Retos de la Dirección 2021; 14(2): 164-182

Article

Contribution of Sustainable Cost to Water Care. An Outlook from a 2030 Agenda Perspective

Contribución del costo sostenible para el cuidado del agua. Una mirada desde la Agenda 2030

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ABSTRACT

Aim: To identify the contribution of sustainable cost to the accomplishment of the 2030 Agenda in relation to water.

Methods and techniques: This study is based on the three-dimensional accounting theory. The study uses a quantitative approach, with a descriptive analysis. The method of analysis and synthesis is applied. The data collection technique used was document review.

Results: The results from the determination of sustainable cost in two business sectors in Mexico are shown, and their contribution to the accomplishment of international goals is analyzed. The preliminary results show that sustainable cost is essential to the business sector, since it helps meet commitments and challenges described in the 2030 Agenda, related to target No. 6.3: clean water and sanitation.

Conclusions: Sustainable cost is a need for humanity.

Key words: environmental accounting, environment, decision-making, sustainable cost.

RESUMEN

Objetivo: Identificar la contribución del costo sostenible para el cumplimiento de las metas de la agenda 2030 vinculadas al agua.

Métodos y técnicas: Se parte de la teoría tridimensional de la contabilidad. El estudio tiene un enfoque cuantitativo, con alcance descriptivo. Se aplica el método de análisis y síntesis. La técnica de recolección de datos fue el análisis documental.

Resultados: Se muestran los resultados obtenidos en la determinación del costo sostenible en dos sectores empresariales en México y se analiza su contribución al cumplimiento de los objetivos internacionales. Los resultados preliminares reflejan que el costo sostenible es fundamental para el sector empresarial, ya que contribuye a cumplir los compromisos y desafíos que describe la Agenda 2030 relativo al objetivo 6.3: agua limpia y saneamiento.

Conclusiones: El costo sostenible es una necesidad para la humanidad.

Palabras clave: contabilidad ambiental; medio ambiente; toma de decisiones; costo sostenible.

Received: 07/10/2019
Accepted: 24/04/2020

INTRODUCTION

One of the targets of the 2030 Agenda for sustainable development is to improve water quality, by reducing pollution, eliminating dumping of wastes, and minimizing the emission of chemical products and dangerous materials, reducing the percentage of untreated wastewaters to 50%, and increasing recycling and reutilization without globally spread risks.

Several theoretical proposals from various disciplines have been made in order to contribute to water care and preservation, including environmental accounting, which is used to identify, measure, and earmark environmental costs for integration to commercial decision-making, and further communication to related company sections (Mussa, Feku & Mussa, 2018)

Environmental accounting deals with activities, methods, records, analyses, and reports of environmental and ecological impacts of defined economic systems (Azizul, 2017). Palma and Cañizares (2018, p. 137) said that this accounting "...has integrated to a particularly specialized segment of accounting, which is made of several branches, such as environmental financing accounting or environmental management accounting, and environmental audit. It is useful in environmental and operational cost management of natural resources (Muralikrishna and Manickam, 2017)

As part of environmental management accounting, Sinforoso, Ricardez, and Álvarez (2018), state the hypothesis that sustainable cost is a means that helps companies access information to identify damage caused to the environment, and be able to manage actions that contribute to a decrease of impacts on the environment.

Sustainable cost represents the value of negative environmental externalities caused to water. It includes the production costs of goods and services, in order for companies to get income to finance activities seeking restoration of the damage caused to natural resources that have no economic value in the market. However, it is a way to assist companies in accessing information to identify environmental damage, and managing actions in favor of nature (Sinforoso *et al.*, 2018).

Accordingly, the issue of how sustainable costs help meet the targets of the 2030 Agenda in relation to water care, and preservation, must be addressed. The solution to this problem justifies the importance of integrating environmental externalities of water in business decision-making. The hypothesis assumed states that sustainable cost helps generate more information for companies to plan actions that benefit the environment.

DEVELOPMENT

Sustainable cost of organizations

The inclusion of environmental externalities of water in the production costs of goods and services through sustainable costs relies on the three-dimensional accounting theory. According to this theory, organizations should report quantitative, qualitative, financial, and non-financial information to internal and external interest groups about the impact of corporate social responsibility practices, and the implementation of their development strategy (Adams and Larrinaga, 2007; Fronti and Wainstein, 2000; Lamorú, 2011; Lehman, 1995; Llena, 1999; Mejía, Montes, and Mora, 2013; Paradelo, 2012, and Salas, 2015).

