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Environmental impact assessment in Colombia: Critical analysis and proposals for improvement

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ABSTRACT

The evaluation of Environmental Impact Assessment (EIA) systems is a highly recommended strategy for enhancing their effectiveness and quality. This paper describes an evaluation of EIA in Colombia, using the model and the control mechanisms proposed and applied in other countries by Christopher Wood and Ortolano. The evaluation criteria used are based on Principles of Environmental Impact Assessment Best Practice, such as effectiveness and control features, and they were contrasted with the opinions of a panel of Colombian EIA experts as a means of validating the results of the study. The results found that EIA regulations in Colombia were ineffective because of limited scope, inadequate administrative support and the inexistence of effective control mechanisms and public participation. This analysis resulted in a series of recommendations regarding the further development of the EIA system in Colombia with a view to improving its quality and effectiveness.

1. Introduction

Environmental Impact Assessment (EIA) entails the examination, analysis and assessment of planned activities with a view to ensuring environmentally sound and sustainable development. EIA can thus be regarded as an effective planning and management tool (Hollick, 1981; Ortolano and Sheperd, 1995; Samarakoon and Rowan, 2008; Snell and Cowell, 2006; Wathern, 1994; Wood, 1993). As such, it can be used to identify the type, magnitude and potential changes in the environment as a result of an activity or policy. It also helps to convey this information to decision-makers. Evidently, the adoption and implementation of Environmental Impact Assessment depend on the institutional framework and political context of the decision-making process (Ortolano et al., 1987).

EIA first came about as the result of the National Environmental Policy Act, passed in 1969 by the United States government (Bailey, 1997; El-Fadl and El-Fadel, 2004; Hollick, 1986). This law provided a baseline for EIA legislation in a number of developed and developing countries, who subsequently introduced their own EIA processes. Examples of such countries are Australia (Formby, 1981; Hollick, 1981), Canada (Sewell, 1981) and New Zealand (Montz and Dixon, 1993; Turner and Somerville, 1983).

Because of its wide variety of ecosystems, flora, fauna, and soils, Colombia is one of the countries with the greatest biological diversity in the world (Armenteras et al., 2003). However, this biological diversity is currently endangered by human activities, which have destroyed approximately half the vegetation cover (Etter et al., 2006). Precisely because of its fragility, biological richness and high number of endemic species, Colombia places a high priority on environmental conservation (Dávalos, 2001). This growing national awareness has led the government to implement programs for environmental conservation, recovery, and sustainable handling in order to counteract the negative impacts of human activities on ecosystems and biological resources (Alexander von Humboldt Biological Resources Research Institute, 2007).[1]

In 1994, Colombia signed international treaties, such as the United Nations Conference on the Human Environment (UN, 1972), the Convention on bilogical diversity (1992a), the United Nations Conference on Environment and Development (UN, 2002) and the Convention on the Environmental Impact Assessment in a Transboundary Context (UN, 1991). As a result of these international agreements, as well as the Colombian Constitution of 1991 (Official Journal of the Colombian Government, 1991), an EIA system is now specifically contemplated in national legislation. Currently, an

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[1] The mission of the Alexander von Humboldt Biological Resources Research Institute is to promote, coordinate, and carry out research that contributes to the conservation and sustainable use of the biological diversity in Colombia.

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environmental license is compulsory for all projects and actions carried out in twenty-one economic sectors and activities (Decree 1220 of 2005) (Official Journal of the Colombian Government, 2005a). This means that these economic sectors and activities must conduct an environmental study before embarking on the planning, location, installation, construction, assembly, maintenance, dismantling, as well as the abandonment and/or termination of activities, use of space, and infrastructure. However, studies conducted by the *Contraloría General de la República*[2] (CGR) point to the weakness and general ineffectiveness of the Colombian EIA system (CGR, 2006), which is in urgent need of evaluation and corrective measures.

Difficulties and obstacles encountered by various countries, which have tried to carry out EIA, have caused organizations to call for the evaluation of EIA systems, e.g. the International Association for Impact Assessment (Sadler, 1996). As a result, evaluation models have been designed and applied in both developed and developing countries: Taiwan (Leu et al., 1996); Estonia and Norway (Holm-Hansen, 1997); the United Kingdom, Germany, Spain, Belgium, Denmark, Greece, Ireland, and Portugal (Barker and Wood, 1999); North America (Clark and Richards, 1999); Republic of Maldives (Annandale, 2001); Egypt, Turkey and Tunisia (Ahmad and Wood, 2002); the Middle East and North Africa (El-Fadl and El-Fadel, 2004); Fiji (Turnbull, 2003); Greece (Androulidakis and Karakassis, 2006); India (Paliwal, 2006); Sri Lanka (Samarakoon and Rowan, 2008). Nevertheless, there are very few references to EIA systems in Latin American countries (Ahmad and Wood, 2002; El-Fadl and El-Fadel, 2004) and absolutely none in Colombia.

This paper describes the Colombian EIA system and applies EIA system evaluation criteria to the impact assessment process in this country. Hopefully, these results will be conducive to administrative reform. Section 2 summarizes the history of EIA activity in Colombia, with particular emphasis on the environmental license; the description of its legislative, procedural, and institutional framework demonstrates how these formal structures influence both policy and decision-making for specific projects. Section 3 focuses on how the EIA evaluation criteria were chosen for our study. It describes how these criteria were used to analyze outcomes as well as to identify the strengths and weaknesses of the EIA process. As a conclusion, a set of recommendations are given for the successful implementation of the EIA system in Colombia. The final section of the paper includes the Acknowledgements as well as the References.

2. An overview of EIA activity in Colombia

The legal system in Colombia regulates the relationship between citizens and government in both natural and sociocultural environments. More specifically, it deals with issues related to project design, performance, implementation and dismantling, as well as work or activities which may cause adverse impacts on the environment (Fig. 1).

Colombian law designates EIA as the main tool in the decision-making process for any project which may cause environmental impacts. Specific examples of such laws are the following:

- The Natural Resources Code of 1974, which was the first national environmental law (Official Journal of the Colombian Government, 1974).
- The Political Constitution of 1991, which includes forty articles related to the environment (Official Journal of the Colombian Government, 1991).
- Law 99 of 1993, which organized the National Environmental System and first incorporated the concept of Environmental Impact Study (EIS) into Colombian legislation (Official Journal of the Colombian Government, 1993a).
- Environmental decrees, ranging from Decree 1753 of 1994 to Decree 1220 of 2005 (Official Journal of the Colombian Government, 1994a).

EIA has been defined in Colombian legislation as a technical and legal system regulating decision-making in projects, work, and activities which may cause environmental impacts (Law 99 of 1993; Decree 1220 of 2005). This definition is in consonance with international definitions, which describe Environmental Impact Assessment as a preventive management tool for the systematic evaluation of actions as well as the effects of such actions on the environment (Snell and Cowell, 2006; Wood, 2003).

2.1. EIA legislation in Colombia

EIA was first introduced in Colombia as the result of various international agreements signed within the framework of the United Nations Conference on the Human Environment, which took place in Stockholm in 1972. For example, Principle 24 of the declaration adopted at this conference fosters cooperation through multilateral or bilateral agreements to effectively control, prevent, reduce and eliminate adverse environmental effects resulting from activities conducted in all spheres (UN, 1972).

Decree 2811 of 1974, which is known as the Natural Resources Code (Official Journal of the Colombian Government, 1974), was the first law enacted in Colombia to regulate environmental policy and social action pertaining to natural resources management (Sánchez-Triana and Ortolano, 2001). This decree incorporated legal measures related to EIA. It made an environmental license compulsory for all projects with a potential environmental impact although it did not regulate the process or specifically name it. However, Decree 2811 indirectly referred to EIA objectives since it required projects to conduct a previous ecological and environmental study as well as to obtain an environmental license for any work or activity, which because of its nature, might seriously damage natural resources.

In 1991, the new Colombian Political Constitution incorporated more EIA measures, especially in Articles 79 and 80 (Official Journal of the Colombian Government, 1991). This new Constitution established the inalienable right to a healthy environment. Furthermore, it made the government responsible for the handling and exploitation of natural resources, for their sustainable development, conservation, restoration or replacement, and for the prevention and/or monitoring of factors that might cause environmental deterioration. In this way, Decree 2811 laid the groundwork for Law 99 of 1993 (Official Journal of the Colombian Government, 1993a) which created the Department of the Environment. It also reorganized the Public Sector for environmental management and conservation as well as renewable resources. In addition, it also led to the organization of the National Environmental System. Law 99 was the first law to specifically incorporate EIS in the Colombian legal code (Article 57) in the same way that Articles 49–62 describe and regulate the environmental license.

