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Information challenges on research concerning certified companies in ISO 14001 in Colombia

Desafíos de la información en investigación relativa a las empresas certificadas ISO 14001 en Colombia

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Access to information is key to monitor and study environmental performance of certified companies
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Abstract

Although the environmental management model ISO 14001 is one of the most adopted in the world, the search for information on certified companies in this standard in Colombia faces great limitations. We analyze the main challenges encountered when undertaking research related to companies that are currently certified in ISO 14001 in the country and how the limited information reduces the possibilities of expanding knowledge. Lack of information makes it

difficult to establish the precise number of certified companies, leading to statistical errors and underestimations of the sample size required for some studies, which also produces inaccurate conclusions about the companies' performance. We found a lack of consolidated statistics of companies certified in ISO 14001 both in Colombia, with an specific focus on the metropolitan area of Valle de Aburrá, with high level of outdatedness of the little information obtained. We propose some guidelines that could improve the process of managing this type of information in the country.

Keywords: environmental management; data access; certifying organizations; certification standards.

Resumen

Aunque el estándar de gestión ambiental ISO 14001 es uno de los más adoptados en el mundo, la búsqueda de información sobre las empresas certificadas en Colombia presenta grandes limitaciones y vacíos. El objetivo del presente documento es analizar las principales retos que se encuentran cuando se emprende una investigación relacionada con las empresas que se encuentran actualmente certificadas en ISO 14001 en el país y cómo esa escasa información reduce las posibilidades de ampliar conocimiento e imposibilita el establecer el número de empresas certificadas de forma precisa, lo que puede conllevar a errores de tipo estadístico al subestimar, por ejemplo, el tamaño mínimo muestral requerido para algunos estudios y, en consecuencia, llevar a conclusiones imprecisas sobre este fenómeno. Entre los resultados más significativos encontramos la falta de consolidación de la estadística de empresas certificadas en ISO 14001 en Colombia y específicamente en el área metropolitana del Valle de Aburrá y el alto nivel de desactualización de la poca información obtenida. Finalmente, se propone una estrategia que podría facilitar el proceso de gestión de este tipo de información en el país.

Palabras clave: Gestión ambiental; acceso a información; organismos certificadores; estándares de certificación.

Introduction

The access to relevant data about organizations is fundamental to produce knowledge that supports people and stakeholders decisions in the use and design of better information systems. Nonetheless, in several disciplines, such as environmental engineering, relevant data collection still faces challenges, particularly in developing countries. Specifically in the case of Environmental Management Systems (EMS), the information about managerial factors is essential to monitor the fulfillment of environmental restrictions and commitments.

EMS, best known since 1996 when the ISO 14001 series of standards were issued, have become subjects of study and, therefore, it is necessary to collect data on them within the framework of scientific research and government management. The ISO 14001 standards are of voluntary implementation and can be adopted by any company. The standard does not refer to the fulfillment of a specific result, but is oriented to systematize and formalize the processes related to different areas of business management (Heras-Saizarbitoria, 2011). Although many companies have implemented this regulation worldwide, few studies on its real impact on the environment exist, particularly in the context of developing countries, such as China (He et al., 2015), Brazil (Aguiar and Côrtes, 2014) and Colombia (Vargas, 2002).

Many limitations on research are closely related to concerns about scrutiny and exposure of EMS weaknesses to public opinion, especially due to the uncertainty of the industry against the legal interpretation of the results when the information is fully known by external agents (Vargas, 2002). Despite the growing number of international articles on ISO 14001, the performance of certifying bodies has not been addressed and there is a clear concentration of studies at the other end of the process, involving only certified companies. Therefore, this limited research seems to be related to a lack of information about the performance of the certifying bodies rather than to a lack of interest in the subject (Aguiar and Côrtes, 2014). This would be the case of countries like Brazil, for example, where interest in studying the effects of environmental certifications clashes with restrictions in information, since the certifiers do not disclose the information to their clients (Aguiar et al., 2016). Research in Europe and Asia is also departing from traditional studies on EMS, focusing more on an exhaustive review of these systems. In this regard, Ferrón (2017), Oliver (2011), Neumayer and Perkins (2004) and Abdullah and Fuong (2010), allow a more in-depth look at the adoption of these certified systems.

