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PhD THESIS

Integrating Environmental Education in National Parks of Colombia

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"In the end we will conserve only what we love, we will love only what we understand, and we will understand only what we are taught."

Baba Dioum

A Marc, mi incansable compañero de viaje
A Marcel, mi felicidad constante
A mi madre, todo un ejemplo de vida

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Abstract

Many experts consider environmental Education (EE) as an essential part in the management of protected areas, constituting a key element linking the biological and social dimensions for the conservation of ecosystems. Comparing with other kind of management strategies as biological monitoring and research, this field is still in its infancy, with many breaches in terms of systematization and assessment, a situation that difficult the integration and visibility of EA within management programs in the conservation of protected areas.

Taking the Colombian National Natural Parks System as study area, a methodological route was developed to integrate local EE plans to the existing model of management planning. The study was developed through a participatory and inclusive research to respond to the specific conservation needs and goals. In first place, an internal EE diagnosis was developed, revealing that EE integration within the parks management structure was a first priority need, being a converging result on the two case studies on National Parks from the Pacific Coast of Colombia. The diagnosis also demonstrates that communication, participation, training and evaluation have to be reinforced, and linking the community and stakeholders involved in the park management was essential for the success of the EE program and management results.

The proposed methodology route has been agreed upon by the National Parks staff from local, regional and national level, and incorporates advice and recommendations from different stakeholders, in order to better include the park users. Integrating EE into local action plans, will help us to advance toward sustainable management in marine and coastal protected areas elsewhere, taking into account not only the biological but also the social-cultural prism.

Once the methodological route was agreed, the assessment was the remaining challenge. Nowadays, a new perspective to measure management effectiveness in protected areas goes through the inclusion of social data for decision-making. In this process, EE plays a key role in catalyzing biological and social fields in the management process, but there are scarce data about this relation. Following an institutional bottom-up perspective, an EE indicator set proposal was developed, being easy to use by practitioners and able to measure the response of the EE program in relation to the conservation objectives of protected areas management plan. Using a combination of quantitative and qualitative techniques, the data gathering and indicator elaboration is divided in five stages: 1. An EE program survey at a national scale. 2. An interview phase to EE staff and NGOs. 3. EE

Objectives categorization. 4. Systematization process and 5. Focus group to evaluate the indicators set proposal. Finally, a set of 5 EE indicators is developed to fulfill the identified needs: appropriation of information, articulation, participation quality, program implementation and continuity of EE process.

It is expected that this new approach for EE evaluation will hopefully be adopted in the update of management plans of the National Park System of Colombia, as an innovative tool that contributes to the effectiveness assessment of protected areas, incorporating a more social and participative focus.

This PhD dissertation is a contribution to the statements of the Colombian Policy for Social Participation in Conservation and the National Environmental Education Strategy for National Parks of Colombia

Resumen

La Educación Ambiental (EA) es considerada por muchos especialistas como parte fundamental en la gestión de las áreas protegidas, constituyendo una pieza clave en la vinculación de las dimensiones biológica y social para la conservación de los ecosistemas. Comparando con otras estrategias de gestión como la investigación biológica y el monitoreo, este campo se encuentra aun en su infancia, en donde se detectan vacíos en lo referente a sistematización y evaluación, lo que dificulta la integración y visibilidad de la EA dentro de los programas de gestión para la conservación de las áreas protegidas.

Tomando el Sistema de Parques Nacionales Naturales de Colombia como área de estudio, se desarrolló una ruta metodológica capaz de integrar los planes de EA locales al modelo de gestión existente, mediante una investigación participativa e inclusiva para responder a las necesidades y objetivos específicos de conservación. En primer lugar, un diagnóstico interno de la EA fue realizado, revelando que la integración de la EA dentro de la estructura de gestión de los parques es una necesidad prioritaria, siendo un resultado que coincide en los dos estudios de caso elaborados en la costa del Pacífico colombiano. El diagnóstico también demuestra que la comunicación, la participación, la formación y la evaluación tienen que ser reforzadas, en donde la vinculación de la comunidad y a las partes interesadas involucradas en le proceso de gestión es esencial para el éxito del programa de EA y los resultados de gestión.

La ruta metodológica propuesta ha sido consensuada por representantes del equipo de educación ambiental a nivel local, regional y nacional, e incorpora consejos y recomendaciones de las ONGs, de manera que la propuesta sea lo mas incluyente con los usuarios y actores sociales vinculados a los procesos de gestión de los parques. La integración de la EA en los planes de acción local, nos ayudará a avanzar hacia una gestión sostenible de las zonas marinas y costeras protegidas, teniendo en cuenta no sólo los aspectos biológicos, sino también el prisma socio-cultural.

Una vez la ruta metodológica fue consensuada, la evaluación era el reto pendiente. Actualmente es necesaria una nueva perspectiva para medir la eficacia de la gestión en las áreas protegidas pasa por la inclusión de los datos sociales para la toma de decisiones. En este proceso, la EA juega un papel decisivo como catalizador entre los campos biológico y social en la gestión de áreas protegidas, si embargo son pocos los datos sobre esta relación. Siguiendo una perspectiva de "bottom-up" institucional, se desarrolló una batería de indicadores de EA, de fácil uso para los profesionales y capaz

de medir la respuesta del programa de EA en relación con los objetivos de conservación del plan de manejo de áreas protegidas. Usando una combinación de técnicas cuantitativas y cualitativas, la recopilación de datos y la elaboración de los indicadores se divide en cinco etapas: 1. Encuesta a escala nacional sobre el programa de educación ambiental. 2. Una fase de entrevistas al equipo de EA de Parques Nacionales y ONGs medioambientales. 3. Categorización de objetivos de EA 4. Proceso de Sistematización y 5. Grupo Focal para evaluar la propuesta de indicadores.

Finalmente, un conjunto de 5 indicadores es desarrollado siguiendo las necesidades identificadas: apropiación de la información, articulación, calidad de la participación, ejecución de los programas y continuidad del proceso de EA.

Se espera que este nuevo enfoque para la evaluación de la EA sea adoptado en la actualización de los planes de gestión del Sistema de Parques Nacionales de Colombia, como una herramienta innovadora que contribuye a la evaluación de la eficacia de las áreas protegidas, incorporando un enfoque más social y participativo.

Esta Tesis doctoral es una aportación para llevar a la acción la Política colombiana para la Participación Social en la Conservación y la Estrategia Nacional de Educación Ambiental para Parques Nacionales de Colombia.

Summary

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Acronyms

ANOVA	Analysis of Variance for Repeated Averages
AECID	Agencia Española de Cooperación Internacional para el Desarrollo
AEMAPPS	Análisis de Efectividad del Manejo de Áreas Protegidas con Participación Social
CEC	Commission on Education and Communication
CENEAM	Centro Nacional de Educación Ambiental (España)
CEPA	Communication, Education, Participation and Awareness
CBD	Convention on Biological Diversity
CBO	Community Based Organization
CI	Conservation International
GEF	Global Environmental Facility
ICT	Information and Communication Technology
IOC	Intergovernmental Oceanographic Commission
IUCN	International Union for Conservation of Nature
MEA	Millennium Ecosystem Assessment
MPA	Marine Protected Area
NGO	Non Governmental Organization
NPS	National Parks System
OECD	Organization for Economic Co-operation and Development
PA	Protected Areas
PPSR	Public participation in scientific research
PSR	Pressure – State - Response
SCB	Society of Conservation Biology
TNC	The Nature Conservancy
UAESPNN	Unidad Administrativa Especial del Sistema de Parques Nacionales Naturales
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
WCPA	World Commission on Protected Areas
WWF	World Wide Fund for Nature

Prologue

Life is a cycle, and when one of these cycles ends, another has to begin. Here I present the story of one of those cycles, my PhD.

It all began when I was doing my research for the biology degree about the composition of fish fauna and coral reefs on a National Park in Colombia. I realized that the work with fisherman that used dynamite for fishing was essential and that the connection between the resident community and the managers was necessary for the conservation of those ecosystems. However, most of the researches were missing this component.

Months later, when I was receiving my bachelor's degree, a great speech from my University director was saying "goodbye", but at the same time, "see you soon".

...*"You have to know that you are privileged people, not only in your country but also all over the world. You are this very low percentage that were able to achieve a career degree in an outstanding Institution. As University director I want to tell you that you have a debt with Colombia. If we want to achieve a promising future for our people and progress in the good way, I hope you come back and give something in change. And I know from the bottom of my heart that you will"*…

These words have followed me up to now. Today, I can proudly say, this come back promise has been accomplished.

When I decided to start my PhD research on environmental education with a focus on conservation, I firmly decided that my project needed 3 essential elements, given the degree of personal involvement. Those three elements were: 1. Produce new knowledge with practical and useful results, 2. To be conducted in Colombia, and 3. Social commitment. I deeply expect these three pillars can be found all through this research.

Thanks to the support of AECID (Agencia Española de Cooperación Internacional para el Desarrollo), and the Administrative Unit of National Parks of Colombia (UAESPNN), I was able to merge those elements into the project "Integrating environmental education within the management model of the protected areas system", which I present in the following lines.

This research proposal was elaborated jointly with the management group of the UAESPNN, especially the environmental education area, with whom collaboration was

permanent during the whole process. Objectives were developed during a series of meetings and teamwork, in order to converge into a unique set of interests able to unify managers and researchers that usually worked separately.

Results from this process, made possible to set-up a real common project from the beginning in a win - win relationship, addressing the research towards existing gaps and needs identified by the practitioners themselves, as suggested by Braunisch et al., (2012). This was a fundamental step for the progress and success of this investigation.

With a common objective and a chronogram established, I started the process, with two key words that summarize the entire process: ACTION and CHANGE.

Introduction

The present study provides the framework and insights of the research context within the environmental education (EE), protected areas management and conservation field. Here I present the most relevant and updated information to understand the connection among fields that gives special significance to this work. I give special relevance to the challenges that nowadays society is facing as the leading thread in which I seek to make a contribution

1. Protected areas, Conservation and Management

We already know, based on scientific evidence that our planet Earth is changing, and not for good in terms of biodiversity and ecosystem complexity. Protected areas as a symbol of conservation action need to incorporate new approaches addressed to reduce this rapid transformation and adapt to this new conditions. In order to implement actions, a collaborative environment is required among managers, researchers and stakeholders to understand the context from multiple dimensions (biological, social, political, etc.) and give an integrated response, in which EE can play a fundamental role.

1.1. Protected Areas Today

Given the great acceleration of the Anthropocene (Palomo et al., 2014; Steffen et al., 2011), referring to that slice of Earth's history pie in which people have become a major geological force, we, as a species capable to transform the biosphere, have warmed the planet, raised sea levels, eroded the ozone layer and acidified the oceans (Monastersky, 2015) in a very brief elapsed time. We live in a world that needs to be thought again in order to fulfill our essential and future needs, not only from a human position (as it has been so far), but also from an environmental perspective that has to be inclusive with social and nature dimensions.

In 1872 the creation of the first protected area, the Yellowstone National Park, as people-free areas that hold great natural and scenic values, marked a before and after in the history of conservation of nature. Since then, the extent of protected areas has grown exponentially: 3.41% of the world's marine area and 14% of the world's terrestrial areas are currently protected (Deguignet et al., 2014). Currently, this no-take and free people model is still in force, but new approaches are rising that foster connections with other PA, integrating the social, economic and political dimensions (Palomo et al., 2014).

Worldwide, protected areas are now created not only with the aim to safeguard unique landscapes or seascapes to preserve biodiversity, but also to contribute to the livelihood of local communities, providing ecosystem services for the present and future human

generations (Watson, Dudley, Segan, & Hockings, 2014), as is represented in the last definition stated by the International Union for Conservation of Nature (IUCN):

"A protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values" (N. (Editor) Dudley, 2008, p. 8).

However the enormous benefits they provide, protected areas are still today under-valued and misunderstood (Stolton & Dudley, 2010, p. 257), evidenced now with the increase of protected area downgrading, downsizing, and loss of legal protection for an entire protected area also known as degazettement (PADDD) (Michael B. Mascia & Pailler, 2011). Currently, more than 543 instances of PADDD in 57 countries are affecting protected lands and waters, being a largely unrecognized threat to biodiversity and a rarely employed mechanism to strengthen conservation policy (Michael B. Mascia et al., 2014). For a long time, PAs existence have been taken for granted, but the vast majority setbacks in terms of economic support, policy protection, unsustainable development and the lack of global political commitment can jeopardize what it has been achieved so far (Bernard, Penna, & Araújo, 2014; Michael B. Mascia et al., 2014; Watson et al., 2014).

With this evidence, today, the solely increase of protected area extension is not enough. It is a fundamental first step, but it must not stop there. In the last IUCN World Parks Congress held in Sidney (2014), conclusions address to focus more on the quality of management of protected areas ("Conservation: A to-do list for the world's parks.," 2014; Rodrigues et al., 2004; Watson et al., 2014), than in the AICHI targets promoted by the last Convention of Biological Diversity (CBD, 2010).

Conclusions from these two significant events converge that a new direction has to be set in order to safeguard nature: protected areas need to be declared with a real meaning of protection, and be managed effectively. Action needs to be undertaken (Knight et al., 2010), and inclusiveness with local communities and stakeholders is needed to set a new approach of management in this new era (Popescu, Rozylowicz, Niculae, Cucu, & Hartel, 2014).

1.2. The conservation challenges
Worldwide, a significant number of organizations have been created in the last decades with the aim of protecting nature. The role that institutions such as the International Union for Conservation of Nature (IUCN), World Wildlife Fund (WWF), Conservation International (CI), The Nature Conservancy (TNC), among others, have been crucial to

develop conservation strategies at local, national and international level to safeguard our natural heritage.

In a parallel way, the documentation of the conservation movement has produced also a fast evolution and has increased the academic input since the beginnings of the conservation history. From 1993 until 2012, the number of journals referring to wildlife conservation, had risen from 50 to almost 300, and the same trend is observed in the number of published articles per year, that have also increased significantly over time, at least tripling in number between 1993, 2002, and 2012 (Cronin et al., 2014).

The rising scientific production figures on high impact specialized magazines is also evident. Journals such as *Conservation Biology, Biological Conservation, Biodiversity and Conservation, Journal of Nature Conservation*, etc. are dedicated entirely to this discipline meanwhile *Nature and Science*, sharing some of the highest impact factors have also contributed with special issues or articles to the science of conservation.

It cannot be denied the strong growing trend of the field, and the high level of commitment of people involved in the task. However, when it comes to conservation practice success, results are quite disappointing. Knight et al. (2008), showed that almost 70% of conservation assessments published in peer-reviewed journals had little or no intention to implement action and from the remaining 30%, only 13% were considered "highly effective". In addition Watson et al. (2014), regarding to the performance of protected areas, established that according to global studies, only 20–50% of protected areas assessed were found to be effectively managed.

Trying to make a unifying approach from different authors conclusions, three main breakages are detected in the practice of conservation:

a. *People's separation from nature:* in the vast majority of cases, the declaration of protected areas as a fortress-conservation strategy, and exclusionary management models, have separated people from nature, ignoring the important role of local communities in managing ecosystems and biodiversity (Palomo et al., 2014). *"Parks, People, Planet: inspiring solutions"*, was the slogan of the last World Parks Congress, in which experts claim for new paths to reestablish connection of humanity with environment, as one of the main strategies to safeguard the natural heritage for future generations. As recommendation, a strong societal support is needed, based on the benefits and values of the services the protected areas provide (MA, 2005), in order to enhance current conservation efforts (Stolton & Dudley, 2010, p. 264).

b. *Academic research and conservation practice:* The second issue rises from the limited

interaction and division between academic conservation scientists and conservation practitioners and managers, called the Knowing-doing gap. Worldwide, most implemented conservation and management actions are being based on extensive knowledge about biodiversity and ecology but less experience with landscape planning (Palomo et al., 2014). This subjective expert opinion, linked to intuition, if not trial and errors, rather than on scientific evidence, has been the major component of the strategies applied into the planning of protected areas (Arlettaz & Mathevet, 2011). This fact is also supported by numerous authors (Habel et al., 2013; Knight et al., 2008; Laurance et al., 2012; Meijaard, Sheil, & Cardillo, 2014), that highlight that research published in refereed journals has little direct impact on real-world in terms of conservation and effectiveness, adding the fact of limited access to such information for practitioners and policy-makers. Most research and researchers never plan for implementation (Knight et al., 2008), and the lack of relevance of obtained results, promotes misconceptions about how conservation works and what practitioners actually need (Laurance et al., 2012). To overcome this gap, and a general call has been made to foster a more proactive attitude that advocates for a better communication with practitioners and seek more efficient means to a common end (Braunisch et al., 2012; "The great divide.," 2007).

c. *Interdisciplinary lack between natural and social science:* In its majority, the conservationist field has focused its efforts in understanding and creating knowledge about biological issues, but the social dimension is still underrepresented. This poor interdisciplinary scenario, result often in conservation efforts that are isolated from the real-world contexts (Laurance et al., 2012; Popescu et al., 2014). However, things are changing and more experts are claiming to re-focus the field of conservation on advancing and sharing knowledge in all relevant disciplines, including new paradigms and models of research to bridge the existing gap (Bearzi, 2007; Braunisch et al., 2012; Bride, 2006; Claudet & Guidetti, 2010; Moon & Blackman, 2014).

Balancing the needs of people and conservation aims, is a difficult task but urgent ("Protect the parks.," 2014). In the final instance, parks were made for people, and to assure their existence, we have to reestablish this connection so they can be not only ecologically, but also, economically and socially sustainable in the distant future.

The solution of this fragmentation between management-monitoring and society can be one of the most important steps toward the finding and activation of practical and effective solutions for the conservation practice. While proof of conservation success is ultimately biological, conservation itself is a social and political process, not a biological process (Alcorn, 1994). A good example of this situation was the creation of the National Park of

Uramba-Bahía Malaga in Colombia in 2010, after years of conflict with the economic sector, which were promoting a deep-water harbor construction project. The involvement of NGOs, local communities with the support of academic sector into an organized social action, made possible to transcend political and economical borders making possible the declaration of this high value coastal and marine protected area (MAVDT, 2010) . This was the first time that in Colombia, a park's declaration was requested and approved by afro communities as an instrument to ensure sustainable management of their territories and ancestral livelihoods, that will have also an important biological impact.

2. Management effectiveness and indicators

Worldwide, numerous methodologies have been developed, under the general framework proposed by the IUCN – WCPA (World Commission on Protected Areas) (UAESPNN, 2011). This framework was built in essence to know to what extent protected areas are functioning as an effective strategy for conservation.

It is important for managers to understand what works and what does not, so they can build on the best ideas and practices. Evaluation of management effectiveness is a vital component of this responsive, pro-active style of protected area management. Through evaluation, success and failure experiences can be used as chance for learning, and continual improvement can be combined with anticipation of future threats and opportunities (Fiona Leverington, Costa, Pavese, Lisle, & Hockings, 2010).

Nowadays measuring effectiveness is still a challenge, especially what has to do with social issues. The assessment of the social dimension in protected areas management is still poor comparing to biological issues (Pelletier et al., 2005). Some constraints can be found in the difficulty to integrate more qualitative and intangible indicators, low budgets for evaluation purposes (Leisher et al., 2012; Pasgaard, 2013), and the need for more staff and better training in a range of technical areas (Fiona Leverington et al., 2010).

In spite of the recent difficulties, proposals start arriving, especially from coastal management. The integration of biological, socio-economic and governance data for the assessment is now evident in most management plans, international guidelines for the effectiveness assessment, but there is little evidence on the real application of this data and its direct relation to conservation goals.

Generally, measuring effectiveness is done through indicators. Some initiatives that integrate the social context are found as governance and socio-economic indicators that are now commonly found in the theory of management practice. Some examples of this kind of measures include levels of understanding of human impacts and resources,

stakeholder knowledge of natural history, perceptions on local resource harvest (e.g., R.S. Pomeroy, Parks, & Watson, 2004), stakeholder participation, NGO and CBO activity, education and training (e.g., IOC-UNESCO, 2006), but rarely those indicators look at processes of the educational task. In addition, other initiatives have developed indicator proposals for management through participatory processes with stakeholders reflecting the participants' perception of the major issues to be addressed in coastal development and management, in which the balance is in favor of social issues and not biological ones (Fontalvo-Herazo, Glaser, & Lobato-Ribeiro, 2007; Marques, Ramos, Caeiro, & Costa, 2013).

However the advancements in breaching the gap, it is still big enough. In terms of educational and participative processes, moving beyond the data gathering of absence or presence is needed. A commitment to long-term evaluation in terms of management, personnel and budget is required (Bowen & Riley, 2003; Olsen, 2003; Satumanatpan, Senawongse, Thansuporn, & Kirkman, 2014), to have a deeper understanding of the management dynamics response instead of the static outputs or products results. Only if we follow this path, we will be able to understand the complexity and linkage between the biological and social dimensions, and improve the task of management and conservation.

3. EE in protected areas

Not all are bad news. Even if the panorama does not look very encouraging, there are solutions and pathways to foster a change; whichever the approach chosen, is necessary to consider how important people are for conservation. Biology and social dimension can and *must* work aside. EE as a broader term for Conservation Education (Kobori, 2009) is one of those powerful solution pathways that can play a strategic role to connect science, people, nature and policy (Bearzi, 2007; Brewer, 2006).

3.1. Putting EE on the map

Having a top-down look into global environmental bodies, evidence shows that the role of EE within organizations is in its infancy. The IUCN-CEC (Commission on Education and Communication) is one of the benchmark institutions at global level that have education to the mainstream of its actions. While recognizing their valuable work, EE nowadays, is more focused in communication, awareness and sustainable development, but its visibility in other fields as protected areas, is still limited.