Since the enactment of Law 99, the EIS and EIA have been modified several times. These modifications reduced the number of activities requiring an environmental license, and also simplified regulations pertaining to methods for the identification and evaluation of environmental impacts (see Table 1). The analysis of Colombian environmental legislation from 1994 to 2007 helps to contextualize this extremely complex situation.

Decree 1753 of 1994 implemented Law 99 (Official Journal of the Colombian Government, 1994a). It regulated forty-two sectors and activities, and required them to submit an EIS (see Table 1, column 1). This group included agriculture and farming, textile, and other representative production sectors with the highest number of

[2] The *Contraloría General de la República* (CGR) is the highest fiscal control agency in Colombia. As such, it monitors and controls the use of resources (including natural resources) and public assets. Its purpose is also to contribute to the modernization of the country through actions promoting the continuous improvement of public organisms.

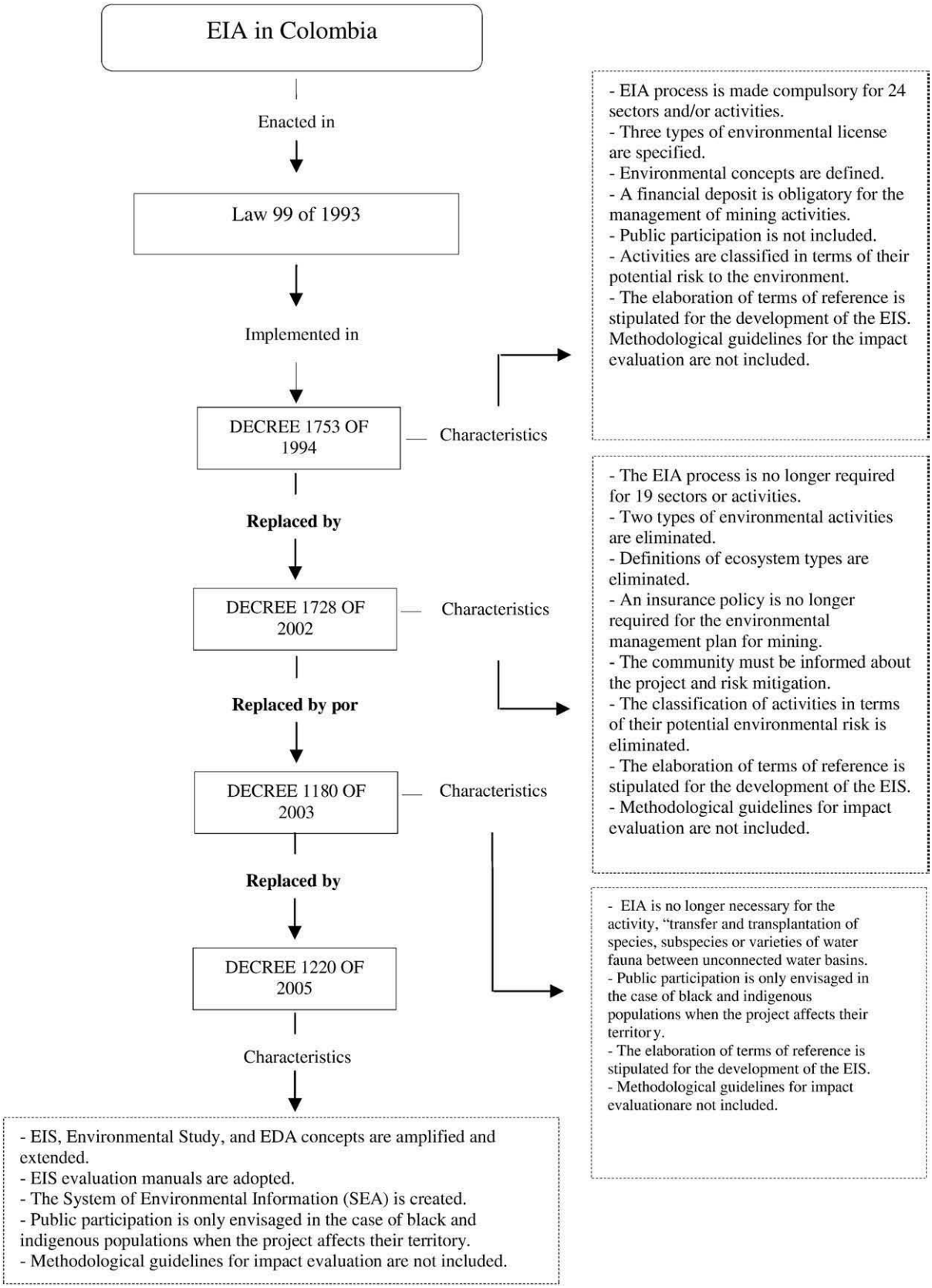

Fig. 1. EIA legislation in Colombia.

production units in the country (DANE, 2004). This decree specifically defined terms such as *critical ecosystem, sensitive ecosystem, ecosystems of environmental importance, ecosystems of social importance, risk analysis,* and *environmental restoration and replacement*; these definitions described the environment where projects would be carried out, and were useful as guidelines to establish indicators and criteria for

Table 1
Sectors and/or economic activities requiring an Environmental Impact Study in Colombia and their evolution.

Activities governed by EIA decree no. 1753, 1994[a]	Decree 1728 (2002)[b] (no longer in force)	Decree 1180 (2003) (no longer in force)	Decree 1220 (2005)
1. Cemetery construction[c]	X[d]	X[c]	
2. Construction of premises for storage and distribution of food	X[d]	X[c]	
3. Construction of blocks of flats and housing premises[c]	X[d]	X[c]	
4. Hospital construction[c]	X[d]	X[c]	
5. Dam and reservoir construction	X[d]		X
6. Construction of water supply line systems	X[d]		
7. Construction of mass transport systems[c]	X[d]	X[c]	
8. Construction and operation of systems for the treatment of waste water for more than 200000 users			X
9. Construction, modification, fitting and operation of terminals for ground transportation of passengers and goods[c]	X[d]	X[c]	
10. Construction and operation of tourist resorts and leisure and sport premises[e]		X[c]	
11. Electricity sector			
Construction and operation of electrical power stations; exploration for and use of polluting alternative energies; cable laying of transmission lines			X
12. Construction and operation of irrigation and/or drainage systems			X
13. Construction and operation of premises for storage, treatment, and/or final disposal of dangerous waste.			X
14. Projects for the storage of dangerous substances with the exception of hydrocarbons			X
15. Construction and operation of sanitary landfills.			X
16. Maritime and port sector			
Construction, extension, and operation of seaports;			
Deepening dredging;			X
Construction of breakwaters, channels and hydraulic fills; beach stabilization and coastal waterways;			
Artificial creation of beaches and dunes			
17. Construction, modification and operation of airports			X
18. Commercial game and establishment of wild animal farms			X
19. Introduction of foreign species, subspecies, breeds and wild varieties of flora and fauna			X
20. Livestock, fish and poultry farming	X		
21. Genetic manipulation and production of microorganisms	X		
22. Intensive flower cultivation	X		
23. Design and establishment of shopping centers and leisure areas.	X		
24. Service stations, and fuel deposits and packaging centers	X		
25. Projects for the generation of nuclear energy			X
26. Timber and furniture manufacture	X		
27. Paper manufacturing, printing shops and publishing houses	X		
28. Manufacture of foodstuffs	X		
29. Manufacture of metallic products, machinery and equipments	X		
30. Textile manufacture, garments and leather	X		
31. Manufacture of basic metals	X		
32. Public works in the railway network.			X
33. Public works in the national waterway network			
Construction of ports;			
Closing of active wetlands;			X
Deepening dredging;			
Construction of breakwaters			
34. Road network projects			
Construction of roads;			
Construction of minor roads;			X
Construction of tunnels and their approach roads			
35. Pesticide importation and production.			X
36. Forest exploitation projects[f]			
37. Reforestation and forestry[f]			
38. Project affecting National Natural Parks.			X
39. Mining, exploitation			
Coal; construction materials; metals and precious stones; other minerals.	X[g]		X
40. Hydrocarbon sector			
Seismic exploration; exploratory drilling; hydrocarbon exploitation; hydrocarbon transport and piping; delivery terminals and transfer stations; construction and operation of oil refineries.			X
41. Basic chemical industrial sector			
Manufacture of basic mineral-based chemical substances; manufacture of alcohols; manufacture of inorganic acids and their oxygenated compounds; manufacture of explosives, gunpowder, and fireworks			X
42. Projects requiring water transfer between hydrographic basins.			X