This article highlights the challenges of addressing an investigation on companies certified in ISO 14001 in Colombia, particularly in the inquiries about name and number of companies, which are minimum data needed for the design and execution of any study. We first identify the entities that, in our opinion, should have updated and relevant information about the certified companies in Colombia, particularly for the Department of Antioquia. The article comprises four main sections. We start with a literary review of the actors and elements that participate in the certification of companies in ISO 14001, followed by the description of the methodology used in our investigation, the results of our inquiries and finally the discussion of the factors that we consider affect this kind of studies in the country.

Review on EMS and the ISO 14001 certification

Sources of information on EMS

Research on EMS, particularly in terms of factors such as design and implementation, is still quite limited (Zutshi and Sohal, 2002; Vargas, 2002). In Latin America, most research on these factors, with a critical view on the standard, is conducted in Brazil (Aguiar y Côrtes, 2014; Aguiar et al., 2016; Silva et al., 2017). In Colombia, some studies exist on the implementation of environmental standards, but focusing on administrative, financial and economic issues and mainly on studies of implementation in the productive sector or as a tool for business management.

Most studies on the standard obtain their data by applying collection tools such as surveys and interviews that are sent to companies to be answered (Signes et al., 2013; Aguiar and Côrtes, 2014; Prajogo et al., 2012). In other cases, personal visits are made to the companies (Buenaventura et al., 2007); while others use data from other research conducted as case studies (He et al., 2015; Darnall et al., 2001). Many of these surveys go directly to the coordinator of the environmental management system and very few to the operators who are the platform in the organizational structure of a company. Studies by Signes et al. (2013), He et al. (2015), and Prajogo et al. (2012), show that many of the research focuses on economics, finance and administration and much less on the environmental implications of certifications.

ISO 14001

The ISO 14001: 2004 standard is a compendium of requirements that companies must comply in order to be environmentally certified. The purpose of this international standard is to provide organizations with a frame of reference to protect the environment and respond to changing environmental conditions in balance with socioeconomic needs. This standard specifies requirements that allow an organization to achieve the expected results for its environmental management system (ICONTEC, 2015a).

ISO International Organization annually disseminates the results of a survey that shows the number of valid certificates in the ISO 14001 management standards registered worldwide. This survey indicates the specific number of certifications per year, allowing a comparison of the evolution of countries over time. These records are issued by the certification bodies accredited by the members of the International Accreditation Forum (IAF), with the environmental management model being one of the most widely implemented.

According to the ISO Survey of 2018 (ISO, 2018), China is the country with the highest number of certifications (136,715) followed by Japan (19,131) and Italy (15,118). In South America, Brazil (2971), Colombia (2,794) and Argentina (1,390) are the countries with the

highest number of companies certified in ISO 14001. The numbers, however, are not entirely reliable, since not all companies are always willing to participate in the survey.

ISO 14001 in Colombia

According to the ISO 14001 2018 survey, Colombia has certified approximately 2,794 companies between 1999 and 2018. The productive sectors most interested in this type of certification are construction, transportation, engineering services, mining, machinery and equipment, and metal production.

Although the ISO 14001 in Colombia is not mandatory, it has been a complementary measure to the already existing national environmental normativity for companies to become aware and committed to avoiding negative impacts on the environment. In this regard, EMS are only an aid to comply with normativity, with four actors participating in the development of the ISO certification (Figure 1).

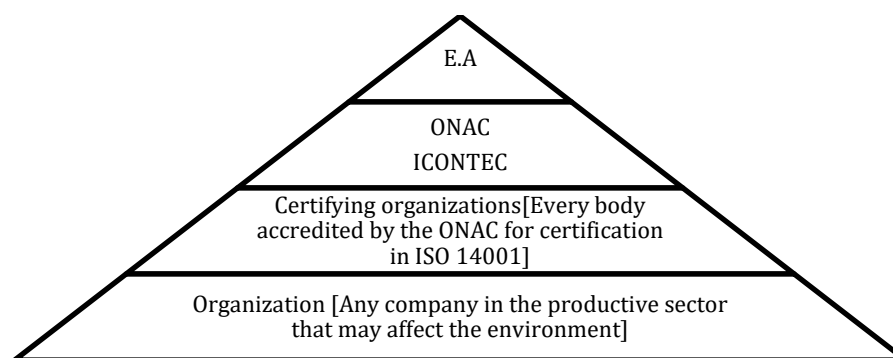


Figure 1 Actors involved in the certification process in Colombia

In the first place are the companies of the productive and service sectors which adopt the ISO 14001 standard, depending on the need or objective of the certification they seek (markets, demand from suppliers or customers, image, environmental commitment).