According to this theory, environmental externalities should be included in the accounting report generated. Environmental impacts (Sinforoso, Ricardez, and Salazar, 2017) are grouped in sustainable costs, which is part of the costs of goods and services, in order to move into socially optimum production (Rodríguez, Moreno, and Zafra, 2014)

The inclusion of environmental externalities in the production costs generates a product life cycle (Fig. 1).

Sustainable cost represents an assessment of environmental externalities. It is integrated in the cost of production as the fourth element added to the profit margin, and makes the sales price (Fig. 1). When a good or service is sold, the organization makes income that will be used in water care and preservation practices, which must be utilized to meet the needs of future generations, thus creating sustainable production (Larrinaga, 1997)

The cycle shown in Fig. 1 encourages consumers to pay for the real cost of the purchase (Rodríguez *et al.*, 2014). Besides, the externalities of information for decision-making improve its financial position; the environmental side generates added value to economic entities (Alexopoulos, Kounetas, and Tzelepis, 2018; Kumar and Firoz, 2019b; La Soa, 2019), though according to Kumar and Firoz (2019a), the largest companies have shown the greatest interest in these issues.

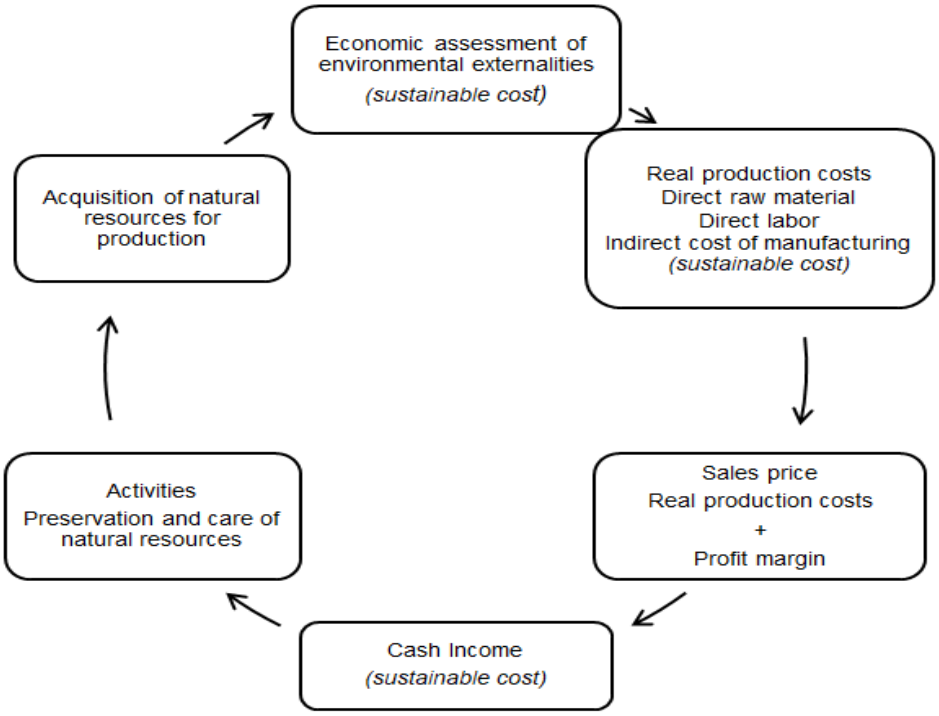

Fig.1. Sustainable cost cycle

Source: Sinforoso, Ricardez, and Tapia (2016)

Three-dimensional accounting theory and sustainable cost

The three-dimensional accounting states the need to record environmental impacts in accounting, which justifies the importance of quantitative and qualitative assessment of environmental externalities, in order to achieve company sustainability (Mejía, Montilla, Montes, and Mora, 2015). It leads to the emergence of environmental accounting; Larrinaga (1997, p.960) says that "... the traditionally assumed criteria of business success in accounting have basically relied on results that ignore the social and environmental effects of companies".