[a] Some activity names have been adapted, in accordance with Decree 1220 of 2005, but without changing the number of sectors or activities (Official Journal of the Colombian Government, 2005a).
[b] The activity "Transfer and transplantation of species, subspecies or varieties of water fauna between unconnected water basins" was not included in Decree 1728 of 2002, and was eliminated in Decree 1180 of 2003. For this reason it is not included in the list of activities that must undergo EIA in Decree 1753 of 1994 (Official Journal of the Colombian Government, 1994a).
[c] Environmental License not required if there is approved LUP for project location.
[d] They must follow recommendations of the specific environmental guide.
[e] Modified by Decree No. 2183 of 1996 (Official Journal of the Colombian Government, 1996a).
[f] Repealed by Decree No. 1791 of 1996 (Official Journal of the Colombian Government, 1996b).
[g] Only for prospecting mining activities.

environmental impact assessment and for designing management plans. The decree also stated that the Ministry of the Environment must establish guidelines for the submission of an EIS, and specify the production activities which require EIA, according to the International Industrial Uniform Codes Classification (IIUCC) adopted by the United Nations (UN). Nevertheless, this requirement was not enforced until 2005 when Decree 1220 was enacted. Finally three types of environmental license are established by Decree 1753 (Official Journal of the Colombian Government, 1994a):

(i) a *standard environmental license*; it is a license for construction work that does not require special permission for the use, mobilization, and exploitation of renewable natural resources;
(ii) a *specific environmental license*; it is a license including permits for the project or activity;
(iii) a *comprehensive environmental license*; it is a license that can be both standard and specific, depending on the nature of the construction work or activities related to the exploitation of oilfields and gas deposits.

Decree 1728 of 2002 repealed Decree 1753 of 1994 (Official Journal of the Colombian Government, 2002). It eliminated the definitions related to ecosystems as well as the standard and specific environmental licenses. However, it maintained the comprehensive environmental license, which had the advantage of eliminating certain formalities and streamlining bureaucratic procedures. The most crucial aspect of this decree, however, was the fact that twenty-one sectors/activities (of the original forty-four) no longer were required to obtain an environmental license or submit an EIS (see Table 1, column 2). They were only required to register at the competent environmental authority, as established in the environmental guidelines. Moreover, the compulsory insurance policy for open air mining was eliminated.

Decree 1180 of 2003 repealed Decree 1728 of 2002, and exempted mining from the recommendations in the environmental guidelines (Official Journal of the Colombian Government, 2003). All future projects, construction work, and activities in the wetlands, however, were required to obtain permission from the Ministry of the Environment, Housing and Land Development (MEHLD) before they could be implemented. According to this decree, projects carried out by Colombian political and administrative bodies (e.g. municipalities and departments), which had adhered to a Land Use Plan (LUP) or similar, were exempt from registering at the Administration in charge of environmental guidelines. Projects, work and activities, subject to the rules on land use established in the LUP (Table 1, column 3), were also exempt from obtaining an environmental license and submitting an EIS. Likewise, this decree stated that municipal sewage projects related to aqueducts, sewer systems and sewage treatment systems, along with most industrial projects, work and activities were exempt from registering with the Administration and submitting an EIS.

Finally, Decree 1220 of 2005 repealed Decree 1180 of 2003 (Official Journal of the Colombian Government, 2005a). It described each activity for which an environmental license is required (Table 1, column 4). It gave an even more detailed description of concepts related to EIS, EIA and the EDA document, which had not been defined in previous decrees. Regarding EIA methods, the guidelines established by the Administration should be followed for each activity requiring an environmental license. This decree followed the criteria established in the EIS assessment guide drafted by the MEHLD for projects and the Executive Secretariat of the Andrés Bello Convention (MMA and SECAB, 2002) for EIS assessment by the Environmental Administration. It also required the Institute of Hydrology, Meteorology and Environmental Studies to create an Environmental Information System, which would provide the country with information on EIA (IDEAM, 2004).

2.2. Current situation

At the present time in Colombia, the Environmental License is granted by the Government Administration (MEHLD), Regional Independent Corporations, Sustainable Development Corporations, or Urban Community Corporations.[3] This license is compulsory for the construction and/or implementation of projects, work or activities. In this sense, the beneficiary of an environmental license must comply with requirements, terms, and conditions to prevent, mitigate, correct, compensate and handle environmental effects and impacts (Decree 1220 of 2005).

Fig. 2 summarizes the procedure for obtaining an environmental license. The EIS is the main tool used in the environmental decision-making process for projects, work, and activities, and is also the main requirement for obtaining an environmental license. However, in other countries, the EIS is an integral part of EIA, and the environmental diagnosis of alternatives is an obligatory part of the EIS process.

Law 99 of 1993 and Decree 1220 of 2005 do not include guidelines concerning methods and techniques for the identification and assessment of environmental impact. They only specify which impacts could be prevented, mitigated, addressed or compensated. The establishment of such guidelines is the task of the *terms of reference*, which, in their most recent edition, appear as binding legal documents. Since 2006, they are available for twenty-nine activities, included in the list of twenty-one sectors/activities which must obtain an environmental license (see Table 2). On the whole, the guidelines for the elaboration of the EIS are similar for all activities for which an environmental license is required (Fig. 3).

Finally the reduction in the number of activities that must obtain an environmental license, and the simplification of requirements for the EIS are problematic because they make EIA less effective. A possible solution lies in the EIS assessment guides as well as the environmental monitoring guides for projects, issued by the Department of the Environment, Housing and Land Development to assess EISs (MMA and SECAB, 2002). Nevertheless, these guides in their current version only contain a series of general recommendations concerning environmental impact assessment, and do not provide information regarding: (i) the elements used to assess impact; (ii) adjustments showing the characteristics of environmental constituents; (iii) the EIS rating system of the assessment method used; (v) benchmarks.

3. The evaluation of EIA systems in Colombia

The evaluation of EIA systems provides an understanding of how such systems work, and makes it possible to assess the results of the EIA process (Barlett and Kurian, 1999). Such an evaluation helps to identify the strengths and weaknesses of the process, which results in recommendations that can make EIA systems more effective.

A number of models have been developed to evaluate EIA processes. These models include a set of very general principles, which are applicable to a wide variety of projects and activities, and are aimed at improving the quality of EIA systems. These principles are known as the Principles of Environmental Impact Assessment Best Practice, and are directly related to the following issues: clear and specific legal provisions; environmental impacts of significant actions; reasonable alternative actions; application of screening actions and

[3] Regional Independent Corporations, Sustainable Development Corporations and Urban Community Corporations are part of the government administration. These corporations have jurisdiction in territories with similar ecosystems or with ecosystems making up a geopolitical, bio-geographical or hydro-geographical unit. The function of such corporations is to administer the environment and renewable resources, and manage the sustainable development of such resources (Law 99 of 1993).