In second place are the certifying bodies of the standard in charge of providing accompaniment to the companies that wish to adopt the model. This accompaniment is usually carried out through consultancies and audits that take the company throughout the process, the culmination of which is the certification, once all the requirements have been met.

In third place are the National Accreditation Agency of Colombia (ONAC) and the Colombian Institute of Technical Standards and Certification (ICONTEC). ONAC is a private corporation of mixed nature, responsible for accrediting the technical competence of Conformity Assessment Bodies that certify companies in Colombia, exercising as a monitoring authority in good laboratory practices and performing functions of the National Accreditation Body of Colombia (ONAC, 2019). ICONTEC is the National Standardization Organization (a private, non-profit organization formed by representatives of the National Government an,

private sectors) that represents Colombia before international and regional standardization bodies such as ISO. ICONTEC was the first certification body that granted a certificate of quality management system in Colombia (ICONTEC, 2015b), and works to promote standardization, certification, metrology and quality management in the country.

In fourth place are the Environmental Authorities (EA), which are expected to enforce the regulations of the voluntarily implemented EMS, making due control and applying the pertinent sanctions for the breach thereof. In Colombia these functions are generally carried out by Regional Autonomous Corporations (CAR).

In Colombia, the Superintendence of Industry and Commerce, an entity attached to the Ministry of Development (Ministerio de Comercio Industria y Turismo in Spanish), is the one with the authority to carry out the accreditation of certification bodies in management systems, such as ISO 9000 and ISO 14001. Colombia has eleven conformity assessment bodies that are registered with the ONAC and are authorized to carry out accreditation processes in standards such as ISO 14001 (Table 1).

Table 1 Conformity assessment bodies in Colombia

N°	Organism assessor of the conformity	Accreditation code
1	Applus Colombia Ltda.	11-CSG-003
2	BVQI Colombia Ltda.	10-CSG-007
3	Colombian Advice of Security	11-CSG-001
4	Corporation technological Center of research and development of the electrical sector-CIDET	10-CSG-002
5	Cotecna certification Services Ltda.	09-CSG-003
6	Future Builders Colombia S.A	15-CSG-002
7	ICONTEC	09-CSG-001
8	International Certification and training S.A.-IC&T S.A.	10-CSG-004
9	Certification body of the management system of the Technological University of Pereira QLCT	10-CSG-001
10	SGS Colombia S.A.S –SG.S	09-CSG-005
11	TUV Rheini and Colombia S.A.S	12-CSG-001

Source: ONAC (2019)

Methodology

The information requested from the institutions in particular was if specific data were kept on the number of companies certified in ISO 14001 at the level of Colombia and at the level of the metropolitan area of the Aburrá Valley. In the same vein, certifying organizations were asked if they could share the list with the names of the companies certified in the Aburrá Valley.

The time taken to gather information was 6 months, since the response time of state institutions and organizations fluctuated between 3 and 120 days. This could be due to the fact that, on many occasions, we were redirected to another post or other department, or we had to wait for the authorization of top management officials.

The sampled population included national entities operating in the country and conformity assessing bodies in Colombia. The protocol for the search of information with each of the organizations was a query via email or by the "contact" link that is established on each of the web pages of the entities. Emails were sent to the managers. Once the answer search was exhausted by this means, we contacted them by telephone.

The search of information in public institutions of the environmental and administrative order (Autonomous Corporations, Ministry of the Environment, Administrative Department of Statistics (DANE), Superintendency of Industry and Commerce of Colombia, National Environmental Licensing Agency, National Cleaner Production Center) followed the same information request methodology: Email to "contact" website of each entity, contacts via email, phone calls and visits to some entities.

Likewise, owing to the impediment of some entities to deliver information, we used rights of petition, which in Colombia is a legal "last resource" to request information and responses from administrative authorities, before some of the surveyed institutions.

Results

Table 2 shows the list of national entities that were asked for information about companies certified in ISO 14001 in the Aburrá Valley. In three cases (Corantioquia, the Metropolitan Area of the Aburrá Valley and the National Mining Agency), the information had to be gathered through rights of petition (Table 3), obtaining a response by certified mail approximately one month after filing the application.

Table 2 National entities to which we requested information about companies certified in ISO 14001 in Colombia.

