental protection legislation, regulations, policies and procedures in order to prevent harmful effects on the natural environment and take appropriate measures to achieve environmental goals. This includes the reduction of pollutant emissions, waste recycling or disposal, environmental management, environmental protection activities supporting environmental and social damage compensation costs"(Huang Jing, Li Songqing 2011)

The United States Environmental Protection Agency defines it as "the monetary and non-monetary traces instigated by a facility or organization as a result of activities that affect the quality of the environment. These expenses consist of explicit traditional charges as well as possible implicit costs and, to a lesser extent, direct expenses". (Salima Ghadeer, Ahmed Yousuf Qureshi, 2012)

The economic costs of environmental deterioration are generally divided into:

-Direct environmental costs: These can include the fees of treating illnesses brought on by industrial facilities, the cost of replacing damaged crops in polluted locations, and the expense of garbage disposal.

-Indirect environmental costs: These are expenses incurred throughout the production phases, such as those associated with the depletion of natural resources like water and air throughout production. (Aqeel Hamid Jaber Al-Helou et al., 2013)

The material losses associated with environmental damage are not the only negative repercussions. However, it also includes the enormous sums of money used to prevent the deterioration, combat it, and safeguard the environment from it.

The financial and economic costs associated with environmental deterioration are therefore growing on a worldwide scale, according to data collected from nations across the globe.The United Nations Global Environment Monitoring Institute estimated in its reports the size of these burdens at about 40 million dollars. Additionally, these figures demonstrate that a percentage (2-4%) of the global gross domestic product is needed to combat pollution.

2- The optimal economic level of environmental degradation:

Resolving environmental deterioration does not imply eradicating pollution. Since eliminating, the deterioration of the environment is theoretically unattainable and unethical. As a result, the fundamental purpose of this framework is to reduce degradation or reduce it to an environmentally and economically acceptable size. Before investigating the ideal degree of degradation, we must first tackle and analyze the societal costs associated with the deterioration of the environment.

2-1-Private costs and social costs

Environmental contamination generates external expenses because of people and organizations failing to shoulder the true social price of resources. For instance, we suppose that certain people and institutions may utilize water and air free, but that other institutions and individuals must incur expenses as a result of their use, and the costs vary. Private costs are different from societal costs related to water and air since the individual who benefits from a specific commodity or resource, such as raw material or labor costs, covers them. (Talaat Al-Demerdash, Principles of Economics, 2006)

Regarding the social cost: This includes the cost to the consumer as well as any damage (pollution) that could arise from using something against another party's wishes. The price paid by the water and air user is less than the true cost to society because cash does not cover this cost. (Ramadan Muhammad Muqallad et al, 2001)

The difference between private costs and social costs occurs only if the use of the resource results in costs for other parties. For example, if a paper factory uses water and then treats it to restore its original specifications; there is no difference between private costs and social costs. However, When the factory throws its waste into the rivers (a cheap way to dispose of waste), the cities located on the rivers after the factory must pay the costs of restoring the water to its previous conditions. In such cases, the difference occurs between private costs and social costs, as shown in the following figure:

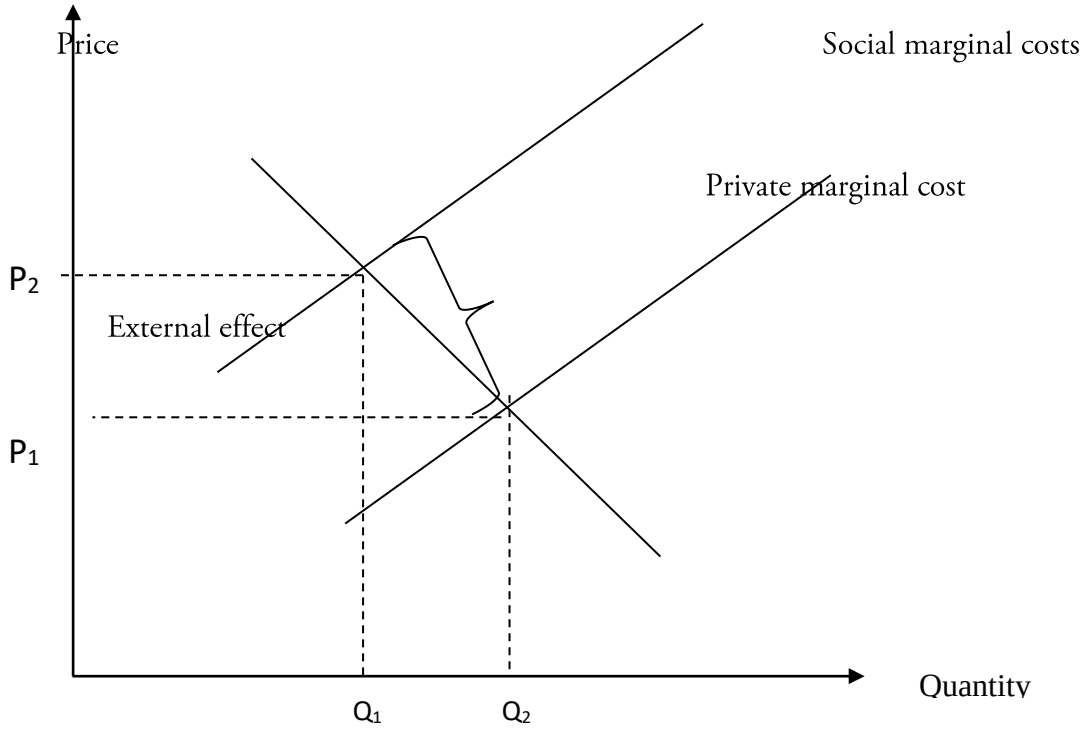

Figure (02): The difference between private cost and social cost

It is shown by the figure that the externality lies between the social cost and the private cost, leading to a fall in prices from P_2 to $P_1$and an overproduction of the quantity produced Q_1 to Q_2.

Thus, it is worth noting that when a person discovers that a portion of their well-being is being lost, they as well as society as a whole bear the external consequences. These expenses may also indirectly manifest in the market as costs or losses in terms of money. For instance, lost crops are the agricultural crops' losses due to air pollution. If we consider these consequences on human health, we get a number of diseases associated with air pollution, not to mention the indirect effects that these diseases have on the decline in productivity due to missed work and medical costs. Therefore, it is necessary to develop procedures and policies to integrate the external impact to reduce its negative effects on society.

2-2- Searching for social costs and determining the optimal amount of pollution

When external factors are present, pollution levels exceed the capacity of the environment to absorb them, and goods' production increase more than the epitome when some of their costs are not included in the social cost. Thus, they are not included in the private costs. (Jean François Noël, Sylvie Francheux, 1995)

Let us assume, for instance, that Institution A disposes of its garbage into a river, and that Institution B, which is situated across the river, requires clean water to operate. The production of enterprise A leads to a loss in the production of enterprise B, and we assume that the damage to B is proportional to the production Q of enterprise A, as in Figure (03).

Within the figure, the curve MP represents the marginal profit p for establishment A. We assume that the establishment sells its products in the market, and that the marginal profit equals the market price. Firm A maximizes its profit p if price equals marginal cost, then the quantity produced becomes OM in this case and we conclude that profit equals OPM. Therefore, the field OPM represents the maximum private profit p for enterprise A.

The curb OL represent the societal cost, the optimal production for a given level of output is the difference between the two fields OPM and ORM, and B's entire potential loss is ORM when A's production reaches the level OM. This is because the producer's objective is to maximize profit within the constraints of cost minimization. When the production of OQx is in quantity, it maximizes social profit. When social costs are equal to marginal profit, this demonstrates that the level of production that achieves collective welfare is less than the level of production that achieves private marginal profit.

Additionally, Figure (03) shows that when pollution surpasses the ocean's capacity to absorb it, the social cost—that is, the cost society utilizes to mitigate the effects of pollution—appeared. This indicates that pollution is becoming more serious.