Making a revision of publications from the history of the IUCN-CEC, draws attention to the fact that EE was very popular during the 60's and 70's, but in the 80's EE was no longer a IUCN priority (Cerovsky, Hesselink, & Maas Geesteranus, 2011). Mid 90's EE revitalized

its labor, but communication, education, participation and awareness (CEPA) for sustainable development was the big package, with communication as it main focus, and somehow it continues to be. Relevant publications in this field are the CEPA toolkit (Hesselink, Goldstein, van Kempen, Garnett, & Dela, 2007) as one of the main publications from IUCN-CEC showing the importance of well communication strategies and practice in the framework of the CBD.

With the UN Declaration of the International Decade of Education for Sustainable Development (2005-2014), the ESD discourse went beyond schooling, to embrace informal learning, advocacy and diverse audience communication activities. However, a lack of collaboration among commissions is observed, especially when it comes to PAs.

Likewise, numerous researches published in high impact journals have been conducted around protected areas, management and conservation, but not that many that include EE as one of the pillars for an effective management and conservation. A similar situation is found in specialized journals of EE, in which research on the field an impact of educational actions in protected areas and management is reduced.

Translating data into meaning (Brewer, 2006) is a good example of this reflection. Her conclusions from an extent bibliographic revision of more than 3000 published papers on *Conservation biology,* highlights that now, more than ever, education must cut across all facets of conservation biology. It would be of tremendous value if research information could arrive and engage the public and inspire them to take action. On her revision, she found that only, 71 essays from the journal were dedicated to education (mean = 4/year), which is a very low percentage given that one of six key objectives stated in 1987 from the Society of Conservation Biology (SCB) is "the education, at all levels, preparatory and continuing, of the public, of biologists, and of managers in the principles of conservation biology."

In addition, Fien et al, (2001), also put together both issues of education and conservation, after an analysis of the global educational programs of the World Wildlife Fund (WWF) and the implications in the conservation objectives of the organization. The article comprises the lessons to be learned from the findings, providing insights about planning and evaluating EE programs, especially within conservation groups and resource management agencies.

3.2. EE and its role in conservation and management

"If conservation biology is to be fully activated, surely we all have a duty to be educators, to engage with some of the more challenging and critical inputs conservation educators

have had (and will have) to offer, and to fight to integrate the outcomes within our institutions and practices. We will thereby inject a new vitality and direction right across our discipline. (Bride, 2006)"

EE as a fundamental basis for conservation is becoming increasingly important among ecosystem managers and conservation specialists (Fien et al., 2001; Hayes, 2009; Kamphuis, 2011; Salm., Clark., & Siirila., 2000). Conclusions from the Millennium Ecosystem Assessment (MEA) underpin education as a key piece in supplying information and awareness for stakeholders. Authors subscribe that although education about ecology has generally improved in recent decades, education on marine systems is underfunded and underdeveloped (Dayton et al., 2005).

This underdevelopment has also some roots in the lack of integration of EE within the management models and conservation objectives. Is very common to find EE process that do not fully support stated management aims. This is due mainly to four reasons: (i). Lack of clear and well-defined management goals (ii). Both strategies are planned separately in time and space (iii). EE practitioners' communication or management team staff integration is low (iv). Limited funding (Fraschetti, Terlizzi, Micheli, Benedetti-Cecchi, & Boero, 2002; Gardner, 2009; Leisher et al., 2012).

Recent research raises the need to elaborate the objectives of conservation, education and management, from an integrating perspective to facilitate the sustainable use and protection of natural habitats, including not only environmental and biological aspects, but also social elements to have an effective and inclusive management of protected areas (Bearzi, 2007; Claudet & Guidetti, 2010; Hesselink et al., 2007; Pollnac et al., 2010; Sherrow, 2010).

Although much progress has been made in the field of EE and protected areas management, one of the biggest challenges to overcome it is the lack of long-term planning. In order to value its contribution to the conservation field, is necessary to establish coherent methodologies, systematization and evaluation of the objectives (Bonney & LaBranche, 2004; Gardner, 2009; Kuhar, Bettinger, Lehnhardt, Tracy, & Cox, 2010). Having this structure clear, a long-term EE plan can also play a key role for project fundraising, negotiation tool with stakeholders, and managers, for a better economic and human resource distribution.

Finding the missing pieces between society and conservation is the key to solve management problems related to local people. To understand this gap, first we have to look inside the processes and evaluate the impact of the undertaken EE actions, and be

able to understand EE success or failure based on evidence. Without these findings, isolating what works in EE will continue to be elusive (Stern, Powell, & Hill, 2013).

Stolton and Dudley (2010, p. 264) make a point in the final page of its book. They argue that protected areas – in their modern incarnation – almost certainly were one of the best and most revolutionary ideas of the 20th century, and still continue to be. Protected areas today are still controversial and against a high number of economical interests, that's why a better understanding of their values, coupled with a conscious building among stakeholders, can ensure the ideas and practice of protected areas to continue growing in the future.

4. Colombia as a case study

Colombia is considered the world's second mega-diverse place in the world. It also constitutes a network of important biodiversity hotspots that still conserve the original extent of high-biodiversity terrestrial ecosystems in the tropics (Mittermeier, Myers, Thomsen, Da Fonseca, & Olivieri, 1998; Myers, Mittermeier, Mittermeier, da Fonseca, & Kent, 2000). It has the first place in number of birds, and amphibians, and within the first five in number of plants, reptiles and mammals. Its high diversity of thermal floors, ranging from 5000 meters above sea level in the Andes, with areas of perpetual snow to benthos in the Pacific ocean and Caribbean Sea, shaped the great biological and cultural richness and diversity of the country (Villegas, 2006).

However its biodiversity richness, Colombia has also a rooted violence history that in the past, present and future, makes it difficult for the management and conservation task. Understanding these two facts, now, more than ever is when education must take a leading role in the construction of peace and sustainable development. This is a direction that Colombia has to choose in order to reach both ports safely.

Management of protected areas in Colombia has been a priority since the establishment of the first protected area in 1960, as the beginning of an incredible network of 59 protected areas today. The increased challenge of the protection of this territory, has forced the NPS to implement a management model that is based on the Pressure-State-Response (PSR). The PSR framework was first developed by the OECD (1998), and has extended its use all over the world to track environmental progress and the factors involved in it, and it is a major tool for analyzing environmental policies and measuring environmental performance.

In 2004, the NPS decided to start implementing the Analysis of Management Effectiveness in Protected Areas with Social Participation (known by its Spanish

acronym, AEMAPPS). This tool was designed to support protected areas, management teams and others actors involved in the process in accordance to the NPS action plan and management strategies (Fig. 1). The indicators focus on the qualification process of planning, executing and verification of the achievement of objectives, desired outcomes and impacts (Fiona Leverington et al., 2008).

Fig. 1. Institutional organization and management plan structure with AEMAPPS as assessment tool

Although the importance of the AEMAPPS as an effectiveness evaluation tool, results remain extremely quantitative with little detail into ongoing processes derived from the complexity of the work in the NPS. An existing gap to evaluate the degree of achievement of the objectives, from a detailed and qualitative perspective remains as one of the big challenges to reach, in order to have a full and detail picture of the effectiveness of PA.

Within the management structure, EE is constituted as one of the transversal programs to improve the social perception and value recognition of protected areas to society, specially the communities involved in their management. This management line within the NPS is conceived to promote relationship and exchange of knowledge between social and institutional actors, for the valuation of National Parks from a natural, social and cultural dimension. It also has an important function within the Policy for social participation in conservation, as an action channel within the task of the management of protected areas in the country (UAESPNN, 2001).

5. Justification

However the specified role of EE and presence within the NPS, is not until 2012, that a

National EE Strategy is consolidated and approved by law (UAESPNN, 2012). This huge step has to be accompanied by an action plan to deliver the objectives and goals that were established, in order to have a real practical meaning.

The poor availability or no access to information of EE practical guidelines of planning mechanisms, systematization, monitoring and evaluation, constitutes an obstacle to the collection of comparable and aggregated data for project assessment and for the elaboration of management reports for decision-making.

The essence of this research was to transform the way the EE program was being developed and integrate it within the actual management structure and model of the protected areas of the NPS. This research coincided with the complete revision and update of the management plans for the entire National Parks System (NPS), which gave us the opportunity to work hand with hand with the ongoing process.

This research aims to acquire further knowledge to promote the articulation of the EE program with the management actions and conservation policies, providing practical tools that facilitate the development and assessment of the EE program based on internal and external participation within the NPS.

6. Objectives of the Thesis

- Create a common project and collaborative relation among NPS and researcher, to fulfill both parts needs
- Perform a diagnosis of the EE program in the NPS
- Integrate EE within the management plan through an agreed guiding route for the elaboration of local action plans
- Develop a theoretical EE indicator set proposal from an institutional bottom-up perspective that is easy to use by practitioners
- Integrate the EE indicator set into the management of protected areas

7. Thesis structure

In order to improve the entire EE process within the institution and evaluation, the research was conducted from an institutional bottom-up perspective to get into the reality from the local level to a national scope. This research work is structured in three chapters that cover all the EE transforming process of EE within the NPS of Colombia (Fig. 1).
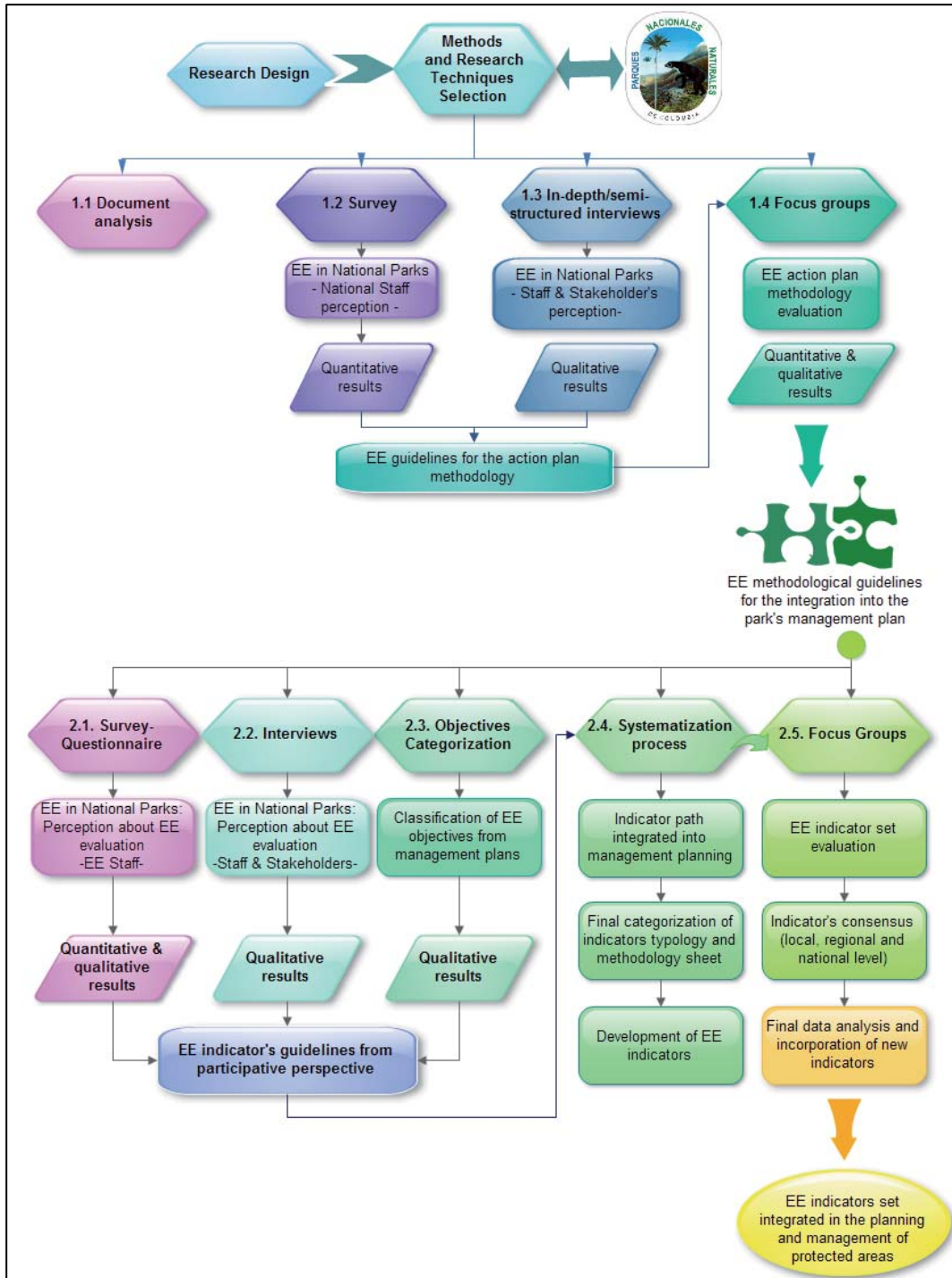
Fig. 2. Research Design

The first chapter incorporates the article published at *Ocean and Coastal Management* in which the objective was to elaborate a common methodology to integrate EE within the updating process of the management plans that were being revised during the time of the research.

It has to be said, that in the first instance, the research was focused on coastal areas from the pacific coast of Colombia, especially in two National Parks Utria and Gorgona, that were similar regarding to protected area size and conservation objectives.

The excellent relation of cooperation established with the headquarters of National Parks, triggered the research to a national level interest, in which representatives from all regions and almost all parks at local level got the opportunity to participate and collaborate with the project. Besides other important achievements, this was the first key and unexpected success reached during the research.

The second chapter is dedicated to the evaluation. Evaluation is still the pending task in EE. Although it is a big step that EE is considered for the short-term evaluation of effectiveness at National Parks, the representativeness and quality is still very low for this crosscutting program. The implemented evaluation tools were focused to measure the final products and outputs, but never take a look at the process and impact of the actions developed. Giving continuity to the institutional bottom-up standpoint, this article gives response to the lack of evaluation tools, offering a methodology to develop EE indicators, and a set of Indicators to evaluate the EE program. These indicators are thought to be useful, practical and easy-use for practitioners in order to be included in the monitoring process of the evaluation of the management effectiveness plans.

The third chapter is dedicated to discussion and conclusions. It relates the obtained results with similar researches and its implications according to the theoretical framework chosen. From the results analysis and interpretation, I develop the final agreed proposal for the integration of EE within the existent management model. It also includes thoughts and recommendations to carry on the EE task.

Chapter I

Integrating environmental education in marine protected areas management in Colombia

Abstract

Environmental Education (EE)[1] is a key component in any marine protected area management. However, its visibility and action plans are still poorly developed and structured as a clear element in management procedures. The objective of this study is to contribute with a methodological route that integrates EE to the existing model of management planning and strategies, taking the Colombian National Natural Parks System as a case study. The creation of the route is proposed as a participatory research with different stakeholders in order to respond to the specific conservation needs and goals for the National Parks System. The EE national diagnosis has shown that its integration within the parks management structure is a first priority need, being a converging result on the two case studies on National Parks from the Pacific Coast of Colombia. The diagnosis also demonstrates that communication, participation, training and evaluation have to be reinforced, linking the community and stakeholders involved in the park management to the whole EE process. The proposed methodology route has been agreed upon by the National Parks staff and incorporates advice and recommendations from different stakeholders, in order to better include the park users. This step will help us to advance toward sustainable management in marine and coastal protected areas elsewhere, taking into account not only the biological but also the social-cultural prism. The main challenges in the management and conservation of coastal and marine ecosystems today are discussed

1. Introduction

Coastal areas undergo a heavy anthropogenic pressure on biodiversity, complexity and key species biomass (Abdulla, Gomei, Maison, & Piante, 2008; Dayton et al., 2005; Jackson et al., 2001; Levinton, 2011; Rossi, 2013). The aim of Marine Protected Areas (MPAs) is essentially to relieve vulnerable habitats and species from such pressures. However, frequently, the conservation plans and recommendations do not reach

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[1] EE – environmental education

stakeholders, politicians and especially end term users. The vast majority of the conservation work and practice remains obscure in the form of scientific papers, grey literature or technical reports and protocols, creating frustration on both sides: the people who make the rules and the people who have to apply such rules (Bearzi, 2007).

Nowadays, participative Environmental Education (EE) is an approach that is becoming increasingly more popular among conservation specialists and ecosystem managers faced with this information problem (Brewer, 2006; Fien et al., 2001; Hayes, 2009; Kamphuis, 2011; Salm. et al., 2000). Recent works state the necessity to determine the goals of conservation, education and management, from an integrative perspective, in order to facilitate the sustainable use and protection of natural habitats, including not only the ecological and biological aspects but also social and cultural elements, with a view to having effective and inclusive management of protected areas (Bearzi, 2007; Hesselink et al., 2007; Pollnac et al., 2010; Sherrow, 2010).

Although considerable progress has been made in the field of community-based management, one of the major difficulties is to move from passive community participation (e.g. information and consultative processes) to an active community involvement (two way communication, decision making, action for change). In this active involvement people participates in the experimentation and learning process, being the participation seen as one of the main rights of the community and not only a way to achieve project goals (Cornwall, 2008). The local and external people need something more than top-down model of laws and policies built by institutions (Kearney, Berkes, Charles, Pinkerton, & Wiber, 2007), but an approach that has to be bottom-up. In fact, it has been demonstrated that local communities have an essential role in this aspect, and a positive effect on the co-management of MPAs (Dahl, 1997; Gutierrez, Hilborn, & Defeo, 2011; Kearney et al., 2007; Mills, Jupiter, Pressey, Ban, & Comley, 2011). To achieve better management, the proper transmission of the educational approach has to adapt to the different communities in which they will be developed, and not the other way round; In this context, one of the major difficulties to achieve this active participation and community involvement, is the lack of well-defined objectives, especially in the methodology, systematization and evaluation of the educational programs and their contribution to conservation goals (Kuhar et al., 2010).

The present research seeks a change instead of reaching theoretical conclusions. The problem is closing the gap between pure theory and practice, where such conclusions are focused on applications that would enable reality to be transformed. It also seeks a continuous improvement in quality and must be based on shared criteria and a

comparative analysis of different points of view (Benayas, Gutiérrez, & Hernández, 2003).

In order to gain a better understanding of the tools that have to be implemented to pass from a theoretical to a more practical approach in the transfer of information from scientists/managers to users, we accomplished in the present study three different targets: 1) Perform a diagnosis of the EE program not only in our study area but also to the whole National Parks System. 2) Establish the main rules of EE in MPAs with solid participation of Park staff members and stakeholders and 3) Integrate these rules into the Park's management plan with a focus on quality and long term practice alongside prioritized social actors. In order to do this, a first national survey was carried out including 20 National Parks (44% of the National Park's network) with a special focus on Gorgona National Park and Utria National Park, both located in the Eco-region of the Choco Biogeographic area (Mittermeier et al., 1998; Olson & Dinerstein, 1998). They were selected because of their biological value, location, socioeconomic and political situation, similar protected area dimensions, reference point for diverse researches in coastal and marine habitats and time within the National Parks System (UAESPNN - Parques Nacionales Naturales de Colombia, 2008).

It is expected that the EE plan will contribute to integrate those stakeholders with major implications in the protected areas, reducing threats and anthropogenic pressures, and improve the state of conservation of MPAs, from a perspective of EE as a process and long-term action. The final aim of this paper is to provide clear EE tools, which can be transferred from scientific and technical managers of MPAs to different social groups everywhere, with a view to the methodology being potentially extrapolated to other areas worldwide.

2. Methods

To carry out the present research, the study was conducted using a quantitative and qualitative methodology (Fig. 3) in order to obtain a general and detailed picture of the complexity of the process studied. The combination of both methodologies allow us to obtain a more solid basis to work at a national and local level during the study, being able to contextualize the research at the different management levels we were working with. For the diagnostic study, we took into account the viability of working together with these two kinds of methodologies, which is acceptable for a diagnostic study (Benayas et al., 2003; Dillon & Wals, 2006; Meyers, 2006; Russell, 2006; Sauvè, 2000).