N°	Entity	Information		
		Null	Partial	Total
1	Superintendence of Industry and Commerce (SIC)	x		
2	National Administrative Department of Statistics (DANE)		x	
3	Ministry of Environment (MED)		x	
4	National Agency of Environmental Licenses (ANLA)	x		
5	National Cleaner Production Center (CNPL)	x		
6	National Accreditation Organization (ONAC)	x		
7	Colombian Institute of Technical Standards (ICONTEC)			x
8	Metropolitan Area of the Aburrá Valley	x		
9	Chamber of Commerce of Medellin	x		
10	Corantioquia	x		
11	National Mining Agency		x	

Sources: this study.

Of the 11 organizations in charge of certifying companies in this standard, just three responded to the request for information (the National Mining Agency, the Ministry of the

Environment and DANE). Of those, only one provided the complete information, another only provided partial information and the last responded that they did not handle the requested information. The remaining eight did not respond, neither by email, nor on the website referred to for contact.

Table 3 Environmental authorities from which information was requested through rights of petition

Entity	Date filing	Answer date	Answer	Response time
Corantioquia	24/11/2017	17/12/2017	"The entity does not have the information, remits right to the metropolitan area ..."	23 days
Metropolitan area	14/09/2017	18/10/2017	"We allow ourselves to inform you that, regarding the list of companies of the Metropolitan Area of Valle de Aburrá certified in ISO 1400; the entity does not have such information, since we are not competent to certify in this environmental management system ..."	34 days
National mining agency	01/08/2018	28/08/2018	"Of the 45 mining titles classified as PIN (mining contracts) only fourteen are certified in ISO 14001"	28 days

Sources: this study.

On the other hand, in the inquiry made to the certifying organizations, state entities expressed some restrictions to deliver the information, which are summarized in Table 4.

Table 4 Adduced restrictions in obtaining information

N°	Restriction	Aspects
1	Refusal of certification organizations to release information	Confidentiality Attack from competitors Business secrecy
2	Lack of consolidated data in state entities	Outdated Sent to other institutions. Do not handle the requested information.
3	Little research on the subject	The information must be directly collected from the certified companies, through surveys or interviews (Heras-Saizarbitoria et al., 2011). There are no consolidated databases where information can be obtained; visits to the study sites are made (Rondinelli, 2000). Studies on the issue itself are limited in Colombia. A large number of studies focus on the economic benefits of model implementation.

Sources: this study.

ICONTEC was the only certifying organization that, on request, provided the statistical data of the companies they have certified in Colombia and the Aburrá Valley since 2012 up to 2017 (Figure 2), with numbers that tend to stabilize below the thousand companies (upon a new request to update numbers in 2019, they did not provide the updated information).

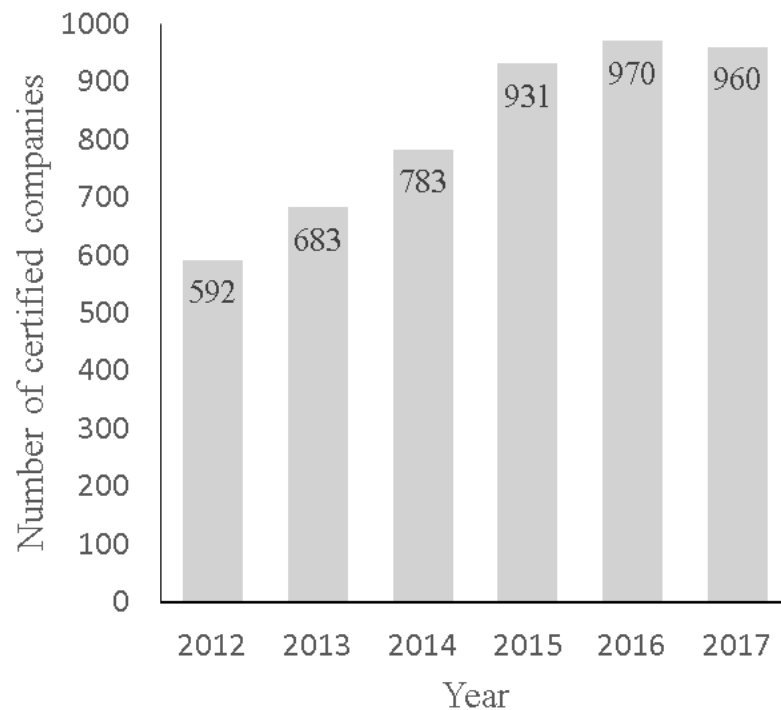


Figure 2. Companies certified by ICONTEC in ISO 14001 from 2012 to 2017 in Colombia. Sources: this study.