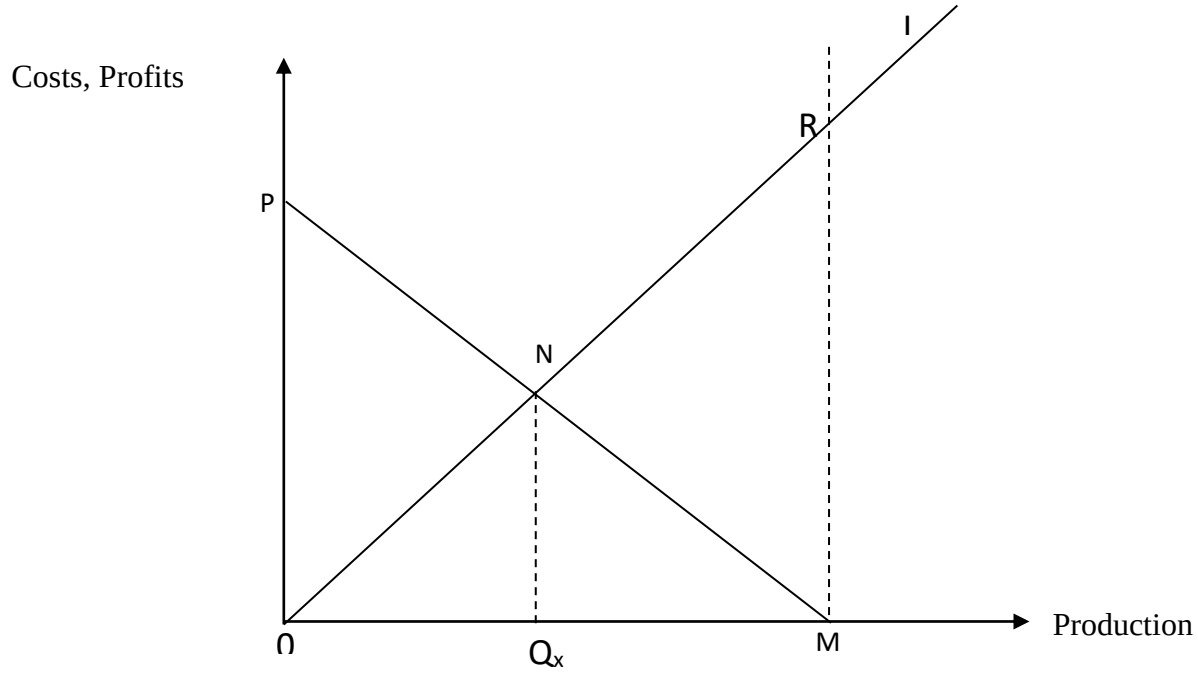

Figure (03): Graphic representation of social cost

Through Figure (04) we are trying to compare the reality in which there is the ability of nature to absorb part of the pollution

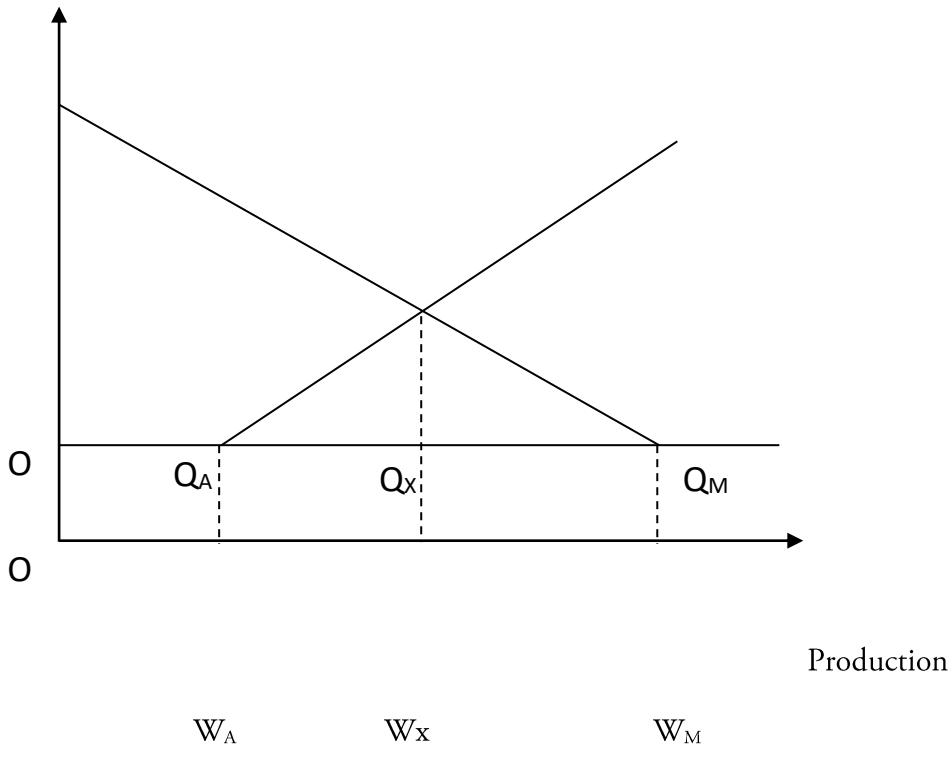

Figure (04): The ability of the environment to absorb part of the pollution

Let A represent this capacity's level and W_AQ_A represent the quantity and generation of pollution associated with it.