The quantitative methodology consisted of questionnaires exploring the perceptions of educators related to the EE program of the National Parks System.
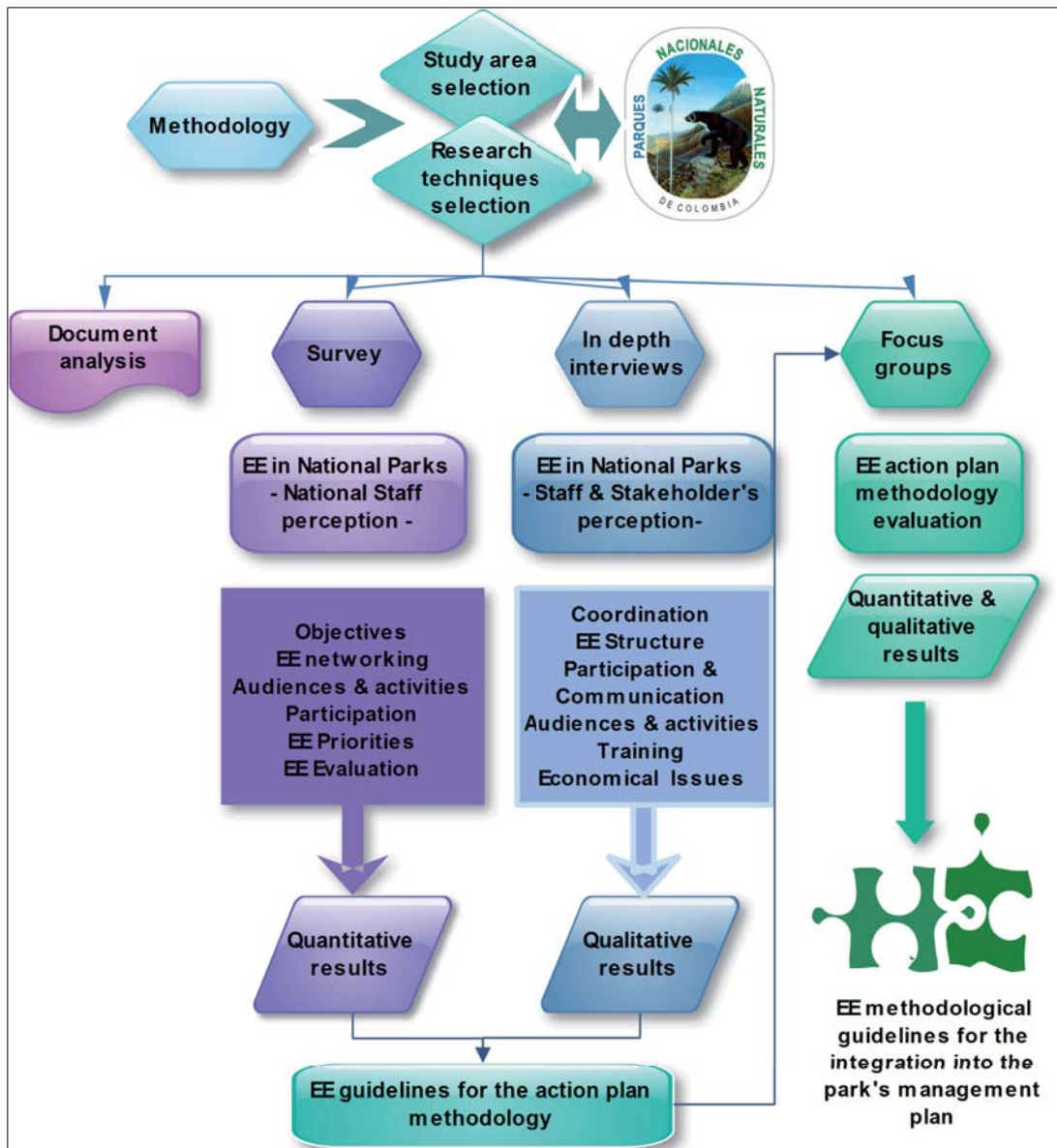
Fig. 3. Scheme of quantitative and qualitative methodology used in the research.

The questionnaire was delivered by e-mail to all EE teams in the National Parks System during the second trimester of 2011, with the exception of Gorgona and Utria National Parks, which were delivered in hard copy during the fieldwork.

The structure of the survey included 7 sections divided into the following topics: EE objectives, institutional coordination and support, audiences and activities, communication and participation, priorities in EE, evaluation process, and personal information. The questionnaire was validated at the central office of the Park system, in order to detect failures and adjust the instrument before sending the document to the educators. They were asked to fill in the questionnaire on the basis of available data and their own experience of the management tasks of the park.

The qualitative data was obtained by means of 15 semi-structured interviews with staff members from the central and local offices including Gorgona and Utria National Parks. The interviews also integrated local stakeholders and environmental NGOs that work in the study area and also at a national level. Atlas.ti 6.2.27 supported all qualitative data analysis, allowing us to use the same categories used in the interviews and surveys.

In addition to interviews, two focus groups were carried out with representatives of local, regional and national management offices of the Park's system, being composed of homogenous groups of people. The common characteristics in both groups were their position at the Institution (regional environmental educator coordinator or local environmental educator) that is relevant to the topic of the study (Krueger & King, 1998). In order to evaluate the route for EE local action plans, focus groups give us information about perceptions, feelings, and attitudes of the new proposal and its application viability. The characteristics of a typical smaller focus group project is that the sample can be taken from two to four groups, being the recruitment of participants easily available (i.e. doesn't require a complex analysis or fully transcription, and produces a brief report with conclusions (Morgan & Scannell, 1998)). With this technique, we can be able to see reality from a bottom up point of view, and not from the top down as usual. The use of this technique facilitates the identification of project strengths, weaknesses, and the generation of new ideas and recommendations (Krueger, 1988), regarding the methodological route to guide the educators in the local sphere to construct the local EE action plans.

The first focus group was composed of local staff members from 10 national parks, with a total of 11 participants, five of which belonging to the MPAs. The EE national committee constituted the second panel, with a total of 10 participants from all regions of the Park System is divided.

The questions that guided the focus groups were:

1. What do you think about the actual structure of the proposed methodology?
2. Do you think this methodology is needed and will help through the process of elaboration of local EE action plans?
3. Which changes would you propose in order to make it practical for its use? (You can change boxes order o rephrase them)
4. Would you include or delete any box from this proposal?

At the end of the session, we delivered a participative evaluation to record the group perception about the session during the discussion and the preliminaries results.

3. Results

The questionnaires were delivered to a total of 45 National Parks that have an EE program running (80% of National Parks) and also to the UAESPNN central office, where a total of 46 surveys were registered. Of the total gathered, 20 surveys (43%) were fully completed, and were used as the sample size for the analysis (Fig. 4). The 26 remaining surveys (56%) were not included in the analysis because answers were not complete or were inconsistent.
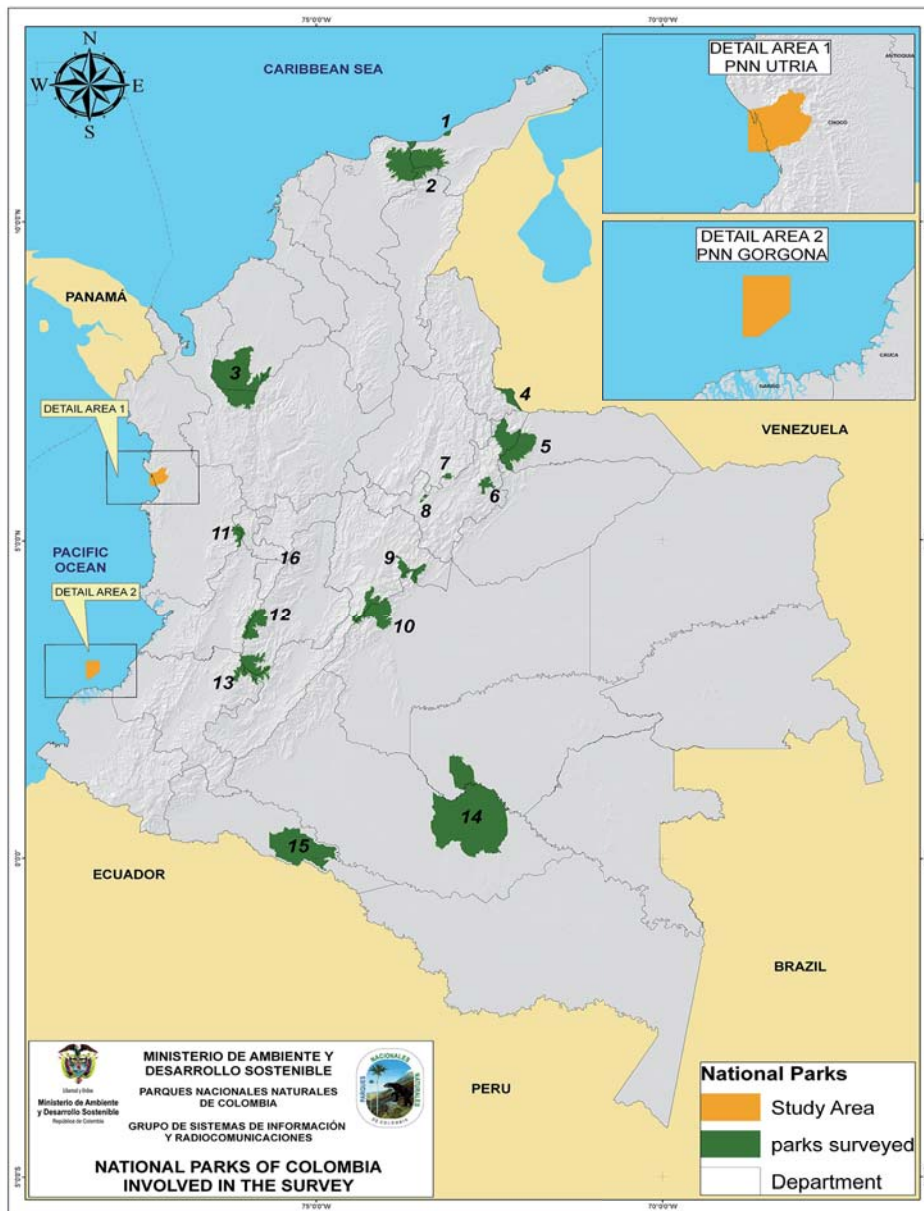
Fig. 4. Geographic distribution of the Natural National Parks involved in the survey including the study area. (1) Flamencos. (2) Sierra Nevada de Santa Marta. (3) Paramillo. (4) Tama. (5) Cocuy. (6) Pisba. (7) Guanetá – Alto Fragua. (8) Iguaque. (9) Chingaza. (10) Sumapaz. (11) Tatama. (12) Las Hermosas. (13) Nevado del Huila. (14) Serranía de Chiribiquete. (15) La Paya. (16) Otún – Quimbaya. Detail Area 1 – Utria and Detail Area 2 Gorgona.

3.1. Objectives

The results from the survey in Table 1 indicate that the objectives of the EE programs are well defined and follow the SMART categories: specific, measurable, realistic and timely. Nevertheless, the condition attainable presents a major disagreement within the survey, in over 50% of the respondents.

Table 1. Percentages results from the National Parks' survey completed by the Environmental Education (EE) staff members (n=20) according to objectives, institutional coordination and assessment.

	% Agree	% Disagree
Objectives		
Understandable	100	0
Clear and specific	90	10
Realistic	85	15
Time defined	80	20
Consistent	80	20
Measurable	75	25
Written plan	75	25
Attainable (availability of resources and capabilities)	45	55
Institutional coordination and support		
Management plan knowledge	95	5
EE alignment with management plan	90	10
EE institutional transversality	75	25
EE transversality in management plans	70	30
Institutional networking	45	55
Human resources	35	65
EE alignment with conservation objectives	30	70
Similar Parks management plan knowledge	30	70
Economic resources	15	85
Assessment		
EE improves conservation	90	10
EE achieves its objectives	70	30
Existing EE program	55	45
EE objectives are known by the staff	55	45
EE is systematic and consistent	55	45
Drafting of EE Annual Report	45	55
Reflection process	45	55
Feedback	40	60
Continuous assessment and monitoring	30	70
Existence of indicators	20	80

In the qualitative analysis, the results show that the objectives are too generalist and that economic resources are not sufficient in order to attain and achieve the proposed goals.

…"I think there should be more clarity: a general objective and clearer specific objectives. What I perceive in general is that there are many loose wheels; there is a need for projection, a scheme with a large target or goal with objectives to fulfill. Obviously, if you're not clear you cannot project anything; methods, stakeholders, anything." (NGO director)

…"While environmental education in parks is not appreciated in its true dimension and there are not sufficient resources to meet objectives, the results will always be occasional and linked to the individual efforts of the staff members." (Park staff member)

…"There are not enough economic resources from my point of view." (Park staff member)

On the other hand there are some cases in which EE has been working in coordination with the local staff and management plan.

…"The objectives of EE in our protected area are developed on the basis of the problems encountered by the park annually. In that sense, the park develops a specific required educational action in those communities that demand special environmental actions." (Park staff member)

…"EE objectives are consistent and have been developed with team members taking into account the management plan, conservation targets and projects that fall under different strategic lines." (Park staff member)

3.2. Coordination

The results from the survey show that from a local perspective, there is a general consensus regarding knowledge of the park's management plans and its alignment with the EE program, but not regarding conservation targets. The constant claim by the participants is that financial resources are very scarce to achieve the objectives and the goals proposed.

"EE in Gorgona National Park is not coordinated with the different institutional management offices: local, regional, central." (Park Staff member)

"Now, in Gorgona National Park, whale watching can only be carried out by tourist concession holders, but there is no communication with researchers, and what is happening is there is a leak of resources from both parts." (NGO director)

"When we say that the EE is not coordinated it's because we don't receive any support or alignment from regional or national offices." (Park staff member)

"We have resources such as radios, documentation centers, staff exchanges with other parks, which facilitate a better approach to the different works they implement. However, there is a lack of a flow of communication regarding the information and more alignments that hinder us from doing a better job." (Park staff member)

3.3. Assessment

According to the participants, it is evident that the work carried out through EE helps to improve the state of the conservation targets, and the objectives set through the EE

program are achieved. Yet, when they are asked about the existence of an established EE program, previous knowledge and awareness of the EE objectives, and activity coherence, almost 50% of participants disagree on these statements.

Taking a look at the evaluation process, the data indicates a gap in the systematization practice, such as the activities of recording information, annual reports and reflections on the educational activity.

This gap increases when we delve further into the evaluation techniques. The surveyors indicated that feedback on the activities monitoring is not frequent in more than 60% of the parks examined. These indicators are the most worrying aspect of evaluation due to their limited use in almost 80% of the parks surveyed. The remaining 20% should be reviewed because most of the indicators are focused on the number of participants/assistants, but are not focused on the educational impact.

Table 2. Percentages from the National Parks survey completed by the Environmental Education (EE) staff members (n=20) according to audiences, activities, and participation and communication criteria.

	Always	**Frequent**	**Infrequent**	**Never**
Audiences and activities				
Academic Institutions	26	63	11	0
Rural communities	22	61	11	6
Visitors	26	42	26	5
Institutional actors	16	53	32	0
Overlapping areas	11	47	11	32
Indigenous communities	19	6	25	50
General public	6	22	72	0
Black communities	16	5	21	58
Specialized audience	0	17	83	0
Participation & communication				
Internal participation	0	35	65	0
External participation	0	30	65	5
My opinion matters	0	45	50	5
My team opinion matters	30	45	25	0
Communication is key for EE	75	25	0	0
Training needs	85	5	5	5
Community participation	15	60	25	0

3.4. Audiences, participation and communication

As shown in Table 2, the most frequent activities registered that fall under all kinds of audiences are communication and dissemination of the National Park's mission and conservation target values, followed by conferences, workshops and inter-institutional work.

One of the most important activities carried out is the participative formulation of projects and also community projects. However, their design and construction hardly reach 25% of

the parks surveyed.

Participation and communication are essential in EE and management decision-making. The survey demonstrates that the majority of participants feel that neither internal nor external participation in the park system takes place. As regards the relevance of the individual opinion, the perceptions are divided, indicating that this depends very much on the way in which the park's team functions, and not on the entire sample and the UAESPNN. However, team opinion prevails rather than individual.

3.5. Priorities in EE

The main priority identified by the educators is the integration of EE into the management plans and the development of educational programs that are consistent with the local environmental problems (Fig. 5). In addition to this demand, the environmental literacy of educators and participation problems are the other criteria that require more attention in order to work within the sub-program of EE within the UAESPNN. Furthermore, methodology design, identification of stakeholders, planning, positioning and socialization of the park legislation are considered important matters in order to succeed, but not on such a wide scale, and with a more individualized and unique character for each park.
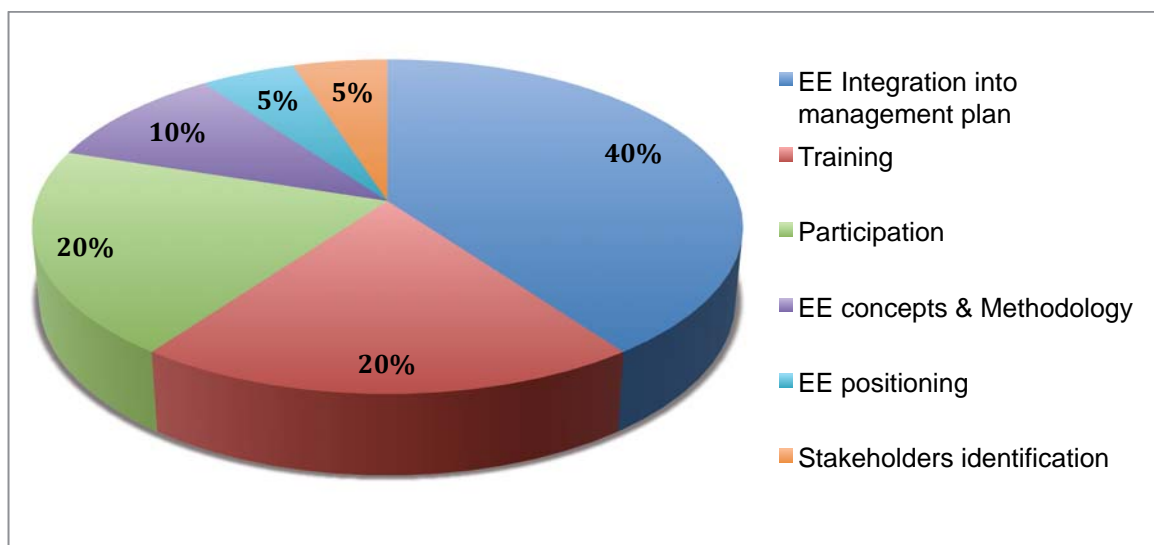
Fig. 5. Results of first line Environmental Education (EE) priorities identified in the survey. (n=20)

3.6. Focus groups

According to the survey, interviews, and workshop results, we identified the key points in order to systematize the EE process and integrate it with the management plan and social actors. To accomplish this target, we developed an EE methodological route to guide the development of EE local action plans in the National Parks in Colombia. This initial proposal was discussed with specialists and EE staff members at the central management

office, in order to adjust the application to their structure and needs, before working with focus groups.

In both focus groups, all participants agreed that the proposal fulfill the need of an integrated methodology of EE within the park's management plans and its management model, being the methodology approved in this last evaluation process, except in cases that the management model has another structure because of local issues as happens in the Amazonian region.

The panels also agreed that this tool will facilitate the process of the elaboration of local plans, even though in some cases, they will have to adapt some guidelines to their local situation, and let the general structure serve as a flexible and dynamic guideline but not a fixed one.

From the original proposal, the structure remained the same, but some boxes were rephrased from the original version, new highlights were included and other boxes changed their order within the structure.

As a final result, we found that both focus groups arrived to the same conclusions and modifications of the original proposal, which facilitates the process of the final version of the EE methodology.

A more detailed focus on the regional and local context was suggested, especially in those cases where indigenous and black communities were overlapping in the protected areas.

The monitoring and evaluation section was changed considerably and improved, and all participants supported the incorporation of a dissemination of results section, absent on the management-planning model. All the participants agreed that recommendations should be included in the new version. Initially, the methodological route was being developed to respond to MPAs needs, especially in the study area. However, during the research and because of the active participation of the EE staff, more parks were willing to be included in the initiative in order to establish this method as a national proposal and an essential component to be included in the EE Strategy of the National Parks of Colombia (Fig. 6).

4. Discussion

The present results clearly support the establishment of a standardized methodology path to improve EE within the National Parks System. There is a consensus that this target has a first priority interest in order to promote systematization of the process and its inclusion in the management plan and operational structure, not only to MPAs as proposed initially but also to the National Parks System, contributing to conservational targets and management effectiveness (Lundquist & Granek, 2005).
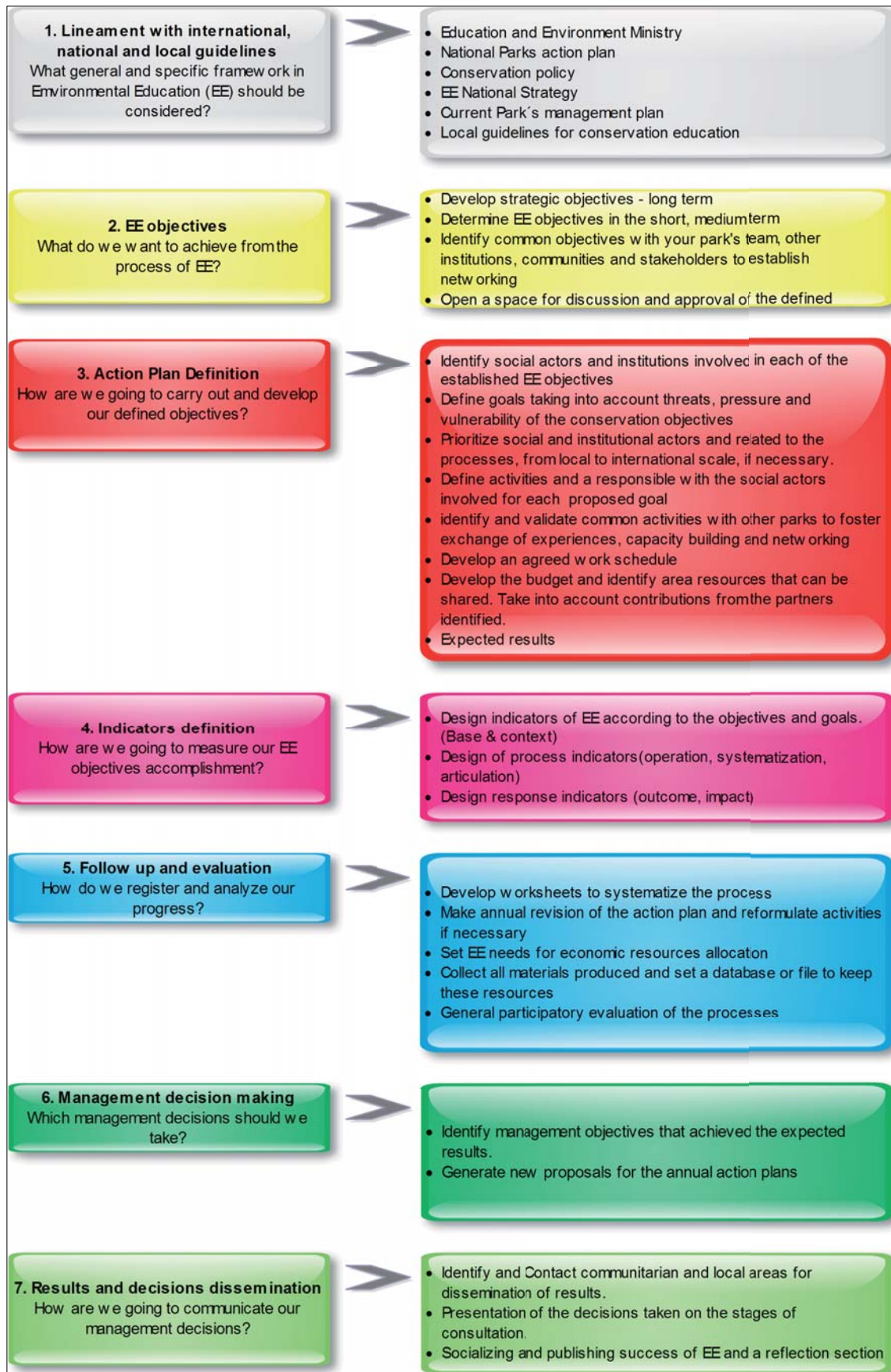
Fig. 6. Methodological route contents for the elaboration of EE local action plans in the National Parks of Colombia.