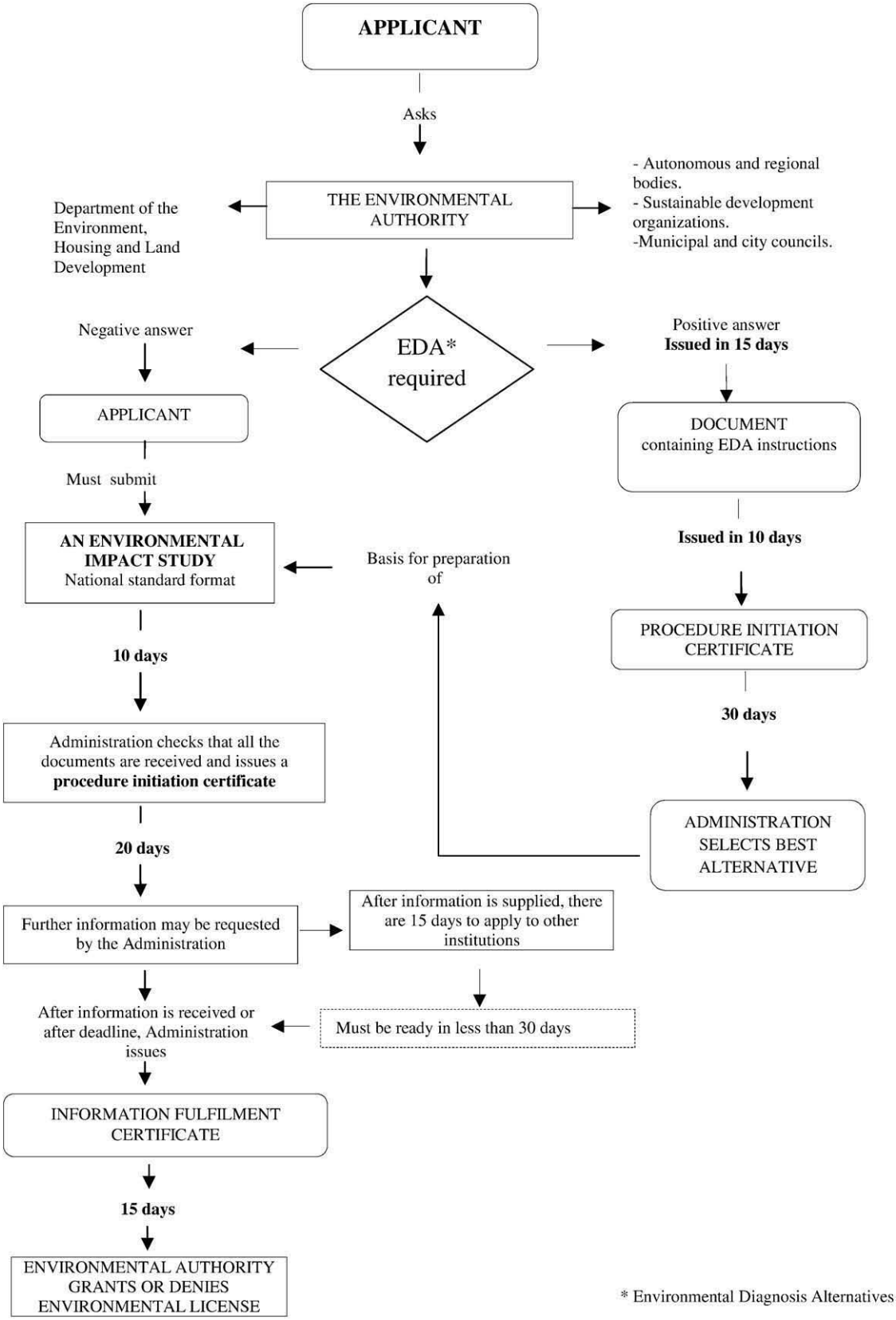

Fig. 2. Procedure for obtaining an environmental license in Colombia.

scoping actions; existence of publicly reviewed guidelines; mitigation of action impacts; and citizen consultation and participation (Deuyst et al., 1993; Hollick, 1986; IAIA and IEA-UK, 1999; Paliwal, 2006; Sadler, 1996; Wood, 1993).

One of the most popular EIA evaluation models was created by Wood (1993). This model has fourteen core criteria, and has been applied in a number of developed and developing countries (Barker and Wood, 1999; Balsam and Wood, 2002; Wood and Coppell, 1999). Also worthy

Table 2
Resolutions regulating the official guidelines for Environmental Impact Studies in Colombia.

Resolution	DOE[a]	Sector/project
1254 of 2006	46366	1. Hydrocarbon delivery terminals and transfer stations
1254 of 2006	46366	2. Importation of biological pesticides for agriculture
1255 of 2006	46368	3. Environmental diagnosis of alternatives in certain projects
1256 of 2006	46368	4. Prospecting drilling for hydrocarbons
1259 of 2006	46375	5. Introduction and breeding of parent exotic species
1269 of 2006	46375	6. Construction and operation of oil refineries and petrochemical developments
1270 of 2006	46375	7. Water transfer between hydrographic basins
1271 of 2006	46376	8. Construction of railways diverted from the national railway network
1272 of 2006	46376	9. Dredging of waterways providing access to deep draught seaports
1273 of 2006	46376	10. Deepening dredging of navigable waterways in deltas
1274 of 2006	46376	11. Construction and operation of sanitary landfills
1275 of 2006	46377	12. Fluid conduction through ducts in the hydrocarbon sector
1276 of 2006	46377	13. Air terminals
1277 of 2006	46377	14. Environmental diagnosis of alternatives in linear projects
1278 of 2006	46377	15. Construction and operation of agrochemical plants
1279 of 2006	46378	16. Hydrocarbon exploitation
1280 of 2006	46378	17. Construction and operation of hydroelectric power plants
1281 of 2006	46378	18. Construction and extension of deep draught seaports
1282 of 2006	46378	19. Closing of active wetlands
1283 of 2006	46379	20. Tunnels and approach roads
1284 of 2006	46379	21. Construction of dams and reservoirs
1285 of 2006	46379	22. Construction and operation of treatment plants for domestic waste water
1286 of 2006	46379	23. Construction and operation of irrigation and/or drainage districts
1287 of 2006	46379	24. Construction and operation of thermal power stations generating electrical energy equal to or more than 100 mW
1288 of 2006	46380	25. Cable laying of electric transmission lines
1289 of 2006	46380	26. Road construction
1290 of 2006	46380	27. River port construction
1292 of 2006	46381	28. Commercial hunting activities
1293 of 2006	46381	29. Introduction and exploitation of exotic species

[a] Official Journal of the Colombian Government.

of mention is EIA effectiveness that, according to Ortolano et al. (1987), has the following five dimensions: procedural compliance, completeness of EIA documents, methods to assess impacts, influence on project decisions, and weight given to environmental factors.

The criteria and concepts in EIA system models have been adapted and used to evaluate EIA systems in both developed and developing countries. Developed countries where this evaluation has been performed are the United States of America, the United Kingdom, the Netherlands, New Zealand and South Africa (Wood, 2003). Cases of EIA evaluation in developing countries are the Republic of Maldives (Annandale, 2001), Turkey, Tunisia, Egypt (Ahmad and Wood, 2002), Iran, Iraq, Morocco (El-Fadl and El-Fadel, 2004) and Pakistan (Annandale 2001; PEPA, 1997; PEPA, 2000; PEPA, 2001; Riffat and Khan, 2006).

3.1. Criteria used to evaluate the EIA system in Colombia

The Colombian EIA system was evaluated with the Wood model (Wood, 1993; Wood, 2003), and its effectiveness was assessed with the mechanisms of control proposed by Ortolano et al. (1987). These models were chosen because they are based on the Principles of Environmental Impact Assessment Best Practice. A further advantage is their flexibility, which makes it possible to adapt them to the characteristics of different countries. These methods have also been validated by the results of previous studies (Ahmad and Wood, 2002; Annandale, 2001; El-Fadl and El-Fadel, 2004; Turnbull, 2003; Wood, 2003; Wood and Coppell, 1999).

Nevertheless, before these models could be applied, the evaluation criteria had to be modified. Consequently, Wood's initial fourteen criteria were revised to take into account the local organizational and jurisdictional cultural issues in Colombia. This raised the number of evaluation criteria to sixteen, which can be classified in three categories (Table 3): (i) legal and administrative support; (ii) EIA process; (iii) follow-up and control. The two new criteria specifically target aspects related to the experience and training of personnel working in EIA systems, methodologies to identify and quantify environmental impacts, and finally, the formulation of environmental impact weighting coefficients for biodiversity in Colombia.

After the evaluation of the selected criteria considering the results of the analysis of the EIA assessment, a panel of Colombian EIA system experts was chosen. The panel of experts should have knowledge about the EIA system, Colombian legal framework related to it and its implementation degree in the country. A group of university teachers, doctors or postgraduate, and at least ten years of professional experience related to different activities requiring EIA process in Colombia, was considered appropriate. Giving thought these requirements, a panel of 25 experts from different Colombian regions was preselected in this study; finally 20 of them accepted to take part in it. Their opinions were then compared with the results obtained in our study. This validation method has also been used in other studies (Vatalis and Kaliampakos, 2006). The results of our evaluation and the evaluation of the panel of experts appear in Table 3 and they are explained in the following sections.

3.1.1. Legal and administrative support

The environmental impact assessment process in a country or territory is based on its legal, administrative, socioeconomic, and political circumstances. According to Wood (2003), each element of an EIA process should be supported by clear and specific legal and administrative arrangements that ensure legitimacy and legality.

Wood (2003) used only one general criterion to evaluate the legal and administrative support of EIA systems in other countries. However, our study includes three criteria: (i) national and international legal foundations; (ii) guidelines for EIS elaboration and implementation; (iii) number and competence of the personnel working in the EIA system.