Environmental accounting is defined as "the part of applied accounting, whose object is the relations between an entity and its environment" (Fernández, 2004, p.33), that reports to internal and external customer of the organization about issues related to the environment, making it a "recognized research line" (Llull, 2001,p.6).

The issue of environmental impact in accounting, according to Llull (2001), had been avoided due to several limitations, such as the absence of market value, the lack of a

model for economic assessment, etc., which made companies focus on just recording the positive side and discard the negative, like the impact of companies on the environment. However, sustainable cost, the element addressed in this study, contributes to the solution of such theoretical shortage.

Several research studies have been done in environmental externalities from a cost accounting perspective, and they are all related to sustainable cost. All claim the importance of considering the environmental side in decision-making. Some of these studies are shown below:

Egbunike and Racheal (2015) suggest the application of a system of costs based on activities to integrate environmental costs in accounting reports.

Reynaldo and Guardado (2016) focus on environmental recording, presentation, and evaluation through technical and economic indicators.

González, Alaña, and Gonzaga (2018) conducted a theoretical review on the inclusion of environmental managing in small and mid-sized companies, and its contribution to increased competitiveness.

Mawali, Sharif, Rumman, and Kerzan (2018) looked into the association between the implementation of the environmental strategy (ES) and environmental management accounting (EMA).

Wang, Wang, Zhu, and Jiayan (2018) studied the environmental impact of the entire process of power generation using coal, in order to implement effective measures to control power use and reduce polluting emissions.

Casazza, Accardo, Severino, and Lega (2019) identified the absence of quantification of environmental impacts caused in a gypsy camp.

Sinforoso, Álvarez, Ferreiro, and Tapia (2019) determined the sustainable cost of 3, 4, and 5-star hotels in Santa Lucia (Cuba) and Tuxpan (Veracruz, Mexico).

Sinforoso, Ricardez, and Pelegrín (2019) established the importance of integrating environmental externalities in production costs for decision-making in environmental matters, by a coffee processing company.

Sinforoso, Salazar, and Álvarez (2019) examined sustainable cost as a strategy to foster sustainable tourism that contributes to industrial development in Tuxpan, Veracruz, Mexico.

Taibi, Antheaume, and Delphine (2020) discussed accounting operationalization for sustainable development.

Sustainable cost and the Mexican standard

The integration of environmental externalities in the cost of goods or services through sustainable cost is legally backed through the Mexican regulations framework. Some legal bases are described below:

The Political Constitution of the United States of Mexico (National Institute of Social Development, 2020), article No. 27, the third paragraph, states that the nation has the right to impose all the modalities needed for public interest on private businesses at any time; and to regulate the utilization of natural elements that can be acquired, seeking social benefits, to make an equitable distribution of public resources; observe preservation; balance national development; and improve the living standards of the rural and urban populations. This document backs the protection of natural resources in such a way that the proposal of sustainable cost is viable for consideration as an environmental practice implemented in Mexican organizations.

The Organic Law of Federal Public Administration (Congress of the United States of Mexico (1976) in item XV, article 32 Bis, determines the development and encouragement of methodologies and procedures of economic valuation of the natural capital, and the environmental goods and services, and to cooperate with subsidiaries and entities to develop an integrated system of economic and environmental accounting. It also adds that sustainable cost is within the functions of the Department of Environment and Natural Resources (SEMARNAT). Its methodological proceedings permit economic assessment of non-renewable economic resources, like water.

The General Law of Ecological Balance and Protection of the Environment (Congress of the United States of Mexico, 2012), article 7, item 8, stipulates that the states have the faculty of regulating sustainable use, and prevention and control of water pollution, as well as the national waters assigned to them within their jurisdictions.

Moreover, sustainable cost is within the parameters of The Financial Reporting Standards, series C-9, and International Standards of Financial Reporting in the International Standard of Accounting 37 (Mexican Counsel of Financial Reporting Standards, 2017, 2019). A study done by Sinforoso, Ricardez, and Tapia (2016) considered it a provision. That is, a debt the company has to the environment, which is paid at the time of implementation of measures to preserve natural resources.