4.1. EE Objectives and assessment

The survey data indicates that a significant majority of participants found that the objectives were adequately clear, concrete, and attainable. However, almost 50% admitted that they did not have a written EE local plan, and objectives were more a statement of intent without a logical framework. Defining the objectives is one of the most important steps for managing and planning EE information transfer in MPAs. In this study, EE staff recognized that a minimal training was required in order to develop these tasks and highlighted the scarce communication between different levels of management, leading to unstructured and misaligned EE local action plans with conservation objectives.

One possible explanation for the absence of well-defined EE objectives and measures to evaluate them in the park system lies in the fact that management plans are outdated, and often have wide-ranging objectives that make it difficult to shape EE actions into specific goals, a situation common in other studies (Abdulla et al., 2008; Dahl-Tacconi, 2005).

On the other hand, measures allowing us to explain the achieved results in terms of social impact and a better state of the conservation objectives do not exist, except limited indicators which do not go beyond simple data (number of workshops held, brochures delivered, number of assistants and visitors, etc.). Impact indicators such as change in knowledge, attitude, networking, and participation quality are not found in any of the parks studied, and it is an area that requires further research. This is a crucial field to explore in order to evaluate the effectiveness of the work done, and to support management decisions.

4.2. Audiences and activities

We found low consistency in the EE process among the goals proposed, the activities set and the way in which results and impacts are measured. Specialists, stakeholders and Park staff members, see EE as a long-term process that seeks the comprehension and responsible action of the community in order to preserve our natural and cultural heritage within the framework of sustainability (Fien et al., 2001; UNESCO, 1979). However, analyzing our results, the most common actions are short-term events such as conferences, environmental talks, inter-institutional meetings and environmental interpretation. True environmental literacy goes beyond awareness and rote learning but involves critical thinking, integrating principles, and using acquired skills to turn knowledge into action (Bickford, Posa, Qie, Campos-Arceiz, & Kudavidanage, 2012).

Most of the activities are addressed to formal education tools such as school environmental programs (Kuhar et al., 2010; Muñoz-Santos & Benayas, 2012), probably because these comprise an audience that is already established and structured,

(Lundquist & Granek, 2005; Rice, 2011) where the implementation of actions proves to be less difficult than with other social actors (J Zorrilla-Pujana, 2008). Conservation biologist, need to be much more strongly proactive in their approach to communicating, in formal educational settings as well as in other venues and via alternative methods to a diversity of audiences (Bickford et al., 2012).

Another limitation found is the deficient condition of the relations between National Parks and local stakeholders, which hinders any EE participative approach with the community, at least in the study area, leaving behind actions with a long-term impact, such as management agreements through communitarian and participative projects with the audiences prioritized by the protected area. In MPAs the role of the community is essential for the approval and monitoring of rules. In a South California MPA, the bottom-up management and EE makes the difference in the increased ratio of fish biomass because of the clear and accepted rules which were correctly transmitted from managers to users from 0.75 tons of fish ha^{-1} to 4.74 tons of fish ha^{-1} in a decade (Aburto-Oropeza et al., 2011).

EE is a crosscutting program in the management process of MPAs and the scarce resources are a common issue that appears in most of the analyzed criteria, but relevant data regarding the benefits of social issues in protected areas are not well covered in local, regional and national accounts (F Leverington, Hockings, Pavese, Lemos Costa, & Courrau, 2008), which in that case could help to justify an increase in the budget in this multidisciplinary field. A lack of job stability for EE staff and undefined funds generate discontinuity and regression in most of the programmed activities (J Zorrilla-Pujana, 2008). Although EE is recognized as a first priority for MPA management and other skills development (Dahl-Tacconi, 2005), reality reveals the contrary: the education program does not present stability in human and economic resources allowing continuity of the established processes (Kullenberg, 2010).

4.3. Coordination, communication and participation

The need to clarify the mechanism of educational conservation objectives has been demonstrated, but even more important than this is the need to break the current dynamic of environmental information transmission, which is not properly aimed at the different groups, because there is a lack of connection between managers, scientist and users in MPAs (Lundquist & Granek, 2005). Scientist and managers need to be more provocative, proactive, and purposeful in how we communicate to create an environmentally literate society that enacts decisions based on both sound science and the needs of humanity (Bickford et al., 2012)

The results indicate a low perception of institutional coordination between local, regional and national management offices by staff members, stakeholders, and some researchers. This situation is visible at different management levels, and in most cases is the result of wastage in the same institution, loss of knowledge, economical opportunities, and inexistent networking between similar parks, that share biological, social values, programs and projects within the EE strategic line. MPA networks are important not only for the conservation of biodiversity but also as a form of management (Guidetti, 2002). Communication efforts can also help to inspire new ideas for research that inform about management questions and may generate connections with other scientists outside a narrow range of expertise (Grorud-Colvert, Lester, Airamé, Neeley, & Gaines, 2010), but scientists actually makes surprisingly few direct contributions to environmental conservation, when there is an evident necessity of a more proactive dialogue between conservation scientists and practitioners when devising research priorities (Laurance et al., 2012; Primack, 2006) and the dissemination of those results to the managers and the community involved.

Despite the key role that communication and participation play in the educational process, this is still one of the most difficult tasks within the Park system in which more than 60% of respondents and interviewees perceived that participation in decision-making is infrequent and communication leaks are very common at all management scales. This situation can be explained from different standpoints: 1. The gap between the Park's local and national scope is still hard to bridge. 2. There is a poor contextualization among local realities and national alignments, and 3. The absence of a peer EE at the regional management office disrupts any communication channels in the local and national spheres. Studies demonstrate that MPAs are effective when information is properly transferred and participation of the different users is solid (Pace et al., 2010).

It is not true that local people have a negative reaction towards protected areas. It has been demonstrated that good information and a clear rule statement in which there is direct community participation has a positive effect on final users (Aburto-Oropeza et al., 2011; Triguero-Mas, Olomí-Solà, Jha, Zorondo-Rodríguez, & Reyes-García, 2009). The lack of effective spaces for communication and participation has led to a negative perception among the team members, stakeholders, researchers and the community who are involved either directly or indirectly with the park's management. Because of this condition, many conservation initiatives are isolated from the park's initiatives, wasting synergies that could be beneficial for the MPA management.

5. Conclusions

The present study demonstrates the urgent need to establish a common methodology for the development and implementation of EE local action plans in National Parks. EE is a multidisciplinary component that works with humanity and its relationship to the environment, linking both natural and social sciences, in order to achieve conservation goals (Bickford et al., 2012). There is a need for cooperation at an inter-disciplinary and inter-sectorial level, that requires exchanges between the scientific disciplines as well as a cultural exchange (Kullenberg, 2000). The new proposed methodology hopes that EE will play a catalyst role between the community and MPA management.

It is necessary a more active, open and conciliatory attitude in order to promote stakeholders' participation in and contribution to MPA conservation. For this reason, EE must focus on those audiences that generate the strongest pressure on the area.

EE should establish itself as a crosscutting program integrated in the management process, in order to contribute to improving the state of the protected ecosystem, enhancing a better protection of natural assets and facilitating the connection between various fields and sectors in the community to implement an effective EE (Kobori, 2009). But if EE limits itself to political and theoretical papers, scholar activities, the celebration of environment day and environmental conferences, it will be difficult to achieve long-term conservation objectives.

In order to support and strengthen the EE program within the management of National Parks System, it is essential that the human resources structure is maintained at the local, regional and national level with an EE responsible at all management scales or disruptions and communication flow will occur, interrupting ongoing processes.

After accepting the proposed route for EE local action plans, and validated at the study area, Colombia National Parks approved its inclusion in the National EE strategy and remarked on its consistency and the integrated perspective with the management and conservation objectives, involving the local community and prioritized stakeholders from the start. Utria and Gorgona National Parks are constructing the EE action plan following this method as other parks from the network. We now have a real opportunity to implement ecosystem-based management in MPAs, but the transmission of essential values and roles in MPAs has to be clearer (Rice, 2011). The results determine that it is imperative to work on the conscious and assertive establishment of objectives for both the MPA management plan and EE programs, as one of the most important steps for the planning, and effectiveness of EE in the park system (Lundquist & Granek, 2005).

CHAPTER II

Environmental education indicators system for protected areas management

Abstract

A new perspective for the management effectiveness of protected areas needs the inclusion of social data for decision-making. In this process, environmental education (EE) plays a key role in catalyzing biological and social issues in the management process, but there are scarce data about this relationship. The main objective of this paper is to develop, from an institutional bottom-up perspective, a proposal for a set of EE indicators that is easy to use by practitioners to measure the response of the EE program in relation to the conservation objectives of protected areas management plans. Using a combination of quantitative and qualitative techniques, a case study at the National Parks System of Colombia is presented, which is divided in five stages: 1. An EE evaluation survey on a national scale. 2. An interview phase with EE practitioners and NGOs. 3. EE objectives categorization. 4. Systematization process and 5. Focus group to evaluate the proposed set of indicators. A set of 5 EE indicators was developed to fulfill the identified needs: appropriation of information, articulation, participation quality, program implementation and continuity of EE process. We expect that this new approach for EE evaluation will hopefully be adopted in the update of management plans, as an innovative tool that contributes to the effectiveness assessment of protected areas, integrating a more social and participative focus.

Keywords: integrated conservation; institutional participation; social dimension; management effectiveness; bottom-up perspective

1. Introduction

Moving beyond the establishment of protected areas to the assessment of management effectiveness (Hockings, Stolton, & Dudley, 2004), has been a crucial step forward in the conservation field. Environmental indicators are essential tools in this progress, but the scarcity of social data is still a common problem that these protected areas face (Moon & Blackman, 2014; Popescu et al., 2014; Stephanson & Mascia, 2014). New integrated solutions must be developed, and environmental education (EE) could be a key piece to bridge the gap between people's needs and biological aims. This conservation practice can be useful for a better decision-making, communication and policy development, (Bearzi, 2007; Michael B. Mascia et al., 2003; Meijaard et al., 2014), but a measure of its true scope is necessary.

Conservation is related to people as much as it is to species or ecosystems. Any measure of conservation is inadequate without education and a direct involvement of the different social actors (Michael B. Mascia et al., 2003; Sherrow, 2010). Fortunately, a shift in conservation science is taking place and a need to include social research is increasingly growing (Fisher et al., 2005, p. 2,15; Linton & Warner, 2003; Michael B. Mascia et al., 2003; Moon & Blackman, 2014; Stephanson & Mascia, 2014).

From the First Intergovernmental Conference on Environmental Education Tbilisi in 1977, EE can be defined as a holistic approach, rooted in a broad interdisciplinary base, which acknowledges the fact that natural environment and man-made environment are profoundly interdependent. EE uses the findings of science and technology to play a leading role in creating awareness and a better understanding of rapidly evolving environmental problems. It should foster positive patterns towards the environment and the nations' use of their resources, to make intelligent, informed and well structured decisions (UNESCO, 1979, p. 24.).

Inclusion of EE within management plans is still in its infancy (Muñoz-Santos & Benayas, 2012), and with the current environmental crisis, education must be considered as a principle for biological conservation and management (Abdulla et al., 2008, p. 132; Brewer, 2006). The employment of objective measures to integrate EE within management effectiveness is still a challenge (Sherrow, 2010), claiming to move forward from assessments based only on knowledge gain (Kuhar et al., 2010; Ruiz-Mallen, Barraza, Bodenhorn, & Reyes-García, 2009) without measuring why and how it works (Robert S Pomeroy, Watson, Parks, & Cid, 2005; Stern et al., 2013).

The Organization for Economic Co-operation and Development (OECD) has long been a pioneer in the field of environmental indicators. It developed and published the first

international set of environmental indicators in 1993, describing 12 main rules of what an ideal indicator should be in terms of policy relevance and utility for users, analytical soundness and measurability (OECD, 2006, p. 143). These first guidelines have been used as a reference point for benchmark organizations like the World Bank, International Union for the Conservation of Nature, and International Cooperation Agencies, among others, to develop environmental and sustainability indicators, with small variations according to their needs and objectives (Global Environmental Facility, 2010; IOC-UNESCO, 2006; R.S. Pomeroy et al., 2004; Segnestam, 2002; Tilbury, Janousek, Elias, & Bacha, 2007).

Governance and socio-economic indicators found in evaluation manuals for protected areas often include EE issues, but they provide limited information about the appropriateness and effects of EE on the conservation aims of the protected area. Some examples of such indicators are: establishment of education and training programs, increased awareness of environmental issues or number and trained decision makers (Borrini-Feyerabend, N. Dudley, Jaeger, Lassen, & Pathak Broome, 2013; IOC-UNESCO, 2006, p. 129; Marino, Marucci, Palmieri, & Gaglioppa, 2015; Robert S Pomeroy et al., 2005).

Kuhar et al. (2010), went further. They measured knowledge gain through EE programs in a quantitative way. The study compared the performance of an EE conservation program in Uganda, using pre-post tests after 30 days, 1 year and 2 years from the initial program. They demonstrated that knowledge gain was not transient, but didn't guarantee that proper behaviors would be performed in a middle-long term time frame.

To improve the evaluation process, the EE indicators should be quality based, embracing quantitative and qualitative measures, to provide additional details to understand not only if EE works, but also why and how it works (Stern et al., 2013). Attention must be focused to link EE activities, processes and evaluation to the park's conservation aims (Claudet & Guidetti, 2010; Muñoz-Santos & Benayas, 2012), and embark on a policy of continuing self-evaluation and assessment (Blumstein & Saylan, 2007). The new EE approach should be inclusive with stakeholders who have a direct impact on the achievement of management objectives and are directly influenced by management decisions (Himes, 2007; Juanita Zorrilla-Pujana & Rossi, 2014).

Through a revision of a wide environmental and sustainability indicators sets, the present study found that criteria used by the Global Environmental Facility (GEF) were the most suitable for the research. GEF works with 5 criteria denoted by the acronym SMART, meaning that indicators should be specific, measurable, achievable, relevant, and time-

bounded (GEF 2010, pp. 28–29).

With these indicators' guidelines established, we conducted an action-research guided by the critical theory paradigm (Crotty, 1998, pp. 139–159), which dictates how data collection and interpretation will be done. This branch of social research intends to challenge, induce and document a change in the reality studied (García & Sampedro, 2006; Sauvè, 2000). It looks to improve some practical aspects of reality as a means for developing our understanding of it, through a participative and empowering focus and praxis (Moon & Blackman, 2014; Winter, 2002)

Having selected this roadmap and following the pressure-state-response indicator framework, the objective of this research was to develop a theoretical EE indicator set proposal from an institutional bottom-up perspective that is easy to use by practitioners and induces a change in the EE evaluation system. These indicators will assist in measuring the influence of the EE programs on the conservation objectives of the Park's management plan, using the NPS of Colombia as a case study.

2. Methods

The action research was conducted using a combination of qualitative and quantitative methodologies (Fig. 7). The use of both compatible and complementary methodologies provides a better understanding of the national and local context during the study, considering an approach that incorporates social variables in the evaluation of protected areas management (Benayas et al., 2003; Dillon & Wals, 2006; Gerson & Horowitz, 2002; Russell, 2006).

To avoid failures or misunderstandings in the written questionnaire, as well as in the semi-structured interviews, both questionnaires were validated at the central office of the NPS. During tool validation, members pointed out questions that were not consistent, difficult to understand or confusing and/or time consuming in order to adjust the tools before its application.

First, a quantitative methodology was used in the manner of a questionnaire; secondly, a qualitative methodology in the form of interviews, categorization process and focus groups. ATLAS.ti 6.2.27 supported qualitative data analysis, allowing us to use the same categories used in the interviews and surveys.
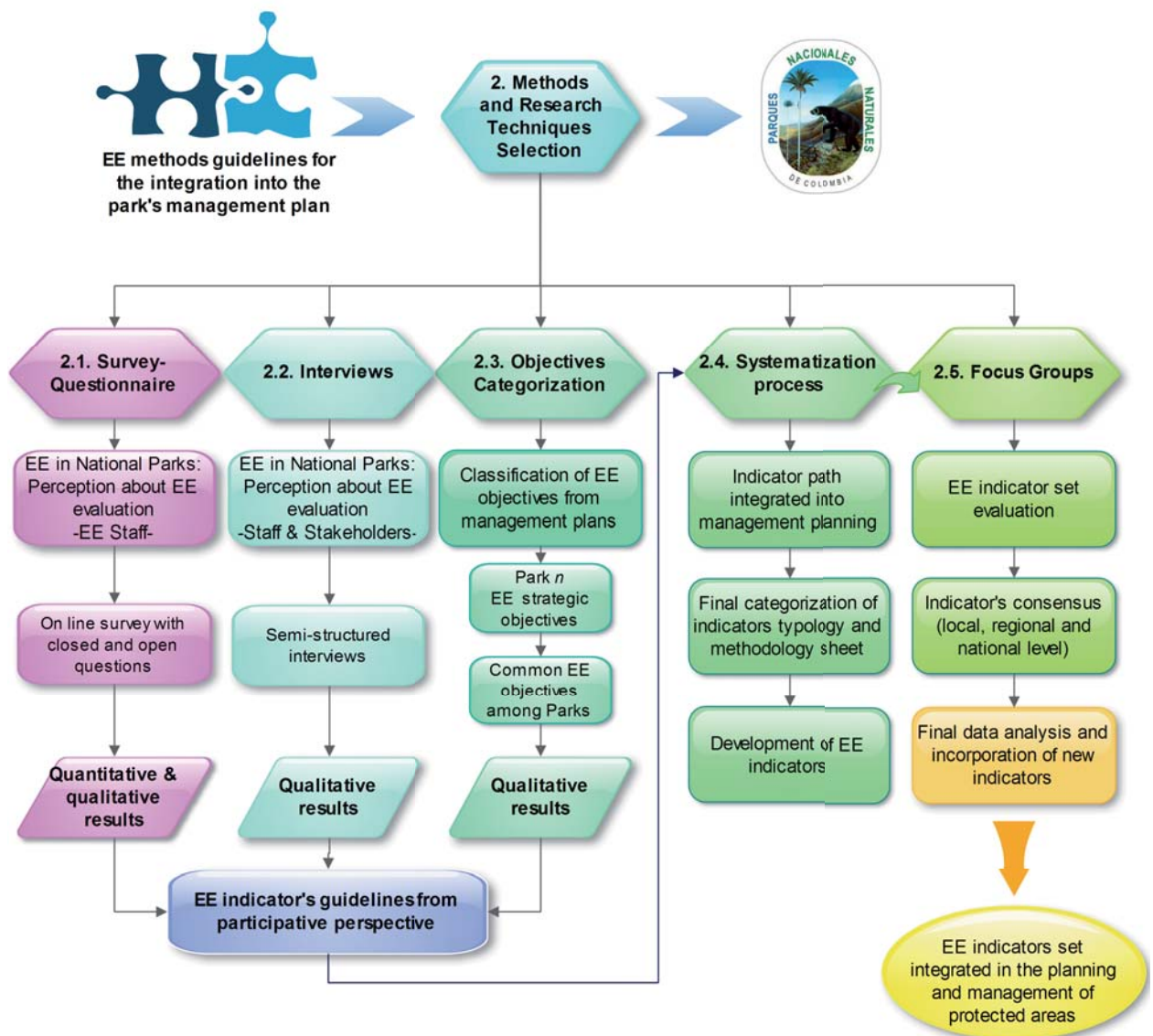
Fig. 7. Quantitative and qualitative methods used in the research.

2.1. Survey - Questionnaire

The questionnaire was developed through three main steps: content selection, structure-design and format. In first place, we developed questionnaires following the structure and functions of the EE program within the NPS (UAESPNN, 2005, 2001), which we divided into 5 categories: objectives of the program, institutional and coordination support, audiences and activities, participation and communication, and assessment (this last section is the one analyzed for this paper). In second place, questionnaire design and structure consisted of closed questions, where alternatives answers were given to respondents.   We also included an open question in each section for comments and reflections (Fernández, 2007; Himes, 2007).   Questionnaire format was chosen through

the formats developed by the webpage where surveys were designed (www.surveymonkey.com).

The questionnaire was sent to all EE teams in the NPS between 2011-2012. To obtain the most objective data from the work experience, we emphasized that the survey wasn't an evaluation of their work, and responses were for research use only.

The questionnaires were delivered to a total of 45 National Parks that have an EE program running (80% of National Parks at the time of the survey) and also to the NPS central office, where a total of 46 surveys were registered. A sample of 20 questionnaires from NPS (43%) at local, regional and national level was used for the research regarding EE evaluation (Appendix VI). The 26 remaining surveys (56%) were not included in the analysis because answers were not complete or were inconsistent.

The survey was used for the purpose of providing an insight into EE staff perceptions and the current situation relating to EE evaluation, through closed questions with an open comment section (Appendix I).