- National and international legal foundations

As previously mentioned in Section 2, Colombia has a wide range of national and international EIA legislation. Especially significant are its political Constitution, laws, regulatory decrees, and international agreements, such as the Convention on Biological Diversity of 5 June

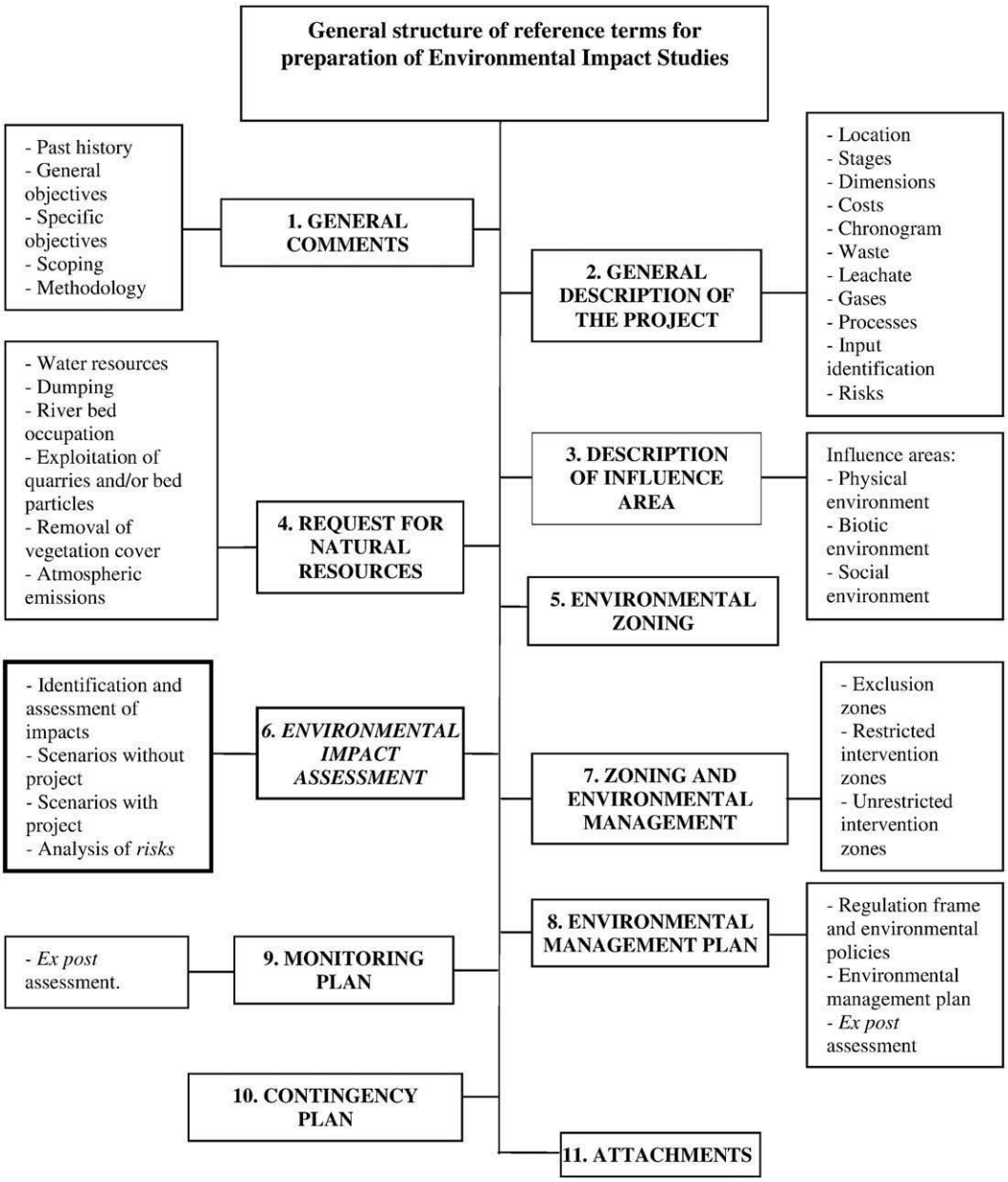

Fig. 3. Guidelines for elaborating an Environmental Impact Study in Colombia.

1992 (UN, 1992a), ratified by Law 165 of 1994 (Official Journal of the Colombian Government, 1994b), and the United Nations Framework Convention on Climate Change of 9 March 1992 (UN 1992b), also ratified by Law 164 (Official Journal of the Colombian Government, 1994c).

Given this extensive legal framework, this criterion was positively evaluated in our study. We also found that 65% of the experts were of our same opinion, whereas 30% believed that this criterion was only partially fulfilled. In their opinion, despite the existence of a national legal framework, there were still certain weaknesses related to the fact that national regulations lack serious technical studies that analyze, evaluate, and justify the modifications and amendments to the laws that regulate the EIA process (CGR, 2006). The percentage of experts that were in total disagreement with our evaluation of this criterion was extremely low.

- Guidelines for EIS elaboration and implementation

In Colombia a series of legal decisions known as *terms of reference* contains general guidelines for EIS elaboration and implementation. In the past decade, these terms of reference have been modified, and since 2006, they are available for twenty-nine economic sectors/projects. The guidelines for EIS elaboration are similar for all activities that require an environmental license. Although criteria and methods in the guidelines vary, depending on the term of reference, they all share the following features:

(i) Environmental impact is assessed by analyzing two cases with a view to establishing vulnerability sensitiveness and magnitude indicators. This signifies that the potential impact of a project can be identified and specified without giving any specific instructions on how to establish indicator types.
(ii) No specific assessment method is provided. Instead, only a general description of the method is required. This description includes both criteria and constraints since the assessment must take into account various elements in order to facilitate the qualitative and quantitative weighting of the impact.
(iii) Railroad construction and commercial hunting are the only activities for which the EIS must analyze and classify impact,

Table 3
EIA evaluation criteria in Colombia.

Evaluation criteria	Study results			Experts' opinion (%)		
	Yes	Partial	No	Yes	Partial	No
1. Legal and administrative support						
1.1. The EIA system is supported by national and international legal foundations.	X			65	30	5
1.2. The elaboration and implementation of EIS is based on guidelines with clear content requirements.		X		60	35	5
1.3. The EIA system is managed by a sufficient number of personnel, who have the competence and training to operate this system.			X		20	80
2. EIA process						
2.1. A screening process is compulsory to determine if the project or activity requires an EIS			X	5	20	75
2.2. The EIA process includes scoping to determine the content and range of the EIS.		X		40	30	30
2.3. The EIA system provides suitable methodological guidelines for the EIS, especially for the identification and evaluation of the significant environmental impacts of all the actions.			X		30	70
2.4. The EIA system requires the analysis of alternatives.		X		20	80	
2.5. The EIA system requires the weighting of environmental impacts related to biophysical and sociocultural factors.			X	5	30	65
2.6. The EIA system includes Strategic Environmental Evaluation.			X		5	95
3. Follow-up and control						
3.1. The EIS is revised by the administration with effective methods.		X		10	55	35
3.2. Decisions taken as a result of the EIA process are published.		X		10	55	35
3.3. The system includes public participation and consultation during the EIA process.		X		5	65	30
3.4. The EIA system requires an Environment Management Plan for the impacts generated by project actions, and for the follow-up and control of the project.	X			65	35	
3.5. There is a monitoring process for the EIA system as a whole.			X	5	20	75
3.6. There are public and private economic incentives to encourage the use of the EIA.			X		15	85
3.7. Besides legal commitments, there are insurance policies and rehabilitation bonds that guarantee the correct application of the Environmental Management Plan.			X		5	95

area of influence, intensity, risk of occurrence, duration, permanence, tendency, magnitude, reversibility, and mitigability.

(iv) The cumulative impact must be analyzed for each of the significant impacts identified.

(v) When the magnitude or scope of a project's impact on the environment is uncertain; predictions must always be made for the worst case scenario.

Decree 1220 of 2005 defines *Environmental Guides* as technical documents providing conceptual, methodological and procedural instructions to support the management, operation and environmental implementation of projects, work, and activities (Official Journal of the Colombian Government, 2005a). They are conceived as a self-management and self-regulation tool for the sector, and as a conceptual and methodological reference both for environmental authorities and for the implementation and development of projects, work, and activities. Nevertheless, these guides are not binding legal codes.

We found that 60% of the experts consulted believed that the existence of terms of reference could be considered guidelines for EIS elaboration and implementation. However, in our opinion, the Colombian EIA system obliges EISs to meet certain content requirements, and establishes procedures for their elaboration even though currently, there are no guidelines that unify criteria and methods. Unfortunately, this is conducive to the use of untested methods that do not guarantee reliable results. Our evaluation of this criterion coincides with the opinion of 35% of the experts. The other 5% considered the degree of compliance to be negative.

- Number and competence of the personnel who work in the EIA system

The analysis of this evaluation criterion focuses on: (i) the personnel hired by consultants to plan and develop the EIS; (ii) the administrators in charge of monitoring the EIA process.

In the first case, the terms of reference for EIS elaboration state that the personnel in charge of EIS planning and development should be professionals from different disciplines. However, neither Law 99 of 1993 nor Decree 1220 of 2005 mentions the experience of these employees nor does it require their training and competence to be certified by the administration.