Refusal of certification organizations to release information

The first challenge in investigating environmental concerns of the certification process is the refusal of certifying organizations to provide information on companies certified in this standard. These organizations adduced three main reasons for this refusal (Table 4): confidentiality (the company requests a guarantee that the internal information of the company will be protected so that it is not disclosed without consent), attack by competitors (subtraction of information from large firms, which motivates many organizations to limit their information due to fear of being affected by attacks by employees who modify or suppress information, by people outside the company or competing companies), and business secrecy (information and knowledge that, according to the certification organizations, should not be accessible to the public, since they offer a competitive advantage in the market, and for this reason their disclosure is avoided).

Lack of consolidated data in state entities

The second challenge is that consolidated information on companies certified in the ISO 14001 standard by the environmental control agencies is very vague and in some cases outdated. The Ministry of Environment and Sustainable Development, for instance, only provided information on the number of certified companies in the period 1996-2014 (Figure 3), figures that are far lower than the ones reported by the ISO survey in 2018 (we requested the information from the Ministry of the Environment in 2017 and again in 2019, obtaining the same response, indicating that no updates have been made on this subject). Differences are expected, since ISO obtains its information directly from the certifying bodies of each country (indicating the number of valid certificates when they complete the survey questionnaire), while the Ministry of the Environment obtains the information available from DANE that reports from certification bodies to calculate the indicator of the country and from their records. DANE extracts the total number of companies that had obtained the corresponding certification but they also expresses that the main limitation is the dependence on reports from certifying bodies who are free to provide or not the information required. In Figure 3 we can observe a decreasing tendency in ISO certifications after 2014, which coincide with the last year in which the Ministry of Environment keeps the records.

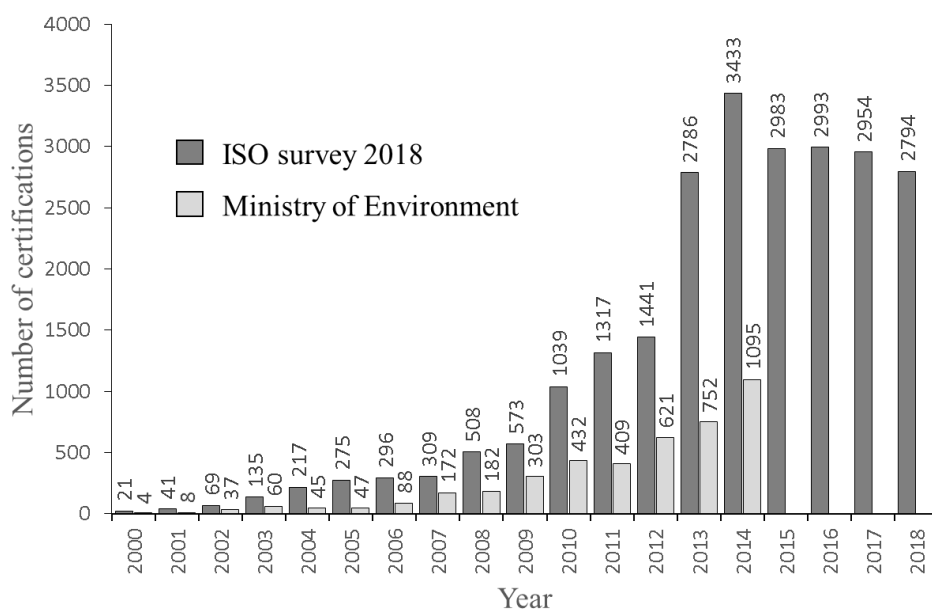


Figure 3. Number of companies certified in ISO 14001 since 1996-2014, according to the Ministry of Environment and Sustainable Development and ISO survey 2018

Likewise, the regional environmental control entities (which in Colombia are the Autonomous Corporations) do not have a consolidated list of certified companies, nor do they manage these environmental management models. They only have information on companies

that have not complied with any environmental regulations and that are sanctioned. In addition, this same information was consulted in entities such as the National Cleaner Production Network and the response was that they did not have a consolidated data on the subject. The answers given by these organizations to the question about the list of companies certified in ISO 14001 in the Aburrá Valley include the following:

"We inform you that, regarding the list of companies of the Aburrá Valley certified in ISO 14001, **the entity does not have such information as we are not competent to certify this management system**, this power to carry out accreditation of certification bodies in Environmental management systems is the Superintendence... "

"According to your request on "companies that are certified in Colombia under the environmental management model ISO 14001" to which a response was given informing that the...**does not have updated information in this regard**, also informing about the entity responsible for processing which is..."