Given the fact that in most cases there is only one person in charge of this area at local and regional level, we didn't have to choose specific criteria to determinate a sample of surveyed educators. In cases where there was more than one, all the EE staff filled questionnaires when it was possible.

2.2. Interviews

Semi-structured interviews with 11 staff members from the central and local offices and environmental NGOs were performed during 2011-2012 to shed light on the process of investigation (Gerson & Horowitz, 2002). The duration of the interviews lasted from 1 to 2 hours following an open questionnaire guideline (Appendix II & III). The criteria used to select interviewed staff were their direct relation with the EE program within the management group and their availability for the interview. The NGOs selected were the ones that responded to the call for participation in the research and with special focus on nature conservation.

2.3. Objectives categorization

An institutional EE indicators workshop was carried out, in which 14 assistants from EE staff were present from local, regional and national level (10, 3, 1 respectively). Although it was not possible to organize a workshop with all EE educators, a homogeneous geographical representation was achieved.

A filtering and categorization process of EE objectives of the new management plans was developed. This classification was the starting point to define the indicators' typology so

they could be useful to most of the EE teams at all management levels (Reed, Dougill, & Baker, 2008), and more suitable for their inclusion into the evaluation format.

Assistants were asked to define each objective of their own EE local management plans using a keyword.   Later, all keywords were put together for grouping, and the categorization process was carried out, for the consolidation of a unique list of common objectives.

2.4. Systematization process

Once the categories were established, a multidisciplinary team was formed including EE researchers, the head of the EE team and the head of effectiveness management at the central level, to search for adequate indicators to fit into the defined categories. A deep bibliographic revision on the topic was carried out to search for existing indicators within the EE field or similar, to construct the proposal.

To systematize the process in the design of an indicator system structure, we followed some of the rules described by Fontalvo-Herazo et al. (2007). These rules consist in four levels: principles, criteria, indicators and verifiers. Principles are the NPS objectives. Criteria are the objectives of the protected area in relation to EE. Indicators are those elements identified to give a measure of the state of the EE program in a specific protected area. Finally, verifiers are the data needed for assessing an indicator.

Having identified an initial proposal for the set of indicators, a series of interdisciplinary meetings with workers from the areas of management effectiveness, monitoring and control and surveillance were held. Feedback was received to improve the proposal so indicators could be as practical and understandable as possible for the whole park system. This networking was critical for the success in the dissemination of EE indicators and a step forward for their inclusion into the new management plans being elaborated during the years 2014-2015.

2.5. Focus group

Finally, to evaluate the proposed set of indicators, a focus group (Krueger, 1988) was carried out at the end of 2012 to detect strengths, weaknesses, and generate new ideas and recommendations. The focus group included 11 members of the NPS EE team from national, regional and local offices. This technique gave us information about perceptions, feelings and attitudes of the indicator system proposal and its application viability (Morgan & Scannell, 1998), allowing us to see the reality from an institutional bottom-up point of view and not from the usual top down perspective.

During the focus group three EE response indicators were presented and four questions were used to guide the group's responses.

    a. Do you think the indicator's name is appropriated for what it is measuring?

    b. Would you be able to use this indicator?

    c. Is the indicator useful to your EE evaluation task?

    d. Do you think there is a way to improve it?

3. Results

3.1. Questionnaire-Survey

…"The EE program should be positioned in the park. This is the most important criteria in order to achieve the conservation objectives"

…"Actions are performed but their effectiveness or relevance are not evaluated"

According to the NPS educators' answers, 90% perceive that the EE program improves the state of conservation of the Parks, and 75% of the sample perceive that EE objectives are achieved.

However, half of those surveyed responded that they don't have an existing EE program, but that EE objectives are known by the staff and the EE program is carried out systematically and is consistent with the Parks objectives.

…"There is an excel table for the environmental education program in each area to fulfill, but measurement of indicators, feedback, and reflections aren't frequent. The ideal way to do it, is to have all the team together but opportunities and means are scarce"

Analyzing the evaluation process in more detail, data shows a gap in the systematization proceedings, such as written annual reports, information recording and reflections on the educational activity.

…"Indicators are being constructed. These indicators for environmental education should be formulated to measure the change in attitude of our subjects, and should be measurable, real and contextualized".

…"Currently, the process of continuous evaluation is being defined and should be measurable"

The gap increases when participants are asked about monitoring and direct evaluation, where just 30% confirmed that a monitoring process is carried out and only 20% use indicators.

3.2. Interviews

For the content analysis of interviews, an evaluation category was established as the backbone code to cluster all questions and answers that were related with this thematic line, integrated by a total of 43 quotations linked to 11 codes. In this analysis, with the exception of the emerged continuity code, the remaining 10 codes were defined by the integration of the conceptual framework of the research and the keywords from the interviews structure that shaped the study (Miles & Huberman, 1994, p. 58).

In this study, what we wanted to measure was not only the frequency of appearance but also the relationships among codes, which are explained in a hierarchical scheme (Fig. 8).
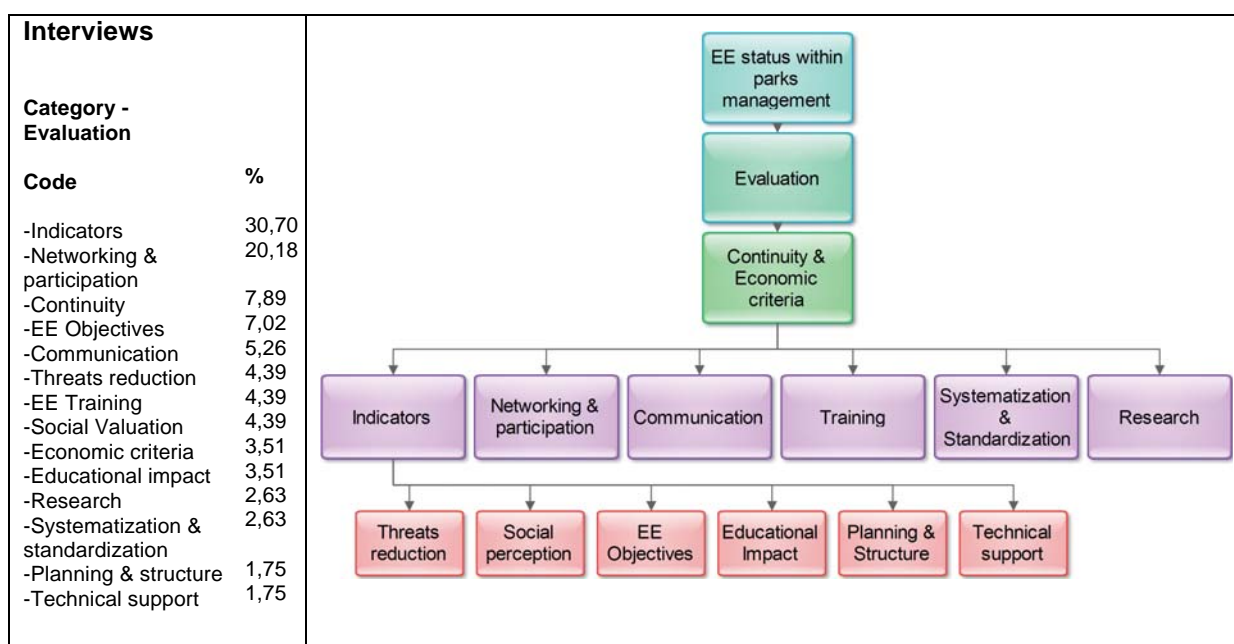
Fig. 8. Interviews: codes ratio appearance within the evaluation category (left) and hierarchical structure generated from the relations among codes (right).

A better evaluation system beyond program outputs is a common answer among respondents, in which indicator development, better internal and external networking with more inclusive participation, continuity in EE processes and EE objectives definition, constitute more than 70% of the total content.

3.2.1. Indicators

"I think that EE should use indicators that measure the decrease in the threats to the conservation objectives. Currently we have no idea how we can measure it and we haven't put it in the guidelines to see which indicators could be possible candidates." (NPS central level)

..."Regarding the evaluation issue, the more evident claim is that the areas have not been able to show the outcomes of EE. Consequently, they asked us to provide a battery of indicators that can be used in this sense." (NPS central level)

…"I think one of the main problems is the impact. We always say, 'we should have an EE strategy', but when considering the practical side, we only have X number of workshops and conferences that cannot be considered real EE. We have to try to find social indicators that measure the impact and consequently analyze which kind of activities we need to test the real impact of EE." (NPS central level)

Answers linked to this code highlight the need to develop impact indicators to measure the EE programs in relation to a reduction of threats to conservation aims, and also highlight that a common EE indicator set should be built with the support of the central level.

3.2.2. Networking & Participation

…"We have no evaluation method to measure the level of networking, but it is worthwhile to generate it. And not just to have a measure of effort, but as to whether the goal is achieved with or without partnerships ... to see if you get to the same point and how, with an alliance or without."(NGO)

…"We work together with the coordinators of 6 other countries on the subject of the indicators. Each of us makes proposals and we discuss them as a group. Once defined, we all use the same indicators to make our evaluation." (NGO)

Being able to measure participation and networking (inside and outside NPS), is identified by those interviewed as key elements to determine if better results are achieved for EE. More participation from inside and outside entities is also claimed as a way to improve the management and use of financial resources.

3.2.3. Objectives, structure, systematization and planning

…"The monitoring report is based on management reports, but when presented, all topics are mixed, and what you have about EE are very incomplete. We have emphasized the need to organize this information in an orderly and detailed manner, specifying the target audience and materials used to get a better idea of what activities they are carrying out at the protected areas." (NPS central level)

…"Things must be categorized to be clearer about the type of EE you're looking for and what are the sources that give us the desired results." (NGO)

…"Management plans should have greater clarity, an overall goal and specific objectives. I don't know much about this issue, but what I see in general terms is that there are many disparate pieces, so there isn't a projection or a scheme. The non-existence of a big goal or goal targets to achieve, obviously you cannot project methods or actors, you can not set up anything." (NGO)

Starting a long-term evaluation process requires: a coherent Institutional structure, clear objectives, a systematization route and a consistent framework to back them up in order to link results to aims and goals for effective management (Bettinger, Kuhar, Lehnhardt, Cox, & Cress, 2010; Saterson et al., 2004).

3.2.4. Economic criteria, continuity and social perception

…"To the extent that we are able to give continuity to the projects, we can have data from before, during and after the application of the measures. One constraint we have for continuity is that there are not enough financial resources to do so." (NGO)

…"Much could be measured in the acceptance of the community towards the perception of the park. Examples like the trust that has been gained, people organization, interpersonal relationships, community service, partners for conservation, etc." (NPS central level)

Being able to measure the social valuation of the Park system and also the continuity of the EE process is one of the big challenges that arise during the interviews. Continuity appears as a transversal issue within the evaluation category, strongly related to economic criteria, as a constraint factor for the development and progress of the EE program.

3.3. Categorization

EE staff classified objectives into 6 major categories: promote spaces and networking for EE, communication, sustainable and effective management, training, social valuation and economical sustainability.

3.4. Systematization process - indicators selection

Performing a cross-analysis of results from the questionnaire, interviews and categorization analysis, a set of co-occurring categories was established as a baseline for the indicators development. Three indicators were selected as benchmark from the identified needs, except for training and economical sustainability, that are not competences of the EE program within the structure of the NPS. In some cases, one indicator can be used to provide information for one or more of the defined categories. The remaining two indicators from the general proposal, continuity and program implementation, were developed at the end of the process, as a result of the general review of data analysis and feedback.

3.5. Focus groups

A unique focus group was carried out to evaluate the set of indicators for its integration into the National Park's management model. This focus group was held as a part of the

EE national meeting with representatives of NPS EE staff from all regions of the country, including national, regional and local level.

As a result, the focus group agreed the inclusion model and the set of indicators, with the correspondent names and methodology. However, in relation to the knowledge indicator as defined by Kuhar (2010), it was renamed as information appropriation, to reflect more precisely the context that Parks work with, avoiding confusion and discrepancies about the cultural meaning of knowledge and the way to measure it.

In relation to this measure, a complementary approach was proposed to be developed in the future, to see the progress in the construction of knowledge among participants of EE process. The articulation and participation indicator, received the green light from participants, and a pilot test is already in progress.

3.6. EE indicator set proposal

Summing up the results, an integrated indicator set proposal was built from the emerging categories, and is presented in Table 3 as a short version. The construction of this indicator set proposal is based in first place of pre-existing indicators, for the case of the appropriation of information and articulation (Kuhar et al., 2010) and coherence indicators (García Ventura, 2007). The interdisciplinary team developed the remaining three. In this step it's more of an art than a science to determine the appropriate indicators for a given information need (Margoluis & Salafsky, 1998) in which no complex mathematical procedures were needed (Saterson et al., 2004).

A methodology sheet for each indicator was developed to explain in detail the procedure needed to measure the indicators (Appendix V). The format follows the one established by the NPS quality system. This is a key step for the integration of EE evaluation into the management planning with a tool that facilitates the comprehension and application of the indicator in all the areas (Rode & Michelsen, 2008).

Table 3. Indicators set proposal, elaborated and developed in collaboration with the EE and effective management central office of National Parks of Colombia.

• **Appropriation of information (Impact indicator)**

Shows the variation in knowledge related to the concepts associated with the conservation of biodiversity and protected areas, developed by EE processes (Kuhar et al., 2010). Measuring consists of pre-post surveys, with repeated measures over time with the same sample. To detect the impact of the program, an analysis of variance for repeated averages (ANOVA) will apply, assuming that the same individuals will go through the pre-post survey, where the dependent variable is the proportion of people who correctly answered each of the questions of the survey.

• **Articulation coherence (Impact indicator)**

Shows the degree of coherence of the educational actions and processes in relation to the identified risks (García Ventura, 2007)

$$3 * \left(\frac{CR}{TCR}\right) + 2 * \left(\frac{MMR}{TMMR}\right)$$

CR = Number of critical risks approached from the EE
TCR = Total critical risks detected, that can be addressed by the EE.
MMR = Number of moderate and / or mild risks approached from the EE.
TMMR = Total of moderate and / or mild risks detected that can be addressed by the EE

• **Participatory quality (Impact indicator)**

Measures the participation of stakeholders involved in the management strategies that are supported through environmental education processes.

$$\sum_{t=1}^{i} \left[\left(\frac{Ao + Pc + Pl}{3}\right) * \frac{Prs}{Pas}\right] * \frac{1}{TNP}$$

Ao = Achievement objectives score
Pc = Process continuity score
Pl = Participation level score
Prs = Prioritized stakeholders
Pas= Participating stakeholders
TNP = Total number of processes supported by EE

• **EE continuity (Process Indicator)**

Measures the continuity of the EE educator in relation to objectives achievement and performed activities.

$$C = \frac{\sum Fi1}{12} * \frac{Gperf}{Pgoal} * \frac{Oach}{Oini} * 100$$

Fi=Educator permanence (months)

Gperf= Goals performed
Pgoal= Projected goals
Oach= Objectives achieved
Oini= Initial objectives

• **EE Implementation Program (Process indicator)**

Measures the total of areas that are implementing educational processes (formal and informal) within the framework of the National Strategy for EE.

$$LIEE = \frac{PA}{TNPA} * 100$$

LIEE=Level of implementation of EE program in %
PA= Protected areas implementing EE
TNPA= Total number of protected areas within the NPS

4. Discussion

Quantitative and qualitative results support the need for an evaluation framework for the EE program that goes beyond annual reports or specific products, supported by the fact that there were no established indicators for EE that allowed measuring of the impact of the program. Similar recommendations were exposed in the last analysis of management effectiveness for the NPS by international experts, in which they highlight the need to identify impact and response indicators that reveal the contribution of institutional actions to the purposes of the system for the conservation of biodiversity (UAESPNN, 2011, p. 131).

Representative voices from EE inside and outside NPS of Colombia gave us the baseline information and first insights on how to address the evaluation issue through the perspective of the people that work in the field, which we discuss in the following sections.

4.1. SMART Objectives for SMART indicators

Survey data, interviews and results from the categorization analysis, agree that a re-definition of objectives was needed before the development of indicators. We coincide with Fraschetti et al. (2002), that one of the major difficulties in quantifying protected areas effectiveness is that reserves generally have multiple or lack clearly defined objectives, that hinders any analysis of management strategies.

The filtering process in the objectives categorization, has led to the staff realizing that EE objectives converge into the same categories from local to national level, despite the Park's location and singular conservation aims. This is significant as it implies that it can serve as a replicable model and also for comparing other studies where, although there might be heterogeneity of protected areas conservation aims, educational objectives go in the same direction.

Having clear objectives linked to the updated management plans is in fact a big step for the transmission management programs outside the official documents (Rodríguez-Rodríguez & Martínez-Vega, 2012). The process of developing smart objectives fostered internal networking and institutional planning, helping to visualize the EE as a crosscutting program and catalyzer for management goals (Abdulla et al., 2008, p. 19,132). This process also improved the status of EE at central level, serving as a benchmark to the rest of the management areas. We recommend this kind of analysis to other crosscutting issues such as the case of gender, to highlight the social dimension for conservation (Fisher et al., 2005).

4.2. Indicators

4.2.1. Appropriation of knowledge

The appropriation of knowledge indicator was developed by Kuhar et al. (Kuhar et al., 2010) and is suitable to be included in our indicators set proposal. This measure groups together the requirements we were looking for, however small changes were made to adapt it to the NPS reality.

It is worth noting that during the focus group, an indicator to measure progress in the joint construction of knowledge was proposed to be developed in the future. It could be of special interest in regions where ancestral and scientific knowledge co-occur and clash with management strategies. A participative and inclusive common knowledge could help to understand the dynamics of local communities and facilitate public participation in the evaluation process (Fisher et al., 2005, p. 25). Measuring the evolution of this process could be of particular importance to save and protect traditional knowledge as a common heritage, and include it as one of the conservation aims of places where this is still alive.

4.2.2. Articulation-coherence and participation quality

In addition, articulation and participation quality indicators were adapted and developed respectively to measure different EE objectives such as networking (internal or external), participation, and communication to achieve sustainable management within the protected areas. Complex situations, as social issues are, require several pieces of data to be fully understood, in which a given objective can have multiple indicators (Margoluis & Salafsky, 1998, p. 89), or cases in which one indicator can provide data to assess different objectives. This is usually represented in an objective – indicator matrix, where indicators are expected to be complementary, according to the project approach (R.S. Pomeroy et al., 2004, pp. 47, 53,117,164).

The articulation indicator (García Ventura, 2007), shows the degree of coherence of the educational actions and processes in relation with the identified risks for the protected area. It gives information about how relevant are the educational processes carried out in relation to management objectives, and provides an insight into how management programs (EE, monitoring, surveillance, research, etc.) interact to achieve a common goal.

The indicator of participatory quality was developed to transform qualitative process data into a quantitative tool. It measures prioritized stakeholders' inclusion (Appendix IV) according to conservation objectives and their involvement within EE processes. This indicator supports the recommendation made by international experts in terms of participation for the NPS (UAESPNN, 2011, p. 91). We also think that this indicator could

provide extra valuable information if at the end it is also correlated with other biological indicators from the monitoring area (Bettinger et al., 2010).

Improving networking, communication, and participation from internal and external levels, are key issues to achieve conservation success in protected areas (Hesselink et al., 2007, p. 51). These two indicators incorporate qualitative data and social variables that will improve and give support in the systematization (Saterson et al., 2004), monitoring, and evaluation of EE within the management plans .

4.2.3. Continuity and program implementation

The program implementation indicator was already defined to evaluate the progress of the EE among protected areas and the advancement of the program in relation to the rest of management programs of the NPS. It was internally socialized in the management-planning group, however its content and structure was improved in order to be included in the set of EE indicators.

The continuity indicator was elaborated at the end of data gathering and participative processes. This indicator arose from a national perspective analysis about the gaps that still existed for the final indicators set proposal. The emerging challenge was to link objectives and achieved goals in relation to the permanence of the EE person/team assigned to such objectives. This measure will show the effects of discontinuity on the accomplishment of objectives and the processes development, a common harmful situation within this field. Attention to the continuity of (Mayer, 2006) recruitment and stability of EE staff and programs remains a major constraint for the progress of the EE program (UAESPNN, 2011, p. 114; Juanita Zorrilla-Pujana & Rossi, 2014), with this proposal representing a first step to measure the effects of this rooted weakness with real data.

The inclusion of both indicators for national level use (headquarters) does not discredit the research design that wanted to include the bottom-up perspective, without forgetting the top-down view, being two complementary processes. In social research practice, processes such as data collection and analysis are rarely distinct or sequential tasks. Indeed, a significant advantage of the qualitative approach is its flexibility in allowing the researcher to move back and forth in a cyclical way as the discovery of theoretical insights prompts adjustments in the research design (Gerson & Horowitz, 2002, p. 200).

4.2.4. Economical sustainability & training

Economical sustainability of the EE program and staff training on EE competences didn't have an associated indicator as those thematic lines were out of the competences of the

EE program, and also beyond the scope of this paper. However we want to highlight the need to foster both issues for the stability and progress, not only for the EE strategic line but also for the performance of the protected areas system (Watson et al., 2014). The success of any educational initiative is linked to the effectiveness of its delivery which requires training and coaching (Bettinger et al., 2010), and it should be considered as an essential component not only for EE but for all management staff.

4.3. Participative process

Initially, the indicators' development was designed to be participative at all stages (Fontalvo-Herazo et al., 2007; Ramos & Caeiro, 2010). We decided not to involve all of the EE team in the whole indicators construction process, because we found a lack of competences and skills needed to advance in the analysis. Coinciding with Elbroch et al. (2011), sometimes it is unrealistic to aim for incorporation of local experts into the complete research process when knowledge, technical literacy or specific expertise is needed.