On the other hand, the CGR (2006) study of the EIA process in Colombia revealed that the resources (including human resources) allocated by the administration are insufficient to deal with the potential number of environmental licenses. Significant weaknesses in the area of personnel are the precariousness of contracts and excessive workload. These factors have evident repercussions on the quality, opportunity, and frequency of the follow-up work and monitoring of projects, work, and activities. Despite these evident deficiencies, the administration tends to hire competent professionals although no continuous and/or formal training is specifically required in the field of EIS.

These considerations have been taken into account in this study to explain the absence of qualified personnel who must work within the EIA system. The results of our study coincide with 80% of the experts consulted.

3.1.2. The EIA process

The EIA system specifies that all activities that do not have a negative impact on the environment need not undergo EIA, whereas all activities that can potentially have an adverse effect on the environment should be subject to the EIA process (Kassim and Simoneit, 2005). The environmental impact of each stage of a project or activity should be assessed (i.e. construction phase, exploration activity, and modification stages of a project).

Currently, in Colombia an environmental license is necessary for the construction and/or implementation of projects, work, and activities. This license signifies that the project/work/activity effectively fulfills all requirements, terms and conditions to prevent, mitigate, correct, compensate and handle environmental effects and impacts. Fig. 2 summarizes the procedure for obtaining an environmental license.

Our study evaluated the Colombian EIA process on the basis of the following six criteria: screening of actions, scoping of impacts, methodological guidelines for EIS development, alternatives within the EIA process, weighting of biophysical and sociocultural factors, and strategic environmental assessment.

- Screening of actions

At the present time, in Colombia, there are twenty-one sectors and activities that require EIA (Decree 1220 of 2005). This is the result of a

progressive reduction of the number of activities over the years. The decision to reduce the number of sectors and activities was not based on previous studies that would have determined their effects on natural resources and the general welfare of the population. Nor has the EIA system ever been evaluated as a whole. As a result, some of the sectors eliminated were those that generated most of the environmental impacts in the country, namely, the agricultural and livestock sector and the mining sector (IDEAM, 2004). This goes against principles such as those mentioned in the Declaration of Rio de Janeiro of 1992, which Colombia signed (UN, 1992c).

Screening decides whether it is necessary to conduct an environmental impact assessment process for a project or activity. It measures the overall importance of the combined environmental impacts of the action. Without screening, a certain number of actions may be assessed accurately, but other actions will sometimes be ignored. For an effective screening process, it is necessary to compile lists of activities, accompanied by thresholds and criteria to determine if an action should be evaluated. It is also necessary to establish the procedures to discretionally determine this as well (Wood, 2003).

We found that 20% of the experts consulted believed that the list of activities in itself could be regarded as part of the screening, even though it did not include procedures, thresholds, and criteria for the evaluation of the action. For this reason, they evaluated this criterion as partially fulfilled. However, according to our study, the current procedure for deciding whether a project should be subject to the EIA process, solely based on an (insufficient) list of activities, hardly constitutes screening. This opinion was shared by 75% of the experts consulted.

- Scoping of impact

Scoping is the procedure used to evaluate a range of issues to be analyzed in the EIA process. This practice is associated with determining the terms of reference for the assessment (Wood, 2003). It requires information and expert judgment on impact-related issues, and the evaluation of critical issues for various stakeholders, apart from the decision-makers (Modak and Biswas, 1999).

In Colombia, the scope and content of the EIS for each activity requiring an environmental license are determined in the twenty-nine terms of reference (see Table 2) for the twenty-one sectors or activities that must obtain this license (see Fig. 3). However, the contents of these terms of reference are evidently in need of homogenization. This hinders the incorporation of natural and human environmental characteristics, which can be affected by the implementation of building work, project, or activity (CGR, 2006). Consequently, this criterion was evaluated as only being partially fulfilled. This coincided with the opinion of 30% of the experts, who were much divided on this issue.

A significant group of the experts (40%) coincided with the positive evaluation in this study, based on the existing terms of reference. The other 30%, however, maintained that the EIA system does not include scoping. In other words, in their opinion, the EIA system lacks methods that permit the identification of both indirect and secondary impacts that determine the depth of the EIS. This is the principal objective of scoping. The lack of a suitable method can produce the loss of valuable information for decision-making, especially regarding environmental management. This goes against the criteria of diversity that the EIA should include to protect natural resources and guarantee human welfare (UN, 1992a).

- Methodological guidelines for EIS development

The Colombian legal framework allows the project originator to select the best method for the identification and evaluation of impacts (Decree 1220 of 2005). The only condition is that this method must have been used in a previous context. To identify and quantify environmental impacts two cases are analyzed to establish vulnerability sensitivity and magnitude indicators. These indicators help to identify and describe the impact generated by the project. However, no instructions are provided on how to establish indicator types, nor is any impact assessment method given. The only requirement is a description of the method to be used, along with an outline of its criteria and limitations.

Nevertheless, the law states that administrative guidelines should be followed. These guidelines must be established by the Administration for each activity requiring an environmental license, and will eventually lead to a general methodology for ES submission. Although the guidelines should have been drafted by the Department of the Environment, Housing and Land Development by 21 October 2006, as of 5 June 2008, they still had not been made public. When they finally appear, they will generally describe the environmental impact assessment process, but will not include either a general or specific methodology for projects or activities.

Based on this state of affairs, the authors of this study determined that the EIA system of Colombia does not provide methodological guidelines for the identification and evaluation of significant impacts. This drastically reduces the effectiveness of the EIA process, an opinion shared by 70% of the experts consulted. The remaining 30% believed that the administration partially supplies methodological guidelines in the form of terms of reference, which contain a list of topics to be included in the EIS.

- Alternatives in the EIA process

Alternatives to a plan/action are an important component of the EIA process. An alternative may be a change in location, materials or procedures, as well as *no action* in some cases, which can minimize the environmental impact of a proposed activity. The proper selection of alternatives helps to reduce environmental degradation and/or minimize the cost of the action. The consideration of alternatives has been described as one of the core components of the EIS. The identification, analysis and comparison of alternatives to the proposal are the key to creative, proactive, decision-relevant assessment (Wood, 2003).

The analysis of alternatives in Colombia is known as *Diagnostico Ambiental de Alternativas (DAA)* [Environmental Diagnosis of Alternatives]. According to Decree 1220 of 2005, the DAA is an important part of the EIS since it requires the project originator to design different technical strategies for the development of a project or activity with a view to selecting the one that generates the least environmental impact (Official Journal of the Colombian Government, 2005a). As shown in Fig. 2, the project originator is required to ask whether the DAA is necessary in order to include it (or not) in the EIS. This means that the DAA is not an obligatory part of any of the twenty-one sectors and activities for which EIA is compulsory.

The authors of this study evaluated this criterion as being partially achieved. This evaluation coincided with the opinion of 80% of the experts consulted.

- Weighting of biophysical and sociocultural factors

A specific objective of the EIA process is to protect the productivity and capacity of natural systems and the ecological processes which maintain their functions. Another EIA objective is to promote sustainable development that optimizes resource use and management opportunities (IAIA and IEA-UK, 1999). This is achieved in the EIS when impacts are weighted on the basis of the biophysical and sociocultural characteristics of the location where projects and activities are implemented (Ortolano et al, 1987).

Regarding the Colombian EIA system, no reference is made either in Decree 1220 of 2005 or in the EIS terms of reference, to the weighting of environmental factors or to the method that should be used. This decision is finally made by the evaluator, whose objectivity is questionable and who may not be acting in his own interests. Consequently, within such a negative context, EIA cannot be effectively

used as an instrument of risk management for the conservation of biodiversity in Colombia.

Based on this information, our results state that the EIA system in Colombia does not require the weighting of biophysical and socio-cultural factors in the evaluation of environmental impacts. A total of 65% of the experts consulted agreed with our evaluation. They affirmed that even though it is not required, the weighting of these factors should be carried out in the EIS, given the characteristics of the area of influence of the project or activity.

• Strategic Environmental Assessment

Strategic Environmental Assessment (SEA) is a systematic process to evaluate the environmental impacts of policies, plans or programs, and thus assure their inclusion in the phase of the decision-making process as well as social and economic considerations (Sadler and Verheem, 1996). The SEA optimizes the evaluation of indirect, accumulative, and synergic evaluation impacts. It also reduces the number of projects that should undergo EIA, which simplifies the process and defines generic corrective measures for a set of projects with similar characteristics.

In Colombia, the SEA is not specifically regulated as an obligatory activity for the public and private sector. It is not a part of the EIA system, and it does not as yet have methodological guidelines.