- The natural environment can easily analyze the pollutants emitted when the level of pollution released W is lower W_A.

- Conversely, if W is larger than WA, then less pollution can be absorbed by the natural environment, which results in the appearance of the social costs (pollution problem).

The two numbers (3–4) differ in that whereas W_A indicates zero production, it actually corresponds to the Q_A production level. Pollution is zero in these figures. The intersection of the marginal profit and social cost lines determines the Q_X.

Third: Measuring the costs of environmental degradation

Incorporating economic reasoning into investments pertaining to environmental resources and striving to maintain and optimize their utilization are among the objectives of monetary measurement of the environment. It should be highlighted that assessing the environmental costs of any economic entity requires assessing the losses. Employees or other members of society bear the losses because of the unfavorable effects of economic activity. As a result, it necessitates striking a balance between the economic unit's positive social contributions and its detrimental environmental repercussions. We discuss the following techniques for calculating the costs of environmental deterioration:

1- Introduction to quantitative measurement with a single content

The approach to quantitative measurement with a single content is based on measuring things and phenomena quantitatively with a unified standard that reflects a common characteristic between them. So that the information resulting from measuring these things and phenomena can provide the property of mathematical aggregation at the level of all their constituent elements. To measure the latter there is a distinction between the two trends regarding the unified standard. The two environmental processes are: (Taha Alawi Nasser, Haitham Hashim Al-Khafaf, Importance, 2012)

1-1-Measurement using the unit of social benefit: the economists' distinction is the basis between two types.

From the values of one thing, it is the exchange value and the value of use. "Exchange value" means the amount of something that has specific characteristics can be exchanged for something else that has different features. As for "use value," it means the ability of something to fulfil a direct human need when a person uses it, or benefits from. For the people who use it or are affected by it

However, despite what the idea of environmental benefits is based on logic that discusses what differs rather than what exists. The difficulty of measuring benefit practically is considered a sufficient reason not to use it as a reliable basis in the field of environmental measurement.

1-2-Method of monetary measurement:

Measurement in financial accounting depends on exchange prices, but with regard to environmental accounting. These prices are often not available, or are considered an incorrect indicator of value. This occurs when the price does not express the benefit achieved by the good or service. This difficulty's resolution is based on some indirect estimation methods, including: (Mahwat Obaidi, 2005)

1-2-1- Alternative evaluation method:

Through this method, dependence is placed on the value of alternative phenomena that are expected to include approximately the same benefits or disadvantages as the phenomena under measurement. For instance, the value of the budgets that can betolerated in order to prevent issues can be estimated at the cost of building a wall. Alternatively, installing soundproof glass. The problem encountered using this method is the availability of suitable alternatives to choose from.

1-2-2- Survey method:

This method of measurement depends on analyzing data obtained from the social groups. The environmental performance subject of the measurement affects these groups, if these groups are aware of all the effects that distress them. Because of this performance, and to be able to express these effects in a critical form, the formulation of questions is considered one of the basic factors on which the validity of the results is based.

3- Correction or evasion cost method:

Through this method, environmental damage is estimated based on the amounts. They are necessary to correct the damage or acquire the essential devices and equipment to evade it, such as the cost of repairing the damage, as well as the amounts borne by the organization to cleanse the waterways. It uses it to dispose of the waste of its operations, such as the cost of avoiding damage is the amount allowed by the institution to treat and purify this waste before tossing it into waterways. Although monetary measurement can be applied in the field of calculating environmental expenses, it cannot be relied upon in estimating the values of the benefits.

2- Accounting measurement of environmental costs:

In order for the process of evaluating environmental returns to be successful, this requires the adoption of integrated economic environmental accounting. That is an alternative to traditional accounting. In this context, we find what is called environmental accounting (environmental cost

accounting) as an approach to assessing the social environmental effects of economic projects. It is considered a physical and financial measurement tool that aims to provide actual and future information to decision makers and environmental policy makers, for determining both the environmental and social costs of all operations and activities related to environmental safety.

The US Environmental Protection Agency has defined environmental accounting in three ways:

1- **Environmental accounting from an economic interpretation**: During this stage, the quantity and value of production factor inputs are measured and analyzed, and this stage often reflects the level of economic well-being of the individual and society (Huang Jing, Li Songqing, 2011).