"Just as they have justified the clients for themselves, in my case I must also tell you that, due to the confidentiality of the information, I can not collaborate with your request."

"In response to your request, I confirm the following information that we can provide", "**Currently it is not possible to give detailed statistics of the number of companies by size**, but we can give you the following data ..."

"As I mentioned from the beginning, I can provide information of a statistical nature, without mentioning companies or information considered confidential, both by and by our clients..."

Although many organizations have websites, official telephone lines and offices, accessing them is difficult and time consuming when requesting the information. Requests are usually moved from one area to another and most of the time, the procedure ends up being transferred to another entity.

Discussion

How do restrictions on information of certified companies in environmental standards imply problems in research processes, decision-making, and development of projects that could contribute to the environmental improvement of an organization, a region or a country?

As emphasized by Torres (2014), the organizational reality of the institutions can strongly influence the way information is provided to those who request it and in the way it is made available to the public. It is evident then that the first challenge that is faced in terms of the refusal to deliver this information by relevant entities is to perform the task of investigating in this regard. The second challenge of lack of consolidated and coherent data on EMS performance, is to try to present results that, in subsequent studies, can contribute to improve and systematize this information.

Information about certified companies is basic to develop indicators for designing public plans and policies that constitute a framework for investments in international projects. Therefore, the scarcity of such information can affect the implementation of these projects. That is the case, for instance, of indicators that reflect the degree of adoption of EMS, which identify the efficacy of policies and procedures in a country or region. The limitations of the indicator depend on the reports of certifying bodies who are free to provide or not the information required to generate the indicator. Another effect is the difficulty to do comparative studies between productive sectors of a region and its environmental implications, being companies that are supposedly complying with an environmental policy.

Unlike Colombia, in European countries, and even in other South American countries, there are public and private organizations that provide this information. This is the case, for instance, of AENOR in Spain, that allows accessing the directory of certified companies (the search is by company name, that is, it serves more to verify the certification, effective date and scope) (Aenor, 2019), or the European Union's EMAS (Eco-Management and Audit Scheme, or Community Regulation for Eco-Management and Eco-auditing), which has an online database organized by the European Commission that lists all the organizations and sites registered in EMAS (European Commission, 2018). In South America, Perú has a directory of certified companies (latest edition of 2016), prepared by the Industry Development Center, a private institution (CDI, 2020). The international organization for ISO Standardization only delivers the annual survey, recording the number of certificates issued by the certification bodies accredited by the members of the International Accreditation Forum (IAF) (the quantitative data available from the ISO's own statistics also show deficiencies, since "not all certifying bodies respond, resulting in a known universe of certified companies lower than the real one") (ISO, 2019).

Lets take the differences in numbers among institutions, for instance: the companies certified only by ICONTEC in 2017 were 960. However, two years before, the Ministry of Environment reported 1,095 companies whereas the same ICONTEC reported 931 companies. We may deduce that the other 164 certifications in ISO 14001 were made by other certifying organizations such as Bureau Veritas, I Qnet, among others. However, when comparing these data with the information provided by the ISO 2018 survey (Figure 2), we observe that ISO registered 2,794 companies certified in ISO 14001 in Colombia. This

incongruence shows how unreliable can be the statistical analysis, depending on the source of information, and the lack of consolidated databases on the certified companies. Given the scarcity of this type of basic information, authors such as Lira et al. (2019) and Hikichi et al. (2017), have relied on logistic and correlative methods to forecast ISO 14001 certifications at a country and continental level in the Americas and Europe. Nonetheless, these methodologies require certain quality control on the data to be employed to avoid bias and misleading results.

In the same vein, the fact that only three out of 11 state institutions and four out of 11 certifying organizations have partial information, indicates that the environmental certification is not a topic of much relevance in terms of environmental management policies in the country, and therefore, as Cuevas-Zuñiga et al. (2016) manifest: “certified companies do not enjoy and do not know the existence of incentives, motivations and benefits to implement a tool that regulates corporate sustainability actions.” This lack of incentives may lead to a reduction of EMS in companies (something that is likely occurring in the last years, according to Figure 3), which may also impact the implementation of new sustainable business models, green technologies, improved environmental communications, reduced emissions, energy savings and sustainable design (Pesce et al., 2018).

The discrepancies in numbers show the necessity to continue working on two aspects. The first aspect deals with the implications of limited information, which generate uncertainty and doubts about the environmental actions performed by the certified companies. In the same way, the outdated information leads to inaccurate results and biases and does not allow controlling effectively the performance of certified companies (Figure 4). In this regard, it would be advisable to make inter-institutional agreements between the private company (certification companies) and the public sector (ICONTEC, ONAC, DANE), to strengthen a database with respect to this information, which is essential as an indicator of sustainable development in companies and regions.

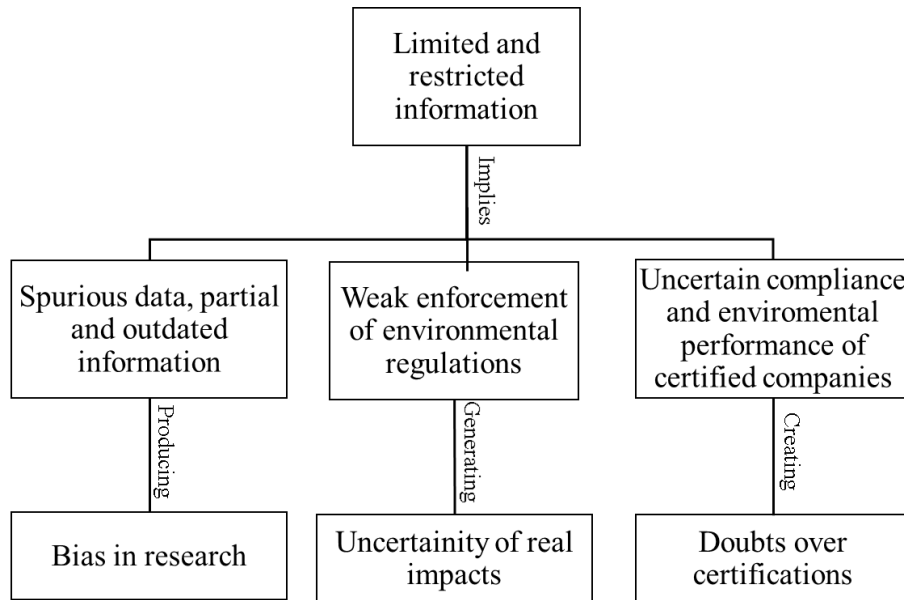


Figure 4 Implications of limitations in information on certified companies

The second aspect deals with the provision of relevant information, which would involve further advances in research studies, a better control in the valuation of the environmental performance of companies by the environmental bodies, and an improvement in decision making processes for development of policies (Figure 5).

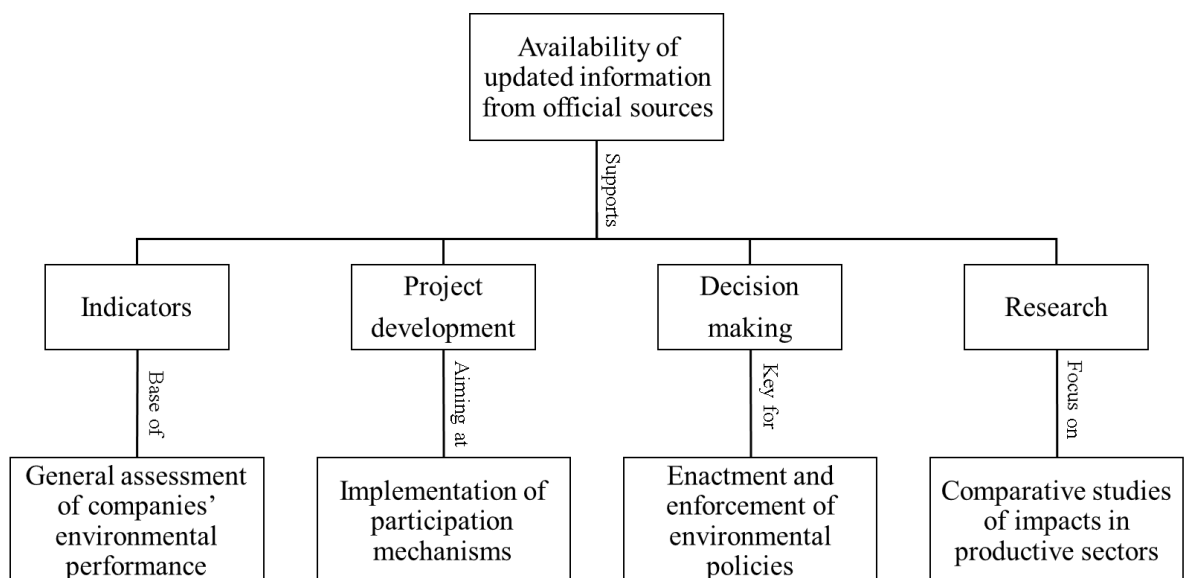


Figure 5 Advantages of relevant information availability

We argue that information is essential for the enforcement of environmental management processes in companies and for the advancement of meaningful national policies of environmental protection. In this sense, Colombia must implement a program to disseminate information regarding the companies that currently manage EMS in its Colombian

Environmental Information System (SIAC), which is a division of the same Ministry of Environment (MADS, 2020), which would be convenient to follow-up and do an effective monitoring of the performance of certified companies and fulfill the purpose of these certifications.

If certified companies, which are supposed to be held accountable for their performance, face the issue of insufficient information, then we must assume that companies that do not enjoy or do not adopt these models, go mostly unnoticed and therefore without adequate control, which implies a bias related to the universe of environmental impacts generated by the total number of companies and their surveillance by environmental authorities. Furthermore, since the evaluation of environmental performance is based on the idea that only what is measurable can be managed (Medel-González et al., 2015), taking certified companies as an indicator of sustainability as established by the Economic Commission for Latin America and the Caribbean (CEPAL) (CEPAL, 2019) could be an unrealistic indicator of a country's environmental performance. Therefore, the non-certified companies should be integrated into a network, together with the certified ones, with the sole objective of having a universe of information that can be managed by institutions working to improve the environment in the regions.

Although some studies indicate non-significant differences between certified and non-certified firms in the improvement rate before and after the adoption of ISO 14001 (Zobel, 2015), it would be essential to have a minimum of information about these companies. To make a follow-up, this information could be summarized in six simple documents that cover the set of essential aspects with which an organization must comply to contribute with the improvement of the environment, these documents would be:

1. Registration of affiliation as a company.
2. Document of environmental evaluation of processes.
3. Planning and execution of environmental activities.
4. A record of compliance with activities.
5. A record of requests, complaints and claims.
6. Record of compliance with current environmental regulations.

In short, Colombia must have a consolidated information system that encompasses both certified and non-certified companies and that serves as an axis for transferring information useful for corporate environmental progress and that contributes significantly to the objectives of the country's sustainable development.

Regarding the results derived from the investigation of these standards, although the specialized literature is extensive (Heras et al., 2006), it is appropriate to highlight that in-depth

studies of the phenomenon of certification are relatively scarce. In accordance with Oliveira and Serra (2010), research on the implementation of these standards should be more widely updated, because many of these studies gather focal information via visits, surveys and interviews directly to certified companies, since there are no precise data in this regard.

Finally, it should be noted that the role of companies in the improvement of the environment should be of public knowledge, and that the entities that represent them should be responsible for publishing this information. Although it is true that the adoption of the standard is voluntary, it is also clear that companies in the productive sector share high responsibility in terms of pollution. Before an undesired situation arises, the environmental control bodies have great responsibility, since all this information would serve to capture data that can be significantly beneficial when it comes to monitoring the environmental performance of organizations. Beyond certification, these models could help to project more precise regulations at the time of evaluation.

Conclusions

A characteristic element that we observe in this research is the high number of entities that claim not to be competent to deliver information and that simply redirect the user to other institutions. Consequently, the adoption of environmental standards by Colombian companies does not constitute in itself a significant indicator of the country's environmental policies, in the same way that not all companies that hold an environmental certification are synonymous with environmental responsibility, since some cases are presented that are sanctioned or fined because they continue polluting, which puts into question the primary objective of these certifications.

It is important to bear in mind that the lack of precision about the number of certified companies ends up damaging the development of comparative studies between productive sectors of a region. To all this, it would be interesting to find out what are the causes of these data inaccuracies and to think that granting certificates with the sole intention of getting more clients from the certifying companies will not necessarily favor the companies, the client or the environment.

To the extent of our review, this phenomenon not only occurs in Colombia, but also in other countries with limited access to information (i.e., China and Brazil). Broadly speaking, it should be noted that in the academic literature that analyzes the phenomenon, there is a need for a greater critical and interdisciplinary perspective that can make contributions from the interests of business managers.

The arguments given by the certifying firms for not providing information on the certified companies, although valid for these firms, limit the investigation and do not allow inquiring about the possible guarantees that arise from the implementation of these management models, as well as the true function that these companies represent. Therefore, overcoming some of the limitations that we have mentioned in this document, through the consolidation of relevant databases of certified and non-certified companies will allow a continuous and systematic comparison process of their environmental performance for which they are accountable.

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