Methodology

This study follows a qualitative approach, using economic values of environmental externalities (sustainable cost) determined during two research studies, in order to analyze the manner in which the outcome can contribute to the 2030 Agenda; it relies on descriptive analysis. Document review was the technique used to analyze the results of sustainable cost, and its contribution to compliance of the global goals of the 2030 Agenda. The instrument is a record sheet, which helped capture the values of sustainable cost in the coffee business sub-sector and tourism. Analysis and synthesis was the method used to study environmental issues as a global phenomenon through sustainable cost, with particular emphasis on water.

Results and analysis

The calculation of sustainable water cost in coffee exporting companies in the state of Veracruz is shown below, according to Sinforoso *et al.* (2017).

- The amount of water used to produce one kilogram of coffee: 60 L
- Percentage of purification (L): 85%
- Total purified water: 51 L
- Total polluted water with an irreversible impact: 9 L
- Economic value of one liter of polluted water (Mexican pesos): $0.40
- Economic value of negative environmental externalities in the water (Mexican pesos): $3.60

The economic value of negative environmental externalities of water in a 5-star hotel in Tuxpan, Veracruz (Sinforoso *et al.*, 2019) is shown below:

- Daily water consumption: 1 000 L
- Percentage of purification: 80%

- Amount of purified water: 800 L
- Amount of non-purified water: 200 L
- Value given per liter of polluted water: $0.40
- Economic value of environmental externality: $80.00
- Additional cost of guest service per night (100 rooms estimate): $0.80

Critical analysis of the contribution of sustainable cost to meet the targets included in goal No. 6 of the 2030 Agenda is being conducted.

Analysis and synthesis was used to generate these results, following the methodological procedure by Sinforoso *et al.* (2017) that comprises the stages of identification, valuation, recording, and presentation of the negative externalities of water.

Identification: It was done throughout the life cycle of coffee, from collection to packing. In the hotel, the lodging cycle was analyzed.

Classification: The typology of environmental impacts used in the two business sectors according to Conesa (2010).

Valuation: The method of choice experiment was used to valuate negative water environmental externalities, a tool used by several authors, such as McFadden (1974), Louviere and Woodsworth (1983), Morley (1994), and Blamey, Bennett, Louviere, Morrison & Rolfe (2000), for environmental assessment.

Recording: The process cost system was used. The environmental externalities were recorded in accounting through the sustainable cost account.

Presentation: The sustainable and provision cost account was used for presentation in the basic financial state.

An analysis of the results from every business sector is shown below:

Coffee sector

Sinforoso *et al.* (2017) did a study to determine the value assigned to a liter of polluted water by coffee exporting companies in Veracruz. They found that, on average, directors give every liter of water that cannot be purified a value of $0.40, which, if multiplied by the amount of water used to produce one kilogram of coffee, makes a sustainable cost of $3.60, as shown above.

Service sector: hotels

Sinforoso, Salazar, and Álvarez (2019) assert that in the case of five-star hotels, the value assigned to environmental externalities is $0.40 to every liter of polluted water, in a study done to several hotels in the harbor of Tuxpan, Veracruz, Mexico. According to the results of the study, the findings of Kumar and Firoz (2019a) were corroborated; the largest companies are the ones placing more emphasis on this issue. Previously, the economic value of environmental externalities in a five-star hotel was presented.

Now, the negative economic value of the environmental externalities of water, estimated for a month of operations in a five-star hotel located in Tuxpan, Veracruz, is shown (Sinforoso *et al.*, 2019):

- Additional cost of guest service per night (100 rooms estimate): $0.80
- Number of hotel rooms: 100
- Daily value of environmental externalities of water: $80.00
- Monthly value of negative environmental externalities of water: $2 400.00

Although the hotel has a water purification system, a volume of water of about 200 liters cannot be purified. According to Sinforoso *et al.* (2018), it must be considered as the cost of lodging service. Based on these calculations, the monthly income would be $2 400.00, which might be used to finance water care and preservation.

The above results were used to conduct a comparative analysis (Table 1) in which the directors of the two business sectors assign the same economic value to a liter of polluted water. This decision is dependent on the environmental culture, and the commitment the company has in relation to the environment. Likewise, the two sectors are willing to contribute to the care of natural resources through sustainable cost determination.