A practical session with researchers, EE practitioners, and the leader from evaluation of management effectiveness, was an added value task to assist final users to get used to the indicators. It helped to solve questions during the indicators testing exercises, and helped to improve the methodological sheet. This practice is important to provide a space to discuss aspects that may be logistically difficult or culturally problematic for its application (Bettinger et al., 2010). The practical work also served as a way to gain support for the indicators set proposal, by seeing for themselves the usefulness of the measures within their local EE plans.

Effective evaluation of EE programs requires expertise from multiple fields. Training, collaboration and partnerships are necessary to build an appropriate knowledge base, to inform across natural and social dimensions for a more effective management of biodiversity recovery (Fisher et al., 2005; Lundquist & Granek, 2005; Moon & Blackman, 2014; Pooley, Mendelsohn, & Milner-Gulland, 2014). We coincide with Ibrahim et al. (2011), that teamwork was essential for the success of the elaboration of this indicators set, resulting in visible, practical and effective collaboration. Establishing dialogue across typical boundaries with managers, conservation practitioners, stakeholders and academics (Popescu et al., 2014), is the manner in which we can effectively use conservation education to positively impact on the many endangered species and habitat around the world (Brewer, 2006; Kuhar et al., 2010; Laurance et al., 2012; Sherrow, 2010).

4.4. Indicators for practice

The simplicity, ease of understanding, and usefulness of the indicators, combining rigor and accuracy, has lead to a favorable implication and integration within the protected areas strategic plans by the EE staff (Reed et al., 2008). The proposal was well received from other entities such as NGOs that agree that the indicators are very comprehensive and easy use for EE practitioners, if compared to other kind of measures from the qualitative point of view. They stated that these indicators could also be useful as a prioritization and coordination tool for incoming projects to the NPS, helping to provide a quick answer and support to those initiatives that best suit the identified needs of the areas. External users from NGOs stated that their use could also be extrapolated to their work and not strictly within the NPS scope.

This indicators set makes it possible to compare results individually among different NPS from similar contexts and sum result of the same hierarchical level as required from managers and decision-makers. The ability to compare protected areas on objective, simple and meaningful bases over time is increasingly demanded, but few systems have been developed so far (Rodríguez-Rodríguez & Martínez-Vega, 2012).

Indicators are powerful tools in the feedback loop of an action plan, and as an early warning signal about an emerging problematic issue, or in providing a concise message for engagement, education and awareness (Blumstein & Saylan, 2007; IOC-UNESCO, 2006) However, indicators must come together with an analysis and interpretation of the resulting data from the EE staff to convert it into valuable information during the evaluation and decision-making process (Ramos & Caeiro, 2010; Segnestam, 2002; Tilbury et al., 2007).

It is expected that this theoretical indicator's proposal could be integrated into the management model as an essential piece (Fig. 9) to understand that EE programs are not quick fixes, but rather as a long-term investment (Sherrow, 2010). Improving the evaluation process will allow one to visualize the impact of the EE actions, both successes and failures (Stern et al., 2013). Having information on these measures at the end of a management plan, will provide backing to the hypothesis that EE process with satisfactory indicator values helps to improve the state of the conservation value. Only in this way, will EE find its corresponding place within conservation policies and budget assignments in the management of protected areas.
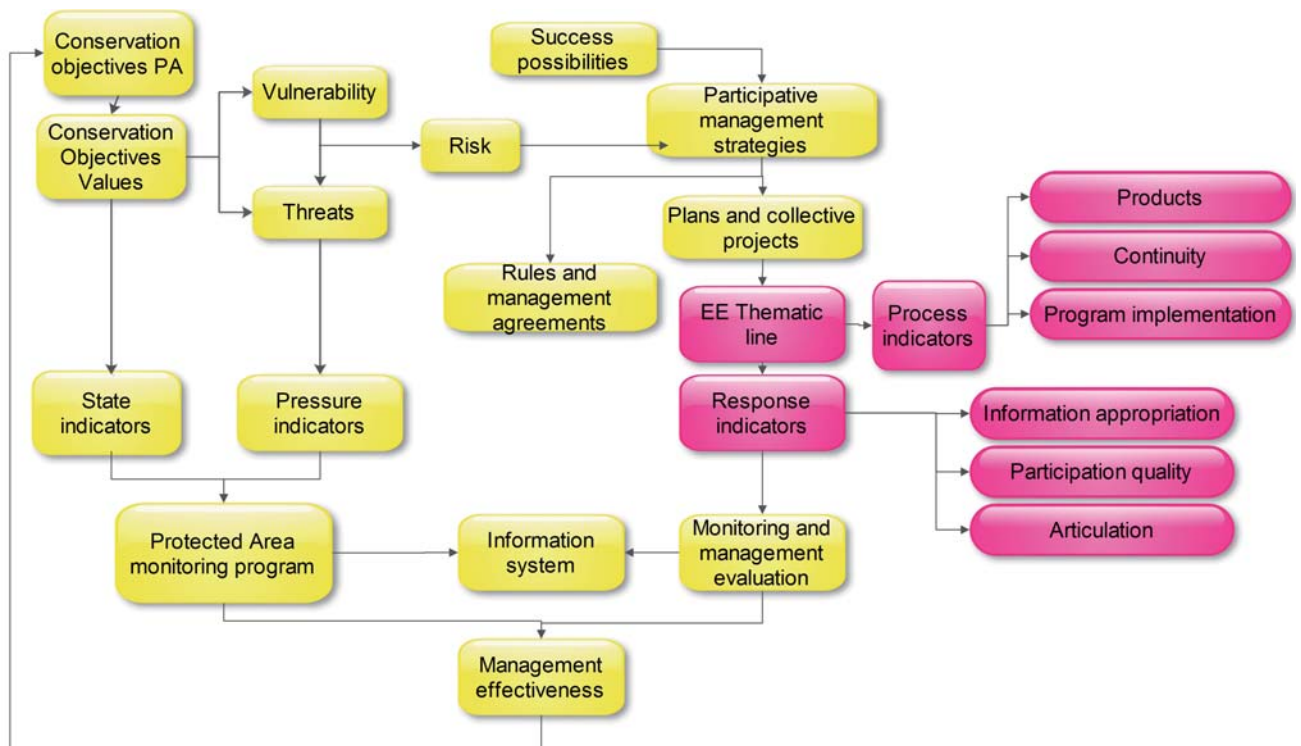
Fig. 9. The set of EE indicators included in the management model for the National Park System. This is the contribution of this research to the EE thematic line, having two indicator's typology: response and process.

5. Conclusions

Environmental governance is also about education. This management variable must go beyond the establishment of laws, scientific knowledge sharing, and cooperation. A general need to increase social participation in the management process is evident and valuation of this involvement must be included in governance issues. With this research we should give a baseline to start this process.

An institutional shift in the conception of management indicators has occurred, in which qualitative measures through the EE program appear as one solution to a large gap in response indicators within the management model in the NPS. This research has generated new insights to improve EE evaluation inside NPS of Colombia, giving a clear, practical and participatory framework for the development, integration and application of process and impact EE indicators for the new management plans of protected areas.

Starting a long-term evaluation process is also a commitment to accomplish the stated objectives of the EE, with a more social focus, providing continuity to environmental conservation policies. This is one of the big challenges that NPS will face in the following years, putting into practice the powerful mission the institution has.

We expect that this methodological approach for evaluation, from a bottom up perspective, could help other EE practitioners to improve their evaluation task, and recognition of EE process as fundamental for protected areas management, with a methodology of easy adaptation and replication in other countries.

CHAPTER III

General Discussion

1. A common EE methodology framework

The present research results clearly support the need to establish a standardized methodology path to improve EE within the National Parks System. There is a consensus that this target has a first priority interest in order to promote a more homogeneous process and its inclusion in the management plan and operational structure, contributing to conservational targets and management effectiveness (Lundquist & Granek, 2005).

Developing and setting an agreed standardized methodology for EE planning through a multilevel participative processes, was a major step in the updating process of the EE program within the management group. This structure includes the principles from national and international frameworks that must be considered, guiding through the elaboration and articulation of consistent goals and objectives for the management plan and management areas, as an essential step for effective conservation management (Margoluis & Salafsky, 1998; Parrish, Braun, & Unnasch, 2003). It also gives instructions and assistance for the process of stakeholders' prioritization, establishment of synergies, and activities planning. The methodology proposed also remarks on the importance of evaluation as a key part of the process for an informed management decision-making and the dissemination of results especially to all parts involved in the process.

The current review and update of the management plans has set an opportunity for a new EE approach. An agreed methodology to construct EE local plans aligned to institutional objectives but flexible enough to be adapted locally, is one more tool for an integrated EE planning. This new proposal, based and agreed from a bottom-up institutional perspective with a top-down support will endorse the inclusion of EE objectives and goals within the management plans and conservation aims within the NPS.

2. SMART[2] objectives for a solid based process

2.1. Lack of specific objectives and goals

One of the major causes that hinder management effectiveness and performance is the paucity of clear objectives (Bettinger et al., 2010; Fraschetti et al., 2002, p. 64; O'Neill,

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[2] I used the Acronym SMART under the definition stated by the Global Environmental Facility (GEF) as objectives that are Specific, Measurable, Attainable, Realistic, and time-defined.

2007; Robert S Pomeroy et al., 2005; Rodríguez-Rodríguez & Martínez-Vega, 2012).

During the time of the research 2010-2012, results revealed that redefinition of objectives was the cornerstone to reinvigorate the EE program within the NPS. Data showed that absence or poor defined objectives produced misalignment between the program's stated objectives, and actual program activities, generating a great difficulty at the time of evaluation to measure the impact of the actions. A similar situation was also evident from a US National Park study on evaluation, in which a mismatch between long-term outcomes of the program and actual program activities were detected (Carleton-Hug & Hug, 2010).

Defining the objectives is one of the most important steps for managing and planning EE in protected areas. Sufficient time should be dedicated to this process, avoiding wide-ranging objectives that make difficult to shape EE actions into specific goals and achieve a consistent assessments for decision-making.

2.2. Setting a Common Language

Redefinition of EE objectives within the NPS needed time to be conceived in an agreed environment, as one of the most critical aspects to meet effective planning within NPS. As Monroe (2010) states, changes require the participation of many and enough time to understand what it means. During this period, a common language was first defined, normalizing concepts such as goals, strategic objectives, management objectives and their hierarchy on the institutional planning model, in order that everyone had the same understanding of the language being used. Agreeing on a common process terminology in conducting management and evaluation, will avoid confusion and facilitate the communication and collaborative processes (Stem, Margoluis, Salafsky, & Brown, 2005). I remark this as a crucial stage in setting the bases of a new EE approach within the NPS.

2.3. Skills development and technical support

The process of developing SMART objectives is expected to facilitate the implementation of the EE and the management task, not only at administrative level, but also on the practice, due to the systematic division of assignments and activities in the achievement of the general aims. During this phase, EE practitioners stressed the need to have specific skills training and technical support to ensure the viability and alignment of the objectives to the park's strategic and management plan. Leverington et al., (2010, p. 85) also support this fact, underpinning that staff training can enhance consistency of results, specially when qualitative measures are involved.

We recommend that specific workshops on objectives definition and planning accompany

this process not individually but from a team management perspective in order to visualize, develop and state objectives as a group, articulating all programs in a systematic and consistent way.

2.4. SMART objectives

With the support of the National Strategy of EE as a legal framework, and the methodological guide for the elaboration of EE local plans as a practical tool, is expected that old EE objectives such as "awareness on environmental issues for the local population ", can be translated into SMART and mainstreamed objectives such as "Implement a participatory training program in sustainable fisheries involving 50% of the actual fishing population census by 2019" or a more general "100% of the areas of the NPS implementing educational processes in formal and informal settings, in the framework of the National Environmental Education Strategy by 2015", that are entirely articulated with the park's strategic objectives, and divided by annual goals.

As recommended by O'Neill (2007), goals and objectives must be explicitly linked to the focal targets and key factors of the project, and undertake a process of prioritizing to align them with project resources.

2.5. Clustering and comparability

Once local SMART objectives were developed, EE teams recognized that they could be merge into similar categories from local to national level, despite the park's plurality and diversity in location and conservation aims. This clear convergence implies that a new interpretation can be done within a systematic structure, in which combinations, aggregations and comparisons of the EE task are possible among the same and different management levels. A homogeneous structure allows horizontal evaluation of individual protected areas on common parameters of use for managers, conservationists and scientists. It makes it also possible to compare results among different PAs from similar contexts for the use of PA network managers and decision-makers (Rodríguez-Rodríguez & Martínez-Vega, 2012).

Having this new perspective, networking and assessment could be reinforced, understanding comparability as a positive issue and avoid perceptions of evaluation as "punishment" or an "examination," something with strong negative connotations (Carleton-Hug & Hug, 2010; McDuff, 2002) as is perceived sometimes by practitioners.

2.6. A shift to long-term horizon

It is necessary to do more than simply raise awareness about evaluation, and develop meaningful objectives, and design ways to evaluate projects' effects over longer time

frames, moving from just achieving outputs to outcomes and look for long-term changes (Keene & Blumstein, 2010; Monroe, 2010). True environmental literacy goes beyond awareness and rote learning but involves critical thinking, integrating principles, and using acquired skills to turn knowledge into action (Bickford et al., 2012).

Redefinition of objectives was essential to adjust the EE program from a short-term to a long-term practice, stating the necessity to look beyond the short term and develop meaningful and non-trivial project objectives and to design ways to evaluate projects' effects over longer time frames (Keene & Blumstein, 2010; Monroe, 2010; Sherrow, 2010).

Results showed that most of EE activities deliveries were focused on awareness, communication, and information to scholars or general public audiences. This common and constant trend makes the full educational potential to get diluted in terms of influencing the people that are first priority to achieve conservation aims. However the importance of this typology of activities, is time to focus the work of EE as a proactive process, not limited to a one-way continuous dissemination task, but to support the conservation aims of the parks, promoting participation, capacity building, critical thinking or direct involvement into management practices for conservation (Blumstein & Saylan, 2007; Jiménez et al., 2014). As Keene (2010) argue, the environmental education community should avoid the evolution of a culture that trivializes evaluation, with programs and organizations evaluating only for accountability requirements and out of fear, rather than as part of a systematic effort to improving and achieving outcomes. Only in this way, EE actions will be effective with a true impact in the future.

3. Inclusive participation and communication

Stakeholders' participation is essential for the management process and success in protected areas and nearby (frontier) zones, especially in places where there are communities affected in the use of natural resources by a protected area restriction (Abecasis, Schmidt, Longnecker, & Clifton, 2013; M B. Mascia & Claus, 2009; Mills et al., 2011; Roth & Lee, 2004; Stephanson & Mascia, 2014). NPS of Colombia is a worldwide example of this integrative and participatory approach as framework for the creation of protected areas and its management plans, moving towards a co-management regime when special situations apply (Lockwood, Worboys, & Kothari, 2006, p. 566; MAVDT, 2010)..

However the clear principles of NPS and its policy of social participation for conservation, there are protected areas that need to foster and improve the involvement of

stakeholders, not only from local communities, but also from NGOs, and academy, that also play an important role in the conservation and management practice. Is evident that NPS is in a leadership position, but it should not bear the whole burden alone underpinning that participative and collaborative processes must share responsibility from all involved parties.

Establishing working networks are important not only for the conservation of biodiversity but also as a form of management (Guidetti, 2002). To achieve this challenge, is necessary that communication channels get improved (Laurance et al., 2012), promoting spaces for debate and project building, involving prioritized stakeholders and a proactive dialogue among managers, stakeholders, NGOs and academy to foster and strengthen management effectiveness (Arlettaz & Mathevet, 2011; Braunisch et al., 2012; Brewer, 2006; Knight et al., 2008; Lundquist & Granek, 2005). This is the manner in which we can effectively use conservation education to positively impact on the many endangered species and habitat around the world (Brewer, 2006; Kuhar et al., 2010; Sherrow, 2010).

In this research, having a direct participation from local EE staff was significant to have an approach to reality on the field, about the essential needs, priorities and evaluation of EE within NPS from a bottom-up perspective. However, the level of participation or involvement in the elaboration of the final output varied depending on the complexity of the task, realizing that local knowledge cannot be accepted unquestioningly, when technical literacy or specific expertise is needed (Elbroch et al., 2011). In the case of EE, participation from local staff enriched all the process, but we notice that a technical knowledge and training was needed to get the final indicators set development. Sometimes, certain tasks require more skills and experience that cannot be easily undertaken by novices or managers without existing training (Robert S Pomeroy et al., 2005, p. 65).

Agreeing with Reed (2008), I consider that combining qualitative insights from participatory research with insights from more top-down empirical research, can derive more accurate and relevant results than either approach could achieve alone.

4. Management levels networking (local, regional and national)

Much work has been done to alleviate the disconnection among management levels, and a redistribution of a more coherent geographic division for regional management has already taken place. In addition, to reduce high mobilization costs and access to Internet facilities now more protected areas have Internet access, which is expected to achieve substantial improvement on Information and Communication Technology (ICT) gaps,

reducing also the need for high travel expenses that sometimes are difficult for limited budget.

Data showed that communication leakages are also caused by the high multiple task that staff has to undertake, low personnel assigned to educational duties (UAESPNN, 2011, p. 114), especially at the regional level. This interruption breaks the connection between local and national level, causing a poor contextualization among local realities and national alignments. To overcome this issue, a national commission of EE has been established to improve communication gaps, and act as a structure for decision making with representation from the local and regional level. It would be of high value to foster exchange among this network finding new meeting scenarios to improve the two-way communication at internal level.

The communication among management programs is another issue that could be improved in order to make better use of economical and human resources and efforts, when working or developing projects for a common conservation objective. Finding nodes and connections with the rest of the management programs was also required to guarantee the EE mainstreaming within the management practice. Is been demonstrated that protected areas are more effective when information is properly transferred and participation of the different users is solid (Pace et al., 2010).

In complex management institutions as NPS is, local management staff sometimes is unrecognized for decision-making and planning tasks, that are mainly conceived to be headquarters office responsibility. Measuring management effectiveness can also be a space to come together all management levels and stakeholders, in order to understand the complexity of the task. Concurrent with Sodhi et al. (2011), the time for increasing bottom-up approaches has come, and conservationist and managers should be more attentive to local needs and practices.

5. Indicators for EE assessment

Progress in management effectiveness call upon the inclusion of more qualitative measures able to integrate the human dimension in the task of protected areas management (Hockings, Cook, Carter, & James, 2009; Watson et al., 2014), but a trend in using obsolete indicators that don't adjust to actual needs is still present. New indicators should be the result of a process that identify measures that clearly relate to programmatic goals, objectives, and activities that show progress along a causal chain toward the desired conservation state (Stem et al., 2005).

Attaining to these suggestions, and considering that the current practice of EE programs

evaluation has more circumstantial than empirical evidence to enable verification of the attained outcomes (Stern et al., 2013), we developed an easy-use indicators set, useful for the EE practice, with a more qualitative approach that the ones used to measure only outputs or products.

Re-definition of objectives and categorization from an institutional bottom-up shaped a tree of singular objectives categories, realizing that although protected areas were completely different among their final conservation goals, they shared the same EE principles. The combination of quantitative data from surveys plus qualitative information gathered through interviews and working groups, greatly assisted in establishing a baseline of EE indicator needs to measure effectiveness of the EE task within NPS.

Having a far-reaching and comprehensive proposal for the first time to measure participation, communication, articulation, appropriation of information, continuity of staff team and program implementation, is a big step forward in the assessment of EE as a crosscutting strategic program in the management of protected areas. In order to go beyond the indicators establishment and assure the chances for indicators to be adopted by the NPS, the indicators were defined and elaborated in alignment with the NPS institutional quality system. This means that all indicators are linked to the management program objectives, institutional strategic objectives and according to the NPS indicators institutional quality requirements (Appendix V)

The simplicity, and usefulness of the indicators (Reed et al., 2008), combining rigor and accuracy, has lead to a favorable implication by the EE staff . The proposal was well received from other entities such as NGOs that agree that the indicators are very comprehensive and easy use for EE practitioners, if compared to other kind of measures from the qualitative point of view. They stated that these indicators could also be helpful as a prioritization and coordination tool for incoming projects to the NPS, specially the articulation indicator, providing a quick answer and support to those initiatives that best suit the identified needs of the areas. External users from NGOs stated that their use could also be extrapolated to their work and not strictly within the NPS scope, validating its broad use.

Agreeing with Ibrahim et al. (2011), teamwork was essential for the success of the elaboration of this indicators set, resulting in visible, practical and effective collaboration. A transdisciplinary work, integrating nonacademic participants and academic researchers from unrelated disciplines for a common goal is needed to create new knowledge and theory in conservation science (Evely et al., 2010; Pooley et al., 2014). In addition, training, collaboration and partnerships are essential to build an appropriate knowledge

base, working across natural and social dimensions for a more effective management of biodiversity recovery (Fisher et al., 2005; Lundquist & Granek, 2005; Moon & Blackman, 2014; Pooley et al., 2014).

This is a moment of high expectance to understand and know what really works in terms of management effectiveness, and now is the chance for EE to show that efforts are really worth it. We must measure, evaluate, and then communicate both the good and bad news (Stem et al., 2005; Stern et al., 2013) about the impacts of individual conservation approaches and the relative effectiveness of strategies across projects and policies. Our collective efforts to convince all sectors of society of the value of sustaining biodiversity depends on our ability to measure and articulate clearly the consequences of conservation decisions and actions (Stem et al., 2005), that also involves the EE field.

Achieving standardization in definition of objectives and assessment, techniques and tools of data gathering in multidisciplinary projects (Evely et al., 2010) would further enable comparative studies (Pooley et al., 2014). Although is known that this will serve for better decision-making, few systems have succeed to such task (Parrish et al., 2003; Rodríguez-Rodríguez & Martínez-Vega, 2012). Reaching this challenge will permit a baseline to assess protected areas on objective, simple and meaningful criteria over time, in which EE process within the social dimension can be evaluated and compared.

6. Training-capacity building

A global study on protected areas effectiveness has shown that overall management effectiveness and the condition of protected area resources has been proved to have strong linkage to staff training among others (Fiona Leverington et al., 2010, p. 37). Our results highlight the need for better and aligned training to face protected areas management needs, especially on the EE area. Although training is not considered a competence of the EE program in NPS, is necessary to underpin that at international level, from the Intergovernmental Conference on Environmental Education celebrated in Tbilisi (URSS, 1977), both concepts are taken together for its complementarity. This fact can also be deduced from a wide variety of reports and indicators proposals, in which EE and training appear together (Ehler, 2003; Fien et al., 2001; IOC-UNESCO, 2006, p. 18,22,26; Tilbury et al., 2007).

One attractive example that integrates EE training model within a National Park System is the case The National Environmental Education Centre (CENEAM) in Spain. It is part of the Autonomous Entity regulating National Parks, part of the Ministry of the Environment and Rural and Marine Affairs. The Centre's mission is to increase awareness among

citizens of their responsibility towards the environment, focusing activities on specific environmental education training, some addressed to general public, schools, technicians but with special attention to training to improve the management in National Parks and protected areas (CENEAM, 2014, p. 59).

Evidence is on the table, and merging EE with training could be a valuable strategy to foster management effectiveness and empower the valuable human resources that constitutes NPS. The success of any educational initiative is linked to the effectiveness of its delivery which requires training and coaching (Bettinger et al., 2010), and it should be considered as an essential component not only for EE but for all management staff

7. Planning - Human and Economic resource funding

"Protected areas must progress, not regress: a step increase is necessary in the scale of protected areas investment to deliver conservation goals." - Sidney World Parks Congress 2014.

Much effort can be made on the paper and declarations of intent by managers and EE staff, but finally, the economical and human resources are the limiting factor to give a real boost to the EE program (UAESPNN, 2011).

Under-resourcing of protected area management is the primary reason for poor performance in protected area effectiveness, especially in the developing world (Bruner, Gullison, Rice, & da Fonseca, 2001; Watson et al., 2014). This constraint fact compromises the viability of any ongoing or future process specially those that depend mainly on a strong human resources core. With the new planning strategy and methodology, having well defined objectives and prioritized stakeholders is expected to increase the chances to ensure budget allocations and introduce foresighted measures for the effectiveness in the expenditure of the available budget.

The insufficient job stability for EE staff and uncertainty in funds allocation generate discontinuity and regression in most of the programmed activities (J Zorrilla-Pujana, 2008). EE is a crosscutting program in the management of protected areas and the scarce resources are a common issue that appears in most of the analyzed criteria. Although EE is recognized as a first priority and a critical activity for PA management (Dahl-Tacconi, 2005; Fraschetti et al., 2002, p. 82,132; Fiona Leverington et al., 2010, p. 87), reality reveals that education programs are identified by managers as a general weakness in the management of protected areas (N. Dudley et al., 2007, p. 11), in which the NPS case can also is included (UAESPNN, 2011).

Only having a better planning dynamic and structure, together with systematize and

continuous evaluation processes, EE will increase probabilities to find its corresponding place within conservation policies and budget assignments in the management of protected areas.

8. Future Perspectives

This is a theoretical study with a practical focus in order to get an EE baseline for present and future actions. However we still need at least 5 or more years to see if the EE processes applied here have attained results in the long term, according to the management objectives that were settled in each case. I consider that these proposed methods are not fixed boxes and indicators are a first proposal that can be enlarged, modified and improved it in the future; time must not be wasted to reach the perfect measure, but we need to start doing and evaluate in order to construct a realistic and well structured baseline.

Is difficult to extend this practice all over the NPS simultaneously, so an ideal beggining should focus on having a pilot test to adjust on the real field all the tools and indicators. The process in first instance can be addressed on those parks where processes are more advanced, having more possibilities of success. Taking in consideration this issue, Green List Parks can be the best alternative. These protected areas have already attained an excellence label of management and could be an exceptional opportunity to go further in effectiveness considering EE as a fundamental principle. EE will help to advance in the engagement and strengthen community and stakeholders' relations and communications, bridging the gap between the social and biological dimension.

Future research should address the development of composite indicators capable to relate biological and social indicators. This tool could improve the displaying of a more complete picture of the complex interactions among both dimensions and their effects on the effectiveness of protected areas, for a better-informed decision-making. Having an approach in this sense will be a big step in the future of the management of protected areas and decision-making.

Promote NPS as a living educational and biological laboratory, given its high biodiversity and ecosystem values, is an excellent opportunity to set up participative educational schemes within a long-term frame, hand to hand with biological research, and communication strategies. Public participation in scientific research (PPSR) is a growing field that has achieved notable outcomes for both science and education, with a broad scope of possibilities, reaching not only local stakeholders, but also external citizens that could give a very valuable information and data to the NPS. This may be an excellent

opportunity to gain data and make good profit of it if well managed.

Is important in all the above-mentioned cases, the role of collaboration and cooperation among NGOs, communities, stakeholders and the academy, establishing interesting synergies and new and strong proposals. This will allow a more dynamic, effective and inclusive EE for the management of protected areas.

Is now the moment to change the concept of conservation as "something that is studied" to "something we study, understand and turn into action", being more real and close to society.

General Conclusions

The intention of my research has been to integrate the EE into the management plans and upgrade its visibility through the management plans and institutional networking. Based on the findings arising from an action research, I present a new agreed framework to elaborate and integrate local EE plans into management of the NPS of Colombia, together with a common indicator set to evaluate EE actions and processes.

As a new initiative, the process followed an institutional bottom-up direction, being faithful to an inclusive, participatory and reflexive approach to EE practitioners. This proposal is based in the context of National Parks of Colombia, but its use, of course, is not limited exclusively to this system. Thus, in case of external use by other institutions, it is recommended to always analyze the usefulness and relevance of these tools (EE local action plan route and indicators), developed to be flexible enough instruments, which can be adapted depending on the different contexts and realities of each entity.

The present investigation has succeed to address the work within a social research framework, following the critical theory paradigm (Crotty, 1998). The EE integration in the management plans of the NPS, (i) seek to solve problems like the EE lack of visibility, systematization and crosscutting program within the management plans, (ii) promoting partnership and collaboration among the different management areas and homologous partners in different protected areas (iii) a change in the EE practice from short term to long term perspective, and (iv) redefine and develop new evaluation practical tools, characteristics that are highlighted by Watts and Jones (2002, p. 233) as the most common conceptual approaches in action research.

All this achievements are accompanied by an engagement of the institution staff to change the previous situation, stimulating critical reflection and engage the NPS in a new culture of EE based on quality and management effectiveness.

With this research, those four principles were attained. Now, EE en National Parks can be developed in a different way, following a coherent and systematic route, with new tools to evaluate the progress of actions and processes, fostering collaboration of stakeholders, and networking. What has been achieved, is a consistent response to the objectives established, based on open and critical discussion, where participation, involvement and reflection of the subjects were essential for the success of this research.

If EE as a management program is expected to get more visibility and work as a cross cutting program is essential that:

- EE must shift to a long-term process of learning and not focus just on short-term activities. This will be essential to develop consistent programs and be synchronized with both management plans and an institutional planning structure to achieve conservation goals.

- Is necessary to adopt and socialize a common planning and management language.

- As a first step for planning, is necessary to have clear, attainable and well-defined objectives; otherwise there is a high risk of failing or lost direction during the process.

- Stakeholders' involvement is essential in educational activities, but there is a need to prioritize and work with the ones that have more influence in the achievement of conservation aims. Scholars are important public target, but in some cases, the efforts made don't represent significant change for the protected area conservation status.

- EE should be supported through a great variety of activities schemes, and should not be limited to isolated events or formal education alone. Activities that contribute to an active participation from local communities, stakeholders and citizens, fostering engagement, volunteering, and capacity-building, will contribute in a more effectively, sustainable and equitable manner to the conservation of protected areas.

- Having solid communication channels along the local, regional and headquarters in NPS are essential for the good functioning, resources allocation and networking among all parts. This research, through interviews, surveys, workshops and focus groups, has given voice to EE staff from local and national level as well to environmental organizations, generating data based on the multiple realities to improve the EE program, strengthening the concept that bottom-up is as important as top-down communication.

- Systematization is needed to advance in the evaluation process and to determine which actions and processes require modifications, rethink or change in order to attain objectives.

- Having a continuous support from EE and effectiveness evaluation from headquarters is also essential for the systematization, monitoring and correct evaluation of the program.

- An increased number of EE personnel are needed in order to increase actions and effectiveness. Without human support, and economic resources the attainment of objectives may be jeopardized.

- In order to advance into quality and effectiveness in management, training and capacity building in EE skills, and evaluation are needed. Without a solid trained human base, achieving new emerging challenges would be a pointless task.

- Measure participation quality, articulation, appropriation of information and continuity, is not a definitive but a first step proposal to start measuring educational processes within the management plans, generating a baseline for the first time for the EE program with a local, regional and national scope.

Starting a long-term planning and evaluation process is also a commitment to accomplish the stated objectives of the EE, with a more social focus. This is one of the big challenges that NPS will face in the following years, putting into practice the powerful mission the institution has.

It is difficult to ascertain the impact that this research has had in EE program within the National Parks System. However, the fact that the EE methodological route and the indicators set are present in the toolbox of the EE National Strategy, are good signals that things have change. In addition, it is known that one park is already taking data and applying the indicator of appropriation of information, as a pilot test of one of the indicators proposed. Once all management plans are finished, will be the time to realize the level of influence of this research. Until then is difficult to measure it in an objective way.

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Appendix I - National Parks System Survey Guide

> ## ENVIRONMENTAL EDUCATION IN NATURAL NATIONAL PARKS OF COLOMBIA

The survey that you are about to complete has been developed with the aim of knowing in depth issues about environmental education program in National Parks of Colombia.

The information obtained will be used for the sole and exclusive purpose of improving the operation and the structure of the Environmental Education program, and not with the intention of evaluating the performance of work done by each of the respondents. Results will be for research use only.

At the top you'll see a progress bar will indicate the progress in the survey, consisting of 10 questions.

Thank you very much for your cooperation and participation.

First part – Let's analyze the objectives

Before anything else, preparation is the key to success – Alexander Graham Bell

A goal without a plan is just a wish. - Antoine de Saint-Exupery

1. In your opinion and experience in the protected area where you work, assess the following statements:

	Very agree	Agree	Disagree	Total disagree	N/A
I understand that we must fulfill the objectives in my area					
The objectives are clear and specific					
The objectives are measurable, they can be quantified					
The objectives are achievable (with the resources and capacities available)					
The goals are realistic (possibility to obtain the level of change reflected in the objective)					
The objectives are achievable in a given time period					
Objectives are accompanied by a plan for its achievement					
The objectives are coherent with the ones stated by the protected area					

If you would like to clarify, propose o comment… this is your space:

Second part – Articulation, alignment and team work

"The achievements of an organization are the results of the combined effort of each individual" – Vincent Lombardi

2. Making a CRITICAL appraisal, we would like to know your position on the following concepts and considerations**:**

	Very agree	Agree	Disagree	Total disagree	N/A
I know the management plan of my area and its conservation objectives					
I know the management plan of other similar areas					
EE objectives are aligned with the conservation objectives					
EE in my area is articulated with the other programs of the management team					
EE is articulated and coordinated at all management levels (local, regional and national)					
EE functions as a cross-cutting program at the UAESPNN					
EE mainstreaming is real and visible at the management plans					
The objectives are coherent with the ones stated by the protected area					

If you would like to clarify, propose o comment… this is your space.

3. Now we'll go deeper into the type of target that we work, prioritizing and assigning the category that best belongs (there is only one option for each menu). It is important to answer as honestly as possible, although it is not "politically correct". We don't want to assess performance, but to know more about the educational work being done.

	EE activities frequency*	Activity typology**	Thematic***
General public			
Visitors			
Residents of overlapping areas			
Black communities			
Indigenous communities			
Institutional actors			
Specialized public			

always, often, rarely, never, N/A.

** *Dissemination and communication, PRAE, Environmental interpretation, leaflets delivery, volunteer rangers, Participatory Project Formulation, institutional work, workshops, environmental festivals and talks, and community projects.*

*** *Solid waste management, National Parks, Conservation objectives, Biodiversity, environment conservation, participatory ecological restoration, water resources,*

management plan, environmental, land-use planning, gardens, ecotourism and fire prevention

If you would like to clarify, propose o comment… this is your space.

Part Three: Participation and communication

"The most important thing in communication is hearing what isn't said." – Peter F. Drucker

4. Now let's explore the participation and communication as intrinsic elements of environmental education in the UAESPNN. Choose the options you consider applying to your experience:

	always	*often*	*rarely*	*never*	N/A
Internal participation is enhanced by the UAESPNN					
External participation is enhanced by the UAESPNN					
Your opinion is taken into account within the UAESPNN					
Teams opinion is taken into account to improve the management of the area					
Communication is a key element in the process of education and awareness					
More training on techniques and competences in communication and participation are necessary					
The collaboration and involvement of communities in the process of power conservation					
Participation does involve the different actors towards the conservation of the area					

If you would like to clarify, propose o comment… this is your space.

5. We all have ideas, knowledge and different experiences. We want to know your opinion and without being pre-conditioned theoretical, strategic and planning aspects, what do you think are the five priority areas, from your experience and expertise to work in environmental education in UAESPNN?

1st priority: _____
2nd priority: _____
3rd priority: _____
4th priority: _____
5th priority: _____

And what do you think?

"Example is not the main thing in influencing others. It is the only thing". - Albert Schweitze

6. In your experience, please rank the options in order of importance (from highest to the lowest), the key elements you consider of high interest to ensure the success of the EE in the UAESPNN. Each value can have a maximum of one element associated.

	1	2	3	4	5	6	7	8	9
Articulation between the different levels of management									
Greater financial resources									
Exchange of experience between areas									
Assessment EE									
Integration of EE in the management planning									
Training									
EE in mediating conflicts									
Systematization of plans and activities									
Involvement of communities in the conservation process									

If you would like to clarify, propose o comment… this is your space….

7. Do you know the environmental education strategy?

- ☐ I read the full draft
- ☐ I have reviewed the above
- ☐ Yes, but still I have not read
- ☐ I do not know the existence of this document
- ☐ Another (please specify)

What do you think about evaluation?

"Just because something doesn't do what you planned it to do doesn't mean it's useless". Thomas A. Edison ·

8. Answer according to your experience in the protected area where you work

	Very agree	Agree	Disagree	Total disagree	N/A
Existing EE program					
EE objectives are known by the staff					
EE achieves its objectives					
EE is systematic and consistent					
EE Annual memories elaboration					
Indicators existence					
EE reflection process					
Feedback					
Continuous assessment and monitoring					
EE improves conservation process					

If you would like to clarify, propose o comment… this is your space….

9. Rate from 1 to 4 the following criteria related to the protected area where you work.

- EE program of the protected area
- Coherence between EE programs and conservation objectives
- Improvement of the management thanks to EE activities
- Community involvement on conservation processes through the EE programs
- Generation of conservation actions through education
- Conflict mediation
- Inclusion of the protected area within the scholar program and activities
- Construction of environmental education scenarios
- NPS effort to maintain and conserve traditions and ancestral knowledge
- Increased perception and valuing image of the NPS from communities over the last few years

10. We want to thank you for your cooperation in finishing this survey. Please complete the data below for research use only.

Name:

Protected area name:

Position:

Time working in NPS:

E-mail:

Appendix II - National Parks System Interview Guide

Work Context

1. What are your responsibilities?

2. Mention the objectives of your EE program

Internal coordination

3. Is there any mechanism that is responsible for ensuring coordination and coherence of EE in the three levels of management?

4. Do you think that these mechanisms are important to ensure the viability of the EE program?

5. Do you think everyone recognizes the area of EE in PNN?

6. Do you know you Park's management plan?

7. Do you know the plan of management of other Pacific Region Parks?

EE in management plans

8. In the current review being undertaken on the management plan, which would change to this new version, so that the EE were more articulate in the park's plan?

9. What is missing in EE to become visible and crosscutting in Parks?

10. How do you think EE should you work with other areas?

11. Do you think EE is transversal in management planning?

12. From your position and as far as you know, can you mention the main problems for the conservation of the area?

Economic sustainability

13. Dou you know the annual budget of EE?

14. What is the annual budget for EE?

15. Are there sufficient resources for EE?

16. In what way can EE provide income to the parks?

Social context and participation

17. Do you think they are making efforts to prevent the loss of customs and traditions?

18. Do you think there is an improvement in the perception and vision of the park institution by communities and groups with whom you work?

19. How would you rate the involvement of communities in the process of achieving conservation through community agreements?

20. Do you think the COs and the mission of parks is included in educational programs in the region?

21. In your position, have you been involved in the planning and operation of the park you are working?

22. The activities carried out are more passive type (awareness raising, workshops, etc.) or active (community projects , decision making)?

23. Is the participation of more companies / institutions / communities is visible in the management planning process?

24. Do you think there are scenarios suitable for education, communication and participation in park?

Training

25. Are the processes of education and training facilitated by the institution?

26. Have you ever participated in any?

27. Who is the target group most involved in these processes?

Communication and information

28. Do you use any kind of space to disseminate the projects being carried out? Could you name a few?

29. Do you have access to information on successful experiences or projects being carried out in parks or other places?

30. Do you know if there is any communication channel between areas, like a blog, periodic newsletter, etc.?

31. Do you know if they communicate the results of the different research conducted on the Park?

Systematization, research and evaluation

32. Is there any EE planning document with (annual), medium and long term objectives?

33. Is there a record and systematization of the processes carried out in

EE?

34. Do you know the existence of an annual report containing all the education experiences conducted in the Park?

35. Do you have noticed changes of behaviors and attitudes following the EE plans that have been carried out?

36. What is needed to improve the EE process?

37. How can be done to measure the degree of fulfillment of the objectives?

38. How could we measure or assess the EE work?

39. Do you think there is consistency between the conservation objectives of the National Strategy and the EE that is being implemented?

40. Do you think there is a policy framework that supports the EE in Parks as institution?

41. Do you know any successful story in reducing threats in the park through educational processes?

42. Have you noticed an improvement in the management of the area from the activities of the EE?

43. Have you managed to perceive changes in behavior against a threat from the communities involved, examples?

44. Do you think there is positive association between educational activities and the status of COs?

Appendix III - Non-Governmental Organizations Interview Guide

Work Context

1. Brief explanation of his/her work
2. What are your goals?

Place history

3. How long ago do you know the Pacific coast?
4. What kind of changes have you seen happen? - (Landscape, biodiversity, fisheries, forests, coral, beaches)
5. What are he principal causes for those changes?

Current situation

6. Are you familiar with the Park management plans? Which changes would you propose for the new revision?
7. What do you consider to be fundamental in a National Parks Environmental Education (EE) strategy?

EE and Participation

8. Is the participation of NGOs promoted by management planning?
9. What elements would you introduce from her point of view of the EE?
10. Do you consider the EE as a key process for conservation?
11. Do you think EE is visible in parks?
12. Do you think there is an articulated process between EE and your institution?

EE and Networking

13. How do you think EE should be articulated with NGOs?
14. How could we measure this work?
15. What are the key actions to protect the Seascapes of Tropical Pacific?
16. Do you think there is a positive association between conservation and EE?
17. How do you think we could measure and evaluate this relationship?

Training

18. From your experience, do you think that training processes are necessary for the adequate management of the protected area?
19. Do you think are sufficient resources allocated to the EE?
20. Do you think the EE can play an important role in the contribution of income to parks and communities?

21. Do you think you are missing customs and traditions in the area?

22. How could you improve the communication process within and between areas?

Evaluation

23. What challenges do we have in EE evaluation?

24. How are educational actions that are carried from your institution being evaluated?

25. From your experience, which aspects must be taken into account when generating indicators?

26. What kind of indicators do you use?

27. How do you measure the impact of social actions in relation to biological data?

28. Which kind of achievement must be focus the EE?

Appendix IV - Actors' identification, prioritization and categorization[3]

In the context of updating and reformulation of management plans for protected areas, it is necessary to conduct a mapping exercise to identify and prioritize the key actors in the territory, whose participation is essential and required for achieving the objectives conservation of the Parks.

As a first step, we define that key actors for management of protected areas are those who:

- Have a duty to intervene in the planning process, according to the current legal framework in the protected area or zone of influence
- Are involved in making policy decisions and/or land use planning that may affect the protected area and/or buffer zone area
- Have a high level of recognition and/or territorial legitimacy and/or sectorial impact and lead to proposals and initiatives for sustainable development.

Once defined the concept of key actor, the analysis must go beyond having a list and it should identify and analyze their interests, importance and influence on the results of management strategies. It's also important to notice the presence of other actors in the territory, so it is proposed that this analysis is addressed through three key steps:

- Identification and categorization of actors
- Prioritization based on the criteria of ability to contribute to the governance of the protected area
- Legitimacy and capacity to generate knowledge and contribute to the management of the protected area

Having finished the first analysis, the next step corresponds to a characterization, which consists in the knowledge and description of institutional, social, cultural and economic characteristics of these actors, which will also give tools to future, and probable negotiation approaches.

In this way, it is considered that the actors will be analyzed collectively, reaching a systemic approach with the relationships established between them in the context in which they operate

At the end of the process of, identification, prioritization and categorization of actors, each of the protected areas should be able to answer the following questions as part of its management plan:

- What are key actors in the management of NNP?
- Following the management planning route, when it is desirable or necessary their link-up?
- What should we do to promote participation? What enables us to improve the current level of relationship?
- How you can use ongoing social processes in order to link them to the NNP management?