However, SEAs are being carried out in the public sector in fulfillment of the national development plans of 2002–2006 and 2006–2010, which recommend this type of evaluation for critical productive sectors. The state perceives the SEA as an activity, which should not be understood as a new document in itself or as an additional procedure that the sectors or activities should carry out previously (DNP, 2006). In Colombia the SEA formalization process is in its initial phases. As a result, it is separate from EIA processes since it is not included in the general laws that regulate EIA processes (e.g. Decree 1220 of 2005 and Law 99 of 1993). Neither does it have its own law that regulates its context of application, scope and planning, and development method. Furthermore, it possesses a limitation that reduces transparency since it is applied to state policies and plans by a national agency such as the DNP with only very limited public participation and social control.

On the basis of this context as well as the fact that the SEA is an optional activity without a legal and formal administrative framework, the authors of this study judged that the SEA could not be regarded as a component of the Colombian EIA system. A total of 95% of the experts consulted agreed with our evaluation.

3.1.3. Follow-up and control

The follow-up and control of the EIS process entail continuous monitoring to determine whether its implementation is in accordance with what was initially approved. The success or failure of management plans must be documented, and reoriented in the event of adverse effects (Kassim and Simoneit, 2005).

Eight evaluation criteria belong to this category: (i) EIS review; (ii) publication of EIA process final decisions; (iii) public participation; (iv) environmental management plans, follow-up and control of the project; (v) EIA system monitoring; (vi) economic incentives for using EIA; (vii) rehabilitation bonds for the application of environmental plans. These criteria are explained in the following sections.

• EIS review

Environmental impact assessment review is normally performed by planners and experts, who are familiar with environmental assessment regulations. The purpose of this review is to decide whether the environmental report provides an adequate assessment of environmental effects, and is of sufficient importance in decision-making. This review can also be used to obtain an impartial judgment of the particular and often conflicting interests of groups involved, as well as to avoid unnecessary costs and delays in the process (Riffat and Khan, 2006).

In Colombia all environmental impact systems are reviewed by the administration before making decisions regarding the environmental license. For this reason, in 2002, the Ministry of the Environment and the *Convenio Andrés Bello* of Spain created *Environmental Studies Assessment Guides* with the objective of providing national and regional government workers with an evaluation tool for Environmental Impact Systems (MMA and SECAB, 2002). Even though EISs came into force in 2005 with Resolution 1552 (Official Journal of the Colombian Government, 2005b), these guides only contain very general recommendations regarding environmental impact assessment, as well as guidelines on how to evaluate: (i) impact assessment criteria; (ii) adjustments showing the characteristics of environmental constituents; (iii) rating scale of the evaluation method; (iv) benchmarks.

Based on these considerations, our study determined that EIS are reviewed by partially suitable methods. This evaluation concurred with the opinion of 55% of the experts consulted. In contrast, 35% of these experts said that the administration does not use suitable methods to review EIS. Reasons given were the lack of evaluation criteria regarding methods used for the identification and evaluation of impacts as well as the lack of weighting of environmental factors.

• The publication of EIA process final decisions

In Colombia, Law 99 of 1993 stipulates that the decisions pertaining to the granting or denial of an environmental license should be published in an official Journal, and sent to interested parties. Alternatively, this publication should be posted and made public. However, thus far, the government is not required to publish its decisions in mass media such as the Internet or local newspapers.

Since 2007, project decisions made by the MEHLD are published in the *Gaceta Ambiental* [Environmental Gazette], available on the web. However, this is not the case for project decisions made by regional environmental administrations, which grant most of the environmental licenses in Colombia. This policy evidently hinders public access to environmental information and the timely lodging of judicial action against administrative decisions concerning the EIA process. According to the CGR (2006), EIA legislation requires the project originator to give information about the project, but the scope and characteristics of this information are not specified. A further drawback is that there is no ongoing information process during the construction and operational phases of the project.

Our study evaluated this criterion as being partially fulfilled because EIA decisions are published, though in communication media of limited scope. Our evaluation coincided with the opinion of 55% of the panel of experts. In contrast, 35% of the experts consulted believed that EIA decisions are not published. Since most of the decisions are made at a regional level where the publication is not easily accessible, they claimed that this was the same as not being published at all.

• Public participation

Public participation is an integral part of EIA in many countries, and strengthens the process (Barker and Wood, 1999; Bekhechi and Mercier, 2002; Wenger et al., 1990). It is even a tool used to evaluate the transparency and equity of EIA systems. It arose as a way of guaranteeing public participation in projects and the incorporation of the observations of affected communities (Wathern, 1994). For example, according to the UN (1995), legal provisions that mandate public hearings are more effective than ones that do not.

In Colombia, public participation in EIA processes is highly discriminatory since the only consultation and public participation envisaged are for the black or indigenous populations, when projects directly affect the territories where they live. For the rest of the population, participation is reduced to information about the project. This does not allow them to take part in the decision-making process. This aspect of the Colombian EIA system contradicts the Political

Constitution of 1991. More specifically, Article 13 outlaws discrimination of any type, and states that all people are born free and equal under the law. As such, they should be treated equally, and receive the same protection from authorities. All citizens should have the same rights, freedoms, and opportunities without being discriminated against because of gender, race, nationality, birth, language, religion, and political or philosophical beliefs.

Furthermore, the Colombian policy regarding public participation goes against international EIA best practices, and invalidates control/monitoring mechanisms. The CGR (2006) criticized the government for this reason, and underlined this weakness in the generation of means and strategies for public participation in EIA processes. Currently, the administration only informs the population about projects and allows the participation of only one sector of the population without the necessary socialization and dissemination of information. This is in evident conflict with the democratic spirit and laws of the political Constitution.

Since some projects do exist in which the population was consulted, the criterion of public participation was considered to be partially fulfilled. This is in consonance with the opinion of 65% of the experts. In contrast, 30% of the experts argued that the project volume in areas inhabited by the black and indigenous population is so small that in the vast majority of EIA processes, public participation is negligible.

- Environmental management plans, follow-up and control of the project

Mitigation is defined as those measures or techniques that are used to minimize damages that would otherwise occur because of a proposed action to the environment. These measures include altering processes to reduce emissions, changing pollution control equipment to render it more effective, adjusting the operation time of a plant, etc. In addition, a continuous monitoring process is essential to ensure that mitigation measures are properly implemented, operated, and maintained in accordance with the approved procedure (Riffat and Khan, 2006).

In Colombia the monitoring and control of activities and commitments to mitigate impacts were included as part of the EIA process in Decree 1728 of 2002. However, this decree was modified by subsequent laws. In 2003, Decree 1180 eliminated the auditing of the accounts of the Environmental Management Plan as well as the possibility of suspending activities. Subsequently, Decree 1220 eliminated the monitoring objectives and periodic updates of the management plans when the decision was based on technical concepts. Such modifications are in evident conflict with the objectives of project tracking and monitoring since any auditing process should facilitate the adoption of corrective measures that prevent and minimize the generation of greater impacts (CGR, 2006).

In order to issue guidelines on monitoring and control, the *Manual de Seguimiento Ambiental de Proyectos* [Environmental Follow-up Guide for Projects] was published in 2002. According to Decree 1552 of 2005, this guide must be used by all regional environmental administrations (Official Journal of the Colombian Government, 2005b).

We have concluded that monitoring and control mechanisms do exist so we have given this criterion a positive evaluation, in the same way as 65% of the experts consulted. In its study of the EIA system in Colombia, the CGR (2006) found that no administration uses this guide as an instrument for monitoring activities within its jurisdiction, concluding that monitoring and control are extremely weak components with minimal effectiveness. Such was the reasoning of 35% of the experts consulted, who evaluated this criterion as being partially fulfilled.

- Monitoring of the EIA system

Monitoring is a continuous checking process to determine whether the implementation of a process is in accordance with the approved procedure. A regular report of impacts should be properly evaluated during an activity for which monitoring is required.

Colombia does not have a specific law that contemplates this particular type of action (Law 99 of 1993; Decree 1220 of 2005). The CGR is the official organism in charge of auditing environmental administration. Although it can monitor EIA processes in the country, it does not do this periodically or as a standard environmental control policy. Furthermore, random evaluations of the EIA system do not generate the desired positive operational impact. An example of this is the report on the EIA process that the CGR delivered to the Colombian Congress so that legislation would be passed to strengthen EIA in Colombia. However, up until now these recommendations have not produced new laws that would improve the national environmental system as legislated in Law 99 of 1993 and Decree 1220 of 2005.

For these reasons, our study evaluated this criterion negatively. This opinion was endorsed by 75% of the experts consulted.