2- Environmental accounting as an extension of financial accounting: During this phase, financial statements are prepared in accordance with accounting standards and principles, so that these lists include data and information on environmental impacts to help the beneficiaries of these lists, such as investors, creditors, and shareholders.

3- Environmental accounting from an administrative perspective: In this step, the analysis and identification of data and information related to environmental activities aids management in planning and making various administrative decisions, such as decisions to price products, continue producing a specific product, quality requirements, and other administrative decisions.

Accounting measurement is the quantitative and monetary assessment of the financial events arising from the institution's practice of its economic activity. This is processed by collecting, classifying, analyzing and recording these economic operations until the final accounts of the activity are prepared at the end of the financial period.

We can clarify that measurement is determining the values of income statement items. This means the necessity of recording environmental fixed assets in the statement of financial position by determining their true value and measuring the result of the activity by matching revenues with expenses. Environmental operations entail ecological expenses to eradicate those effects that the institution causes as a result. In carrying out its activities, the concept of measurement applies to it, as they are economic events that affect the tenets of the financial statements. Accounting methods and procedures are used for environmental events to record them so that their implications appear within the financial statements.

Fourth: The challenges facing measuring the costs of environmental degradation

The most important challenges faced in measuring environmental costs are:

1- Determining the causal relationship between the action and the damage resulting from it:

The difficulty of determining the source of the damage that occurs to society, especially when many economic units of pollution are present in the same workplace, and thus the difficulty of measuring the costs of the damage and determining its root, for instance, air, water, or soil pollution in locations close to the performance of these units;

The struggle of measuring the long-term effects that economic units leave on the environment and society. Because they remain for a long period, which creates difficulty in measuring and evaluating these damages.

The difficulty of determining the perpetrator of the damage or pollution, and thus the difficulty of measuring and blaming those effects on specific parties, such as damage resulting from the use of cars, airplanes, or ships;

The difficulty of determining the damage to the environment. In addition to recognizing the perpetrators and then deciding the value of compensation for each perpetrator. Adding the difficulty of restoring conditions to what they were before the damage occurred.

2- Numerous main approaches to accounting for environmental costs: Environmental costs are, for many economists, one of the new branches of accounting. Therefore, for them, it is necessary to develop a clear intellectual framework that addresses the aspects of this new method.

The first entry: the traditional method

The pioneers of this trend believe that accounting for environmental costs is an extension and completion of financial accounting. Financial statement makers must measure and include the environmental dimension when preparing traditional financial statements.

The second entry: the developed traditional method

This trend believes that accounting for environmental costs is a new aspect in accounting. Therefore, it requires reformulating its concepts to take into account the point of view of society and the environment.

The third entry: the modern method

The innovators of this inclination believe that accounting for environmental costs is a new branch of accounting. It has its own characteristics within the general framework of accounting, such as financial accounting, cost accounting, and administrative accounting. In accordance with this trend, the economic unit seeks to achieve a level that satisfies workers and society, in addition to attaining the interests of the unit in maximizing profits in a manner consistent with the applicable accounting rules.

3-Challenges related to determining the quality of costs

Achieving the purposes of accounting assessment of environmental costs demands establishing the type of costs, as it is. The challenge in providing the worth of social damages resulting from economic units. This arises when accountants cannot agree on the quality of costs that the unit ought to assume responsibility.

Conclusion:

Finally, deterioration of the environment has significant social and economic consequences, which increase when environmental protection actions are postponed. Environmental damage, from an economic standpoint, entails the occurrence of several direct and indirect economic damages and losses, some of which are visible and identifiable, and others whose effects will be visible only in the future.

In this instance, the costs of losses can be used to assess the economic traits of environmental deterioration. Which include costs that the ecosystem's components bear as a result of pollution, such as health problems that require time away from work and a descent in production. More specifically, even though they were not involved in the pollution, environmental degradation leads to a decrease in the opportunities. Society and third parties have to use resources for production or consumption, as well as the direct and indirect damage that pollution causes to projects. Costs associated with treating and mitigating the consequences of pollution, such as those connected with purifying water and treating contaminated water and air, are included in treatment costs. In addition to reducing the concentration of polluting gases. It also includes costs for treatment and medication for diseases caused by environmental pollution.

Prevention costs represent expenses that keep contamination within environmentally acceptable limits, such as installing devices and equipment to reduce pollution emissions in factories, using new modifications in production and in the technology that is used in order to obtain environmentally clean technology.

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