---

[3] Elaborated by Febe Lucía Ruiz - Head of Environmental Education Program at the UAESPNN. 2014. Edited by Juanita Zorrilla-Pujana

Appendix V - Indicator's Methodology Sheets

INDICATOR REFERENCE SHEET

Code: DE_FO_0
Version: 3
In force since dd/mm/yy:

Integrated quality management system

PROCESS	QUALITY OBJECTIVE	Institutional Action Plan
Development and management of the NPS	Continuous improvement of conservation processes, promotion and protection of natural and cultural heritage of the areas of the National Park System	**SUBPROGRAM** 1.2.4 Promote educational strategies that contribute to the social value of protected areas

INDICATOR NAME	INDICATOR OBJECTIVE	INDICATOR TYPOLGY	FREQUENCY
Appropriation of information	Shows the impact of educational activities promoted by the NPS, in terms of information. It´s expected that this impact is reflected in the variation of the concepts used by the actors involved. These Effectivity concepts are handled during the educational process developed by the protected area.		Annual

METHODOLOGICAL DESCRIPTION

Educational processes address a communication phase in which the primary purpose is to make information available to participants. This indicator measures the level of appropriation of this information of participants in educational processes. We want to compare the variation in knowledge in the same group before and after of an educational process.

Considering the few studies developed to measure the environmental impacts generated from the processes of education, the methodology proposed in the paper by Kuhar, et al (2010), will be implemented.

In this sense, for people involved in the processes of environmental education (when it corresponds), an early survey in the process (pre) and at the end of it (post) will apply.

In order to analyze the trend of the program, an analysis of variance for repeated averages (ANOVA) will apply, assuming that the same individuals will go through a series of experimental treatments (pre-post) and the dependent variable is always the same (repeated measures), in this case, proportion who correctly answered the questions. The formula appearing is the applied for the

Kuhar, C.W., Bettinger, T.L., Lehnhardt, K., Tracy, O., Cox, D., 2010. Evaluating for long-term impact of an environmental education program at the Kalinzu Forest Reserve, Uganda. Am. J. Primatol. 72, 407–413.

DESCRIPTION OF VARIABLES FOR CALCULATING THE INDICATOR	MATHEMATICAL FORMULA FOR THE INDICATOR	COVERAGE OR SCALE
		Protected Area
		REFERENCE LINE: NA
		BASELINE: ND
		CRITICAL LEVEL
		ACCEPTABLE LEVEL
		SATISFACTORY LEVEL
		MANAGEMENT RANKS

DATA SOURCE	MEANS OF VERIFICATION:	ANNUAL GOAL	MEASURE UNIT
			Porcentaje

DETAILS OF RESPONSIBLE FOR INFORMATION	
Goal's Responsible name (Process, Sub-Program)	
position	
E-mail	
Responsible name for monitoring and follow-up	Environmental Education Professional, Planning and Management Group - Subdirectorate of the protected Areas Management
position	Environmental Education Professional, Planning and Management Group - Subdirectorate of the protected Areas Management
E-mail	eduambiental@parquesnacionales.gov.co

INDICATOR REFERENCE SHEET

Code: DE_FO_0
Version: 3
In force since dd/mm/yy:

Integrated quality management system	Institutional Action Plan

PROCESS	QUALITY OBJECTIVE	SUBPROGRAM
Development and management of the NPS	Continuous improvement of conservation processes, promotion and protection of natural and cultural heritage of the areas of the National Park System	1.2.4 Promote educational strategies that contribute to the social value of protected areas

INDICATOR NAME	INDICATOR OBJECTIVE	INDICATOR TYPOLGY	FREQUENCY
Articulation index of environmental education with the PA Management Plan	Show the degree of coherence of environmental education activities undertaken in relation to the educational needs of each of the lines of management planning for reducing, mitigating or eliminating conservation ojectives pressures.	Effectivity	Annual

METHODOLOGICAL DESCRIPTION

Design: The purpose of this indicator is to obtain information related to the EE activities linked to the risks (critical and moderate), identified by an analysis of the park context in the formulation of management plans. The methodology seeks to determine whether EE processes developed by the park are related to the prioritized risks to which they are exposed.

Population on which the study was done: All parks that are part of the system.

Environment: each of the parks of the NPS

Interventions: an analysis should apply the proposed formula and contrast ranges.

It is necessary to note that the threats that can be addressed from the processes of environmental education are: livestock, agriculture, logging, fires, illegal crops, fishing, fuel wood use, hunting, solid waste, spills, introduction of invasive species and exotic, tourism, illegal traffic in species of flora and fauna, traffic of forest products, climate change adaptation, mitigation, and prevention and management of natural hazards.

DESCRIPTION OF VARIABLES FOR CALCULATING THE INDICATOR		MATHEMATICAL FORMULA FOR THE INDICATOR	COVERAGE OR SCALE		
CR	Number of critical risks addressed from EE		REFERENCE LINE	Protected Area	
TCR	Total of critical risks detected from the risk analysis that can be addressed by the EE		BASELINE	NA	
MoMi	Number of moderate and / or minor risks addressed from EE	$$3 * \left(\frac{CR}{TCR}\right) + 2 * \left(\frac{MoMi}{TMoMi}\right)$$		NID	
TMMi	Total of moderate and/or minor risks detected from the risk analysis that can be addressed by the EE.		MANAGEMENT RANKS		
			CRITICAL LEVEL	<2 - Very Low	
				≥2-<3 -Low	
			ACCEPTABLE LEVEL	≥3-<4 - Medium	
			SATISFACTORY LEVEL	≥4 - High	

DATA SOURCE	MEANS OF VERIFICATION:	ANNUAL GOAL	MEASURE UNIT
	Environmental Education Professional Planning and Management Group - Subdirectorate of the protected Areas Management		Number

DETAILS OF RESPONSIBLE FOR INFORMATION	
Goal's Responsible name (Process, Sub-Program)	
position	
E-mail	
Responsible name for monitoring and follow-up	Environmental Education Professional Planning and Management Group - Subdirectorate of the protected Areas Management
position	
E-mail	eduambiental@parquesnacionales.gov.co

INDICATOR REFERENCE SHEET

Code: DE_FO_0
Version: 3
In force since dd/mm/yy:

Integrated quality management system	
PROCESS	**QUALITY OBJECTIVE**
Development and management of the NPS	Continuous improvement of conservation processes, promotion and protection of natural and cultural heritage of the areas of the National Park System

Institutional Action Plan	
INDICATOR NAME	**SUBPROGRAM**
EE Team Continuity	1.2.4 Promote educational strategies that contribute to the social value of protected areas

INDICATOR OBJECTIVE	**INDICATOR TYPOLGY**	**FREQUENCY**
Measures the relation between the continuity of the EE educator/educators in relation with objectives achievement and Effectivity performed activities.		Anual

METHODOLOGICAL DESCRIPTION

Measure and monitor educational processes start with the key person or team that manage the EE program. This indicator measures the relation between objectives ang goals achievement and the team continuity. This is important in order to show if the permanence of an educator or EE team is essential for the objectives accomplishment.

Continuity is a key issue that could favor in establishing social relationships with the actors involved in the process of conservation. We want to compare if there is variation in the objectives accomplishemnt when an EE educator or team works ininterruptedly in a EE work plan. It is also important to have solid basis to demonstrate that human resources are also key elements to foster educational process and commitments with local stakeholders, where communication is the basis for any adancement in the edicational process.

The projected goals and initial objectives, are those established at the strategic plan of each park.

Here, we propose an orientative management ranks, but the analysis will determine if this ranks are relevant and extrapolated, because each Park really has its own complexities.

It is very important that the results of this indicators go through an analysis an interpretation for a more explanatory and precise results of the continuity of the EE process. This will help to make tool adjustments in the future.

DESCRIPTION OF VARIABLES FOR CALCULATING THE INDICATOR

Fi	Educator permanence (months)
Gperf	Goals performed
Pgoal	Projected goals
Oach	Objectives achieved
Oini	Initial objectives

MATHEMATICAL FORMULA FOR THE INDICATOR

$$C = \frac{\sum Fi1}{12} * \frac{Gperf}{Pgoal} * \frac{Oach}{Oini} * 100$$

COVERAGE OR SCALE

REFERENCE LINE	
BASELINE	NA
	ND

MANAGEMENT RANKS	
CRITICAL LEVEL	<15% - Very low
	>15% - >25% - Low
ACCEPTABLE LEVEL	>25% - medium
SATISFACTORY LEVEL	>50% - High

DATA SOURCE

Management plan, Strategic plan, Annual report of EE activities

MEANS OF VERIFICATION:

Staff contracts and products reports

ANNUAL GOAL	MEASURE UNIT

DETAILS OF RESPONSIBLE FOR INFORMATION

Goal's Responsible name (Process, Sub-Program)	
position	
E-mail	Environmental Education Professional. Planning and Management Group - Subdirectorate of the protected Areas Management
Responsible name for monitoring and follow-up	
position	Environmental Education Professional. Planning and Management Group - Subdirectorate of the protected Areas Management
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INDICATOR REFERENCE SHEET

Code: DE_FO_0
Version: 3
In force since dd/mm/yy:

Integrated quality management system		Institutional Action Plan

PROCESS	QUALITY OBJECTIVE		SUBPROGRAM
Development and management of the NPS	Continuous improvement of conservation processes, promotion and protection of natural and cultural heritage of the areas of the National Park System		1.2.4 Promote educational strategies that contribute to the social value of protected areas

INDICATOR NAME	INDICATOR OBJECTIVE	INDICATOR TYPOLGY	FREQUENCY
Articulation index of environmental education with the PA Management Plan	Index of quality participation in the processes of Environmental Education	Effectivity	Annual

METHODOLOGICAL DESCRIPTION

Design: It is necessary to note that this indicator only applies to processes with a well defined time schedule and not singular activities. For the application of the indicator, processes that are susceptible to be evaluated, must define the qualification of the following variables from 1 to 3 prior to the start of the process.

• Objectives Achievement (OA): This variable seeks to determine the level of implementation of the work plans and / or agreements with stakeholders involved in the process. For the qualification of this variable, a contrast tool is needed to contrast the development of the established work plans and / or agreements with the group from the participatory processes in a given period of time.
Possible scores for this variable are:
- Score 3 = have met all the objectives and / or set tasks in the work plan and / or agreement.
- Score 2 = Objectives were completed between 75% and 50% of the targets and / or set tasks in the work plan and / or agreement.
- Score 1 = less than 50% of the objectives and / or set tasks in the work plan and / or agreement were completed.

• Process Continuity (PC): This variable seeks to define the permanence of prioritized stakeholders in the process, through their participation in the activities proposed by the park. For qualification of this variable, assistance listings are needed and records, that allow accounting for the participants in each of the activities proposed in the process.
Possible scores for this variable are:
- Score 3 = prioritized actors participated in all least 75% of the proposed activities within the process.
- Score 2 = the prioritized actors involved between 75% and 50% of the activities proposed under the process.
- Score 1 = the prioritized actors involved in less than 50% of the activities proposed under the process.

• Level of participation (PL): This variable seeks to define consistency between the level of participation required and the level of participation achieved by actors involved in the process. It's necessary as part of the methodological design, to define these variables, according to the level of participation expected (information, consultation, initiative, cooperation, decision, management, control) to be able to qualify the process at the different stages.
The possible scores for this variable are:
- Score 3 = at least 75% of the actors involved with the level of participation expected.
- Score 2 = between 75% and 50% of the actors involved with the level of participation expected
- Score 1 = less than 50% of the actors involved with the level of participation expected

• The fourth variable is related to the prioritization of actors and it has a greater weight than the previous three, considering that is a determinant of the effectiveness of educational actions in relation to the management of areas is whether these are being addressed to the actors involved in this effort.
The prioritization of actors is carried out as part of the diagnostic synthesis of management plans. From this information and as part of methodological design of the participatory process, it must determine which of actors should be included and with which objective. Then, this fourth variable will help to determine which percentage of prioritized actors is effectively participating in the process. The four variables should be evaluated for each of the processes developed for the implementation of the strategic lines of management and supported by EE.

DESCRIPTION OF VARIABLES FOR CALCULATING THE INDICATOR

OA	Objectives Achievement
PC	Process continually
PL	Participation Level
Pact	Prioritized Actors
ParAct	Participant Actors
TNP	Total Number of Processes supported by EE

MATHEMATICAL FORMULA FOR THE INDICATOR

$$\sum_{i=1}^{i} \left[\left(\frac{OA + PC + PL}{3} \right) * \frac{Pact}{ParAct} \right] * \frac{1}{TPS}$$

MEANS OF VERIFICATION:

Management Plan, EE Local Action Plan, Local Plans of other management strategies, Assistance listings, work plans and / or agreements with the priority actors.

COVERAGE OR SCALE

REFERENCE LINE	Protected Area
BASELINE	NA
	ND

	MANAGEMENT RANKS
CRITICAL LEVEL	Range between 1 y 1.5 : Very Low
ACCEPTABLE LEVEL	Range between 1.5 y 2.5: Medium
SATISFACTORY LEVEL	Range between 2.5 y 3: High

DATA SOURCE

ANNUAL GOAL	
MEASURE UNIT	Absolut value

DETAILS OF RESPONSIBLE FOR INFORMATION

Goal's Responsible name (Process, Sub-Program)	
position	
E-mail	
Responsible name for monitoring and follow-up	Environmental Education Professional Planning and Management Group
position	Environmental Education Professional Planning and Management Group - Subdirectorate of the protected Areas Management
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INDICATOR REFERENCE SHEET

Code: DE_FO_0
Version: 3
In force since dd/mm/yy:

Ministerio de Ambiente
y Desarrollo Sostenible
República de Colombia

PARQUES NACIONALES NATURALES

Integrated quality management system		Institutional Action Plan	

PROCESS	QUALITY OBJECTIVE	SUBPROGRAM	
Development and management of the NPS	Continuous improvement of conservation processes, promotion and protection of natural and cultural heritage of the areas of the National Park System	1.2.4 Promote educational strategies that contribute to the social value of protected areas	

INDICATOR NAME	INDICATOR OBJECTIVE	INDICATOR TYPOLGY	FREQUENCY
EE process implementation Percentage of areas that are implemented, in the framework of the National Strategy for Environmental Education.	Monitor the implementation of formal and informal educational processes, following the strategic guidelines of the National Strategy Efficacy for Environmental Education NPS		Annual

METHODOLOGICAL DESCRIPTION

Design: an online survey contains 10 questions that follows and link the action lines from the National Strategy for Environmental Education for SPNN. The survey is sent to each of the parks to collect the information on the environmental education program with an annual periodicity. This information is consolidated and analyzed by the NPS Central Level.

Population: all parks t of the NPS

Environment: National Park System of Colombia

Survey structure

The survey contains questions that can collect information related to:
* Actions aimed at the social value of the protected area (Awareness)), types of activity, audiences, topics addressed, duration, number of people, and places where activities were developed.
* Actions in Environmental Interpretation: interpretive services offered, audiences, topics, duration, number of people.
* Volunteer Ranger Service: contributions to the management of the Park.
* Participatory Education (Educational activities in support of other strategic management lines): types of activity, type of audience, and number of connected persons.
* Participation in the Regional Committee of Environmental education
* Establishment of Alliances and agreements for the implementation of the National Strategy for EE or EE Local Plan.
* Formulation of EE Local Action Plan
* Participation in interagency coordination spaces.
* Systematization of educational experiences: an analysis of the information is performed by the areas to determine:
- Frequency of awareness activities including voluntary rangers program

DESCRIPTION OF VARIABLES FOR CALCULATING THE INDICATOR	MATHEMATICAL FORMULA FOR THE INDICATOR	COVERAGE OR SCALE	
A	Areas implementing environmental educational activities	A/56 * 100	Protected Area

		REFERENCE LINE	
		BASELINE	NA
		CRITICAL LEVEL	Less than 50%
		ACCEPTABLE LEVEL	50%
		SATISFACTORY LEVEL	100%

DATA SOURCE	MEANS OF VERIFICATION:	ANNUAL GOAL	
		MANAGEMENT RANKS	
			ND

	MEASURE UNIT	
		Percentage

DETAILS OF RESPONSIBLE FOR INFORMATION		
Goal's Responsible name (Process, Sub-Program)		
position		
E-mail		
Responsible name for monitoring and follow-up	Environmental Education Professional. Planning and Management Group - Subdirectorate of the protected Areas Management	
position	Environmental Education Professional. Planning and Management Group - Subdirectorate of the protected Areas Management	
E-mail	eduambiental@parquesnacionales.gov.co	

Appendix VI - National Parks System Involved in the survey

NATIONAL PARKS OF COLOMBIA
INVOLVED IN THE SURVEY
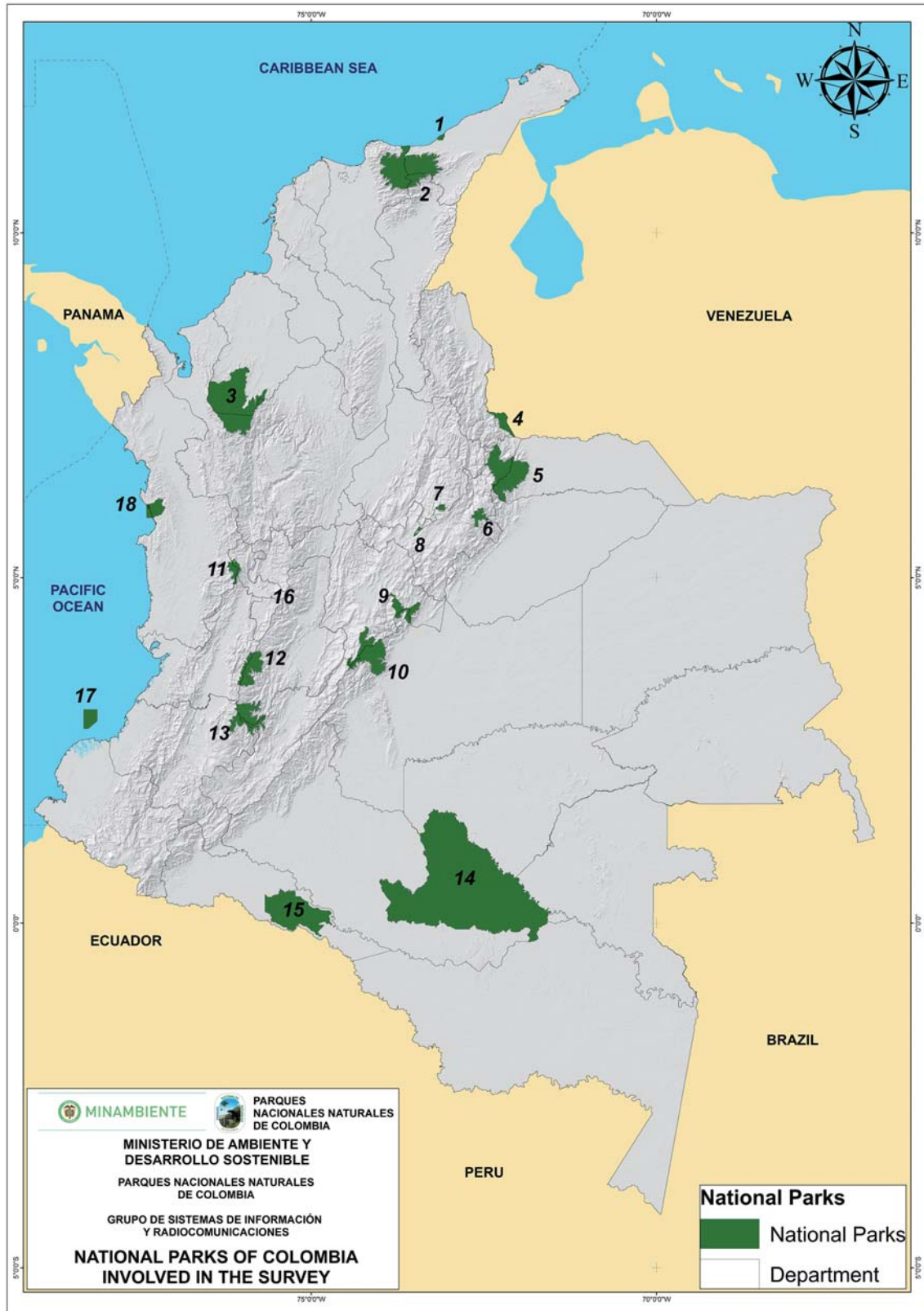
Appendix VII – Article I (Chapter I) Published in Ocean & Coastal Management

Impact Factor: **1.748**

5-Year Impact Factor: **2.000**

Integrating environmental education in marine protected areas management in Colombia

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ARTICLE INFO

ABSTRACT

Environmental Education (EE) is a key component in any marine protected area management. However, its visibility and action plans are still poorly developed and structured as a clear element in management procedures. The objective of this study is to contribute with a methodological route that integrates EE to the existing model of management planning and strategies, taking the Colombian National Natural Parks System as a case study. The creation of the route is proposed as a participatory research with different stakeholders in order to respond to the specific conservation needs and goals for the National Parks System. The EE national diagnosis has shown that its integration within the parks management structure is a first priority need, being a converging result on the two case studies on National Parks from the Pacific Coast of Colombia. The diagnosis also demonstrates that communication, participation, training and evaluation have to be reinforced, linking the community and stakeholders involved in the park management to the whole EE process. The proposed methodology route has been agreed upon by the National Parks staff and incorporates advice and recommendations from different stakeholders, in order to better include the park users. This step will help us to advance toward sustainable management in marine and coastal protected areas elsewhere, taking into account not only the biological but also the social–cultural prism. The main challenges in the management and conservation of coastal and marine ecosystems today are discussed.

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1. Introduction

Coastal areas undergo a heavy anthropogenic pressure on biodiversity, complexity and key species biomass (Abdulla et al., 2008; Dayton et al., 2005; Jackson et al., 2001; Levinton, 2