- Economic incentives for EIA

Economic incentives, such as tax rebates or deductions, soft loans, reduced insurance premiums, and priority status for government grants and project co-financing are examples of control mechanisms that can make the use of EIA more attractive for activities where environmental impact assessment is optional (Ortolano et al., 1987).

Colombia has some economic incentives, such as income tax deductions (Official Journal of the Colombian Government, 1989). However, these deductions do not apply to the use of EIA in environmental management or in projects and activities that can potentially generate environmental impacts. Deductions are only given for voluntary investments in environmental control and improvement. Nor do banks take into account the voluntary use of EIA when granting loans (Official Journal of the Colombian Government, 1993b).

For these reasons, our study found that Colombia lacks incentives that encourage the use of EIA. This evaluation was endorsed by 85% of the experts.

- Rehabilitation bonds that guarantee the application of environmental plans

When Decree 1753 of 1994 (Official Journal of the Colombian Government, 1994a) was enacted, an insurance policy was established to cover expenses for any environmental damage that occurred as the result of a project, work or activity. This policy was valid until the end of the project's useful life in the event that the policyholder was unable to cover the expenses incurred. This measure guaranteed that the environment would be restored to its original state. However, recently Decree 1728 of 2002 eliminated this policy.

Law 491 of 1999 reinforced this insurance policy with another compulsory policy for all activities requiring an environmental license (Official Journal of the Colombian Government, 1999). However, oddly enough, this insurance policy has not been demanded of any project with an environmental license during 2002–2006. Reasons given for this oversight were the lack of administrative regulations regarding the policy, gray areas in the insurance clauses, or insufficient insurance coverage (CGR, 2006).

There is thus clear evidence that Colombian legislation does not contemplate rehabilitation bonds, which would guarantee the effective application of environmental plans. Not surprisingly, 95% of the experts consulted agreed with our evaluation.

3.2. Critical analysis of the Colombian EIA system

The results obtained in the evaluation of the Colombian EIA system show its multiple deficiencies. Of the sixteen evaluation criteria used in our study, only two were positively evaluated (*Yes*). Of the other fourteen, six were evaluated as only partially successful, whereas the remaining eight received a negative evaluation

(*No*). These results underline the urgent need to improve the EIA system in Colombia. Most of the experts consulted agreed with our evaluation.

Regarding the legal and administrative support of the system, our results show that if current legal measures are to be effectively applied and enforced, EIS criteria, methods, and content must be unified. This would greatly reduce any subjectivity on the part of the evaluator, and eliminate the possibility of biased results that would make the system less effective. This problem is made even more serious by the low training level and lack of supervision of the personnel working within the EIA system.

Six criteria were used to evaluate the EIA process, of which none received a positive evaluation. Only two were considered to be partially satisfied. The remaining four criteria were negatively evaluated. These results reveal that current legislation does not make the EIA process more effective, largely due to its limited scope. Particularly depressing is the absence of screening as well as the lack of methodological premises that facilitate the identification, evaluation, and weighting of the impacts, and of the Strategic Environmental Evaluation (SEA). These deficiencies in the system are manifest in: (i) the unsatisfactory results of EIA; (ii) the loss of valuable information in the decision-making process, especially in regards to environmental planning and management, which are thus incapable of producing optimal results; (iii) the progressive deterioration of the environment (IDEAM, 2004).

Regarding the monitoring and control of the process, of the seven criteria used, only one was positively evaluated. Of the other six, three were classified as partially successful and three were negatively evaluated. Consequently, the weakness of the Columbian EIA system is evident in this aspect of the process as well. This is especially true when it comes to the non-existence of monitoring procedures, public and private economic incentives to encourage the use of the EIA, as well as legal guarantees and measures that guarantee the effective application of environmental management plans. As a result, public and private companies do not voluntarily participate in EIA, and thus show very little social and environmental responsibility. On top of all these deficiencies, there is also an abysmal lack of public participation in EIA, a possibility only open to native ethnic groups. However, it is generally acknowledged that public participation is indispensable when it comes to improving the effectiveness and quality of the EIA process (Ahmad and Wood, 2002; Annandale, 2001; Barker and Wood, 1999; El-Fadl and El-Fadel, 2004; Leu et al., 1996; Ortolano et al., 1987; Paliwal, 2006; Wood and Coppell, 1999).

3.3. Improvement proposals

Although so far no study has established a direct link between environmental deterioration in Colombia and the progressive elimination of environmental control and assessment measures, a causal relationship can be inferred using the Precautionary Principle Method. This means that where there are threats of serious or irreversible damage to the environment, the lack of complete scientific certainty should not be used as a justification for postponing cost-effective measures to prevent environmental degradation (UN, 1992b). This is directly related to the potential environmental impacts that activities exempted from an environmental license can potentially generate, and the state of the environment in Colombia during the 13-year period in which EIA has been part of the legal code. Environmental components which have suffered the greatest deterioration during this period are water, air, and soil, according to a study conducted by the *Instituto de Hidrología, Meteorología y Estudios Ambientales de Colombia* (Institute of Hydrology, Meteorology and Environmental Studies of Colombia) and the *Contraloría General de la República* (CGR, 2006; IDEAM, 2004). These components risk further degradation because of the textile industry, pig farming and paper manufacturing (Ki Youn et al., 2007), none of which is required to have an environmental license.

Given this state of affairs, and in compliance with international treaties, the Political Constitution, and current legislation, the Environmental Impact Assessment System in Colombia must be made more effective in order to effectively protect the environment and conserve Colombian biological and cultural diversity. This entails the following:

1. Legal and administrative support
   - The actions of the administration need to be more in consonance with environmental legislation. Decree 1220 of 2005, should be modified in order to provide more specific guidelines for the EIA process.
   - In order to guarantee the quality of EISs, the professionals and/or technicians designing or implementing them must ideally possess theoretical and technical knowledge of EIA. They should also be registered with the administration, which means that they should be officially authorized to perform this type of assessment.
2. The EIA process
   - Precise criteria should be established to define the kinds of project and activity subject to EIA. Such criteria should also be in harmony with the environmental features of the location, and should include a screening process.
   - The Colombian administration should propose a generic EIA methodology, which would be applied to each EIS without limiting the use of complementary methods to safeguard basic principles. This methodology should take into account the environmental features of the Colombian natural regions (Pacific, Andean, Caribbean, Orinoquean and Amazonian), and the potential environmental impact of the activities that require an environmental license. This is in agreement with the recommendations of the World Conservation Union to Central American countries in the results section of the Environmental Impact Assessment Project in Central America (UICN, 2003).
   - The analysis of alternatives should be required for all projects subject to an EIS. All activities under the jurisdiction of the regional environmental administration should be examined to see if they require an EIS.
3. Follow-up and control
   - All follow-up and control measures should cover the plans for environmental impact prevention and reduction as established in Decree 1753 of 1994.
   - Public participation should be increased by means of the following measures: (i) open consultation of all population groups; (ii) the publication in local newspapers and/or Internet of all decisions regarding environmental licenses made by regional administrations.
   - The government should establish the conditions and the ways to specifically include an environmental insurance policy, which would be valid for the useful life of the project.
   - Economic incentives should be created to encourage the voluntary use of EIA.

4. Conclusions

The study described in this article evaluated the EIA system in Colombia by using a series of criteria based on Principles of Environmental Impact Assessment Best Practice. These criteria are valid because they have previously been applied in other countries. The results obtained provide a critical analysis of the Colombian EIA system, and highlight both its strengths and weaknesses.

It can be concluded that the mere existence of a body of legislation as well as an administrative framework, one of the undeniable strong points of the EIS system in Colombia, is not sufficient in itself to make

the system effective. Problems arise due to the limited scope of legal measures and administrative support. Other weaknesses reside in the procedures for the design and implementation of EISs as well as the follow-up and control mechanisms. This situation in Colombia is adversely affecting the environment, which should be protected because of its fragility, biological richness and high number of endemic species.

The important deficiencies detected in the Colombian EIS system mean that many of the productive sectors in the country are exempt from the EIA process. Public and private companies also show very little social and environmental responsibility, and do not voluntarily participate in EIA.

The Colombian EIS system would certainly benefit from the proposals stemming from our study. Our recommendations would facilitate the identification and evaluation of environmental impacts, potentially generated by projects and activities. The population, as stakeholders in environmental quality, would be duly informed, and be encouraged to take part in the decision-making process. This would transform the EIS system into a more effective risk management tool than it is at the moment. Financial measures would also be adopted to provide an added incentive for companies, who wish to apply environmental impact control measures. The evaluation criteria and the results of our analysis were endorsed by a high percentage of the experts consulted.

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