Table 1 Comparative analysis of sustainable cost between the coffee and hospitality sectors

Business sector	Economic value assigned to each liter of polluted water	Sustainable cost
Coffee sector	$0.40	$3.60 to every coffee kilogram
Hospitality sector	$0.40	$0.80 to every room, daily

Source: Based on the data by Sinforoso *et al.* (2017) and Sinforoso *et al.* (2019)

Assigning a value to environmental externalities is a move toward sustainable development that very few companies would make. It requires real commitment to the environment. However, companies should identify environmental externalities urgently in order to change their productive processes or the manner in which a service is provided, then seek for alternatives to preserve water.

Analysis of sustainable cost and its relation to Goal No. 6 from the 2030 Agenda

In 2015, the United Nations Organizations stated 17 goals for sustainable development. Water care and preservation is Goal No. 6: clean water and sanitation, focused on improvements in access to water for consumption and sanitation, and rational management of fresh water ecosystems in the local communities of various developing countries from Sub-Saharan Africa, Central Asia, South Asia, Eastern Asia, and South East Asia.

Goal No. 6 contains several targets, including significant aspects in relation to water, as shown in Table 2.

Table 2 Targets in Goal No.6 Clean water and sanitation (up to 2030)

Target	Description
6.1	Universal and equitable access to safe and affordable drinking water for all.
6.2	Access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girlsandthoseinvulnerablesituations.
6.3	Improvement of water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
6.4	Substantially increase of water use efficiency across all sectors and ensure sustainable withdrawals and supply of fresh water to address water scarcity and substantially reduce the number of people suffering from water scarcity
6.5	Implementation of integrated water resources management at all levels, including through transboundary cooperation as appropriate
6.6	Protection and restoration of water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

Source: Self-made using data from CEPAL (2019)

Determining the sustainable cost of organizations, and including it in their production costs to set selling prices is in keeping with goal No.6 from the 2030 Agenda, as follows:

Target No. 6.1, when an organization determines sustainable cost and includes it in the selling price, it will have enough resources to finance universal access to water by the inhabitants of nearby communities. Besides, it will be able to finance sanitation and hygiene services. According to Sinforoso *et al.* (2017), sustainable cost permits companies to possess cash for implementation of purification water systems that reduce pollution (goal No. 6.3).

Knowing the sustainable cost of companies or the country will allow national and international companies to make more appropriate decisions to implement environmental management strategies in order to improve water quality (target No. 6.5), reduce shortage (target No. 6.4), and search for alternatives to protect and preserve natural resources. For instance, sustainable cost from companies may be used not only to protect water, but also to restore other ecosystems, such as forests, jungles, mountains, etc. (Target No. 6.6).

CONCLUSIONS

Determining sustainable cost allows companies to access information for decision-making in favor of the environment, from raw material replacement to changes in productive processes. It also generates additional income to companies, that should be used for the protection and preservation of water or other natural resources.

Sustainable cost is one tool that contributes to sustainable business model. Accordingly, coffee companies should work on the pressing need of identifying which production stage is most polluting, in order to conduct proper analysis, and implement an innovating and sustainable stage alternative. Following the same line in the hospitality sector, particularly the hotels require analysis of environmental impact that helps reduce water pollution.

The information generated by environmental accounting is essential to make business decisions, whose implementation through sustainable costs of companies contributes to meet the challenge of the 2030 Agenda, Goal No. 6 (clean water and sanitation), since determining sustainable cost represents an additional income for companies. These

funds can be used to finance activities in favor of natural resources, such as the cleaning of rivers, creeks, lakes, wells, etc., or management of green investments, such as the installation of water purification equipment, and the like.

The relation of the results of sustainable costs between the coffee and hospitality sectors in Mexico, and the compliance of one of the goals of the 2030 Agenda, shows that accounting is not just a discipline, but a science seeking satisfaction of the demands of society in such a significant issue for humans, as water use is.

In the Mexican business sector, sustainable cost may be developed in the companies indexed in the Mexican Stock Exchange, since they share the greatest interest in environmental issues.

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Conflicts of interest

The authors declare that this manuscript is original, and it has not been submitted to another journal.

Author contribution statement

The authors are responsible for the contents of this article, adding that it contains no plagiarism, conflicts of interest or conflicts of ethics. Author contribution statement

Dr. Saulo Sinforoso Martínez: Redaction of the theoretical rationale, and design of the manuscript.

Dr. Arístides Pelegrin Mesa: Design of the methodology.

Dr. Edalid Álvarez Velázquez: Analysis of results and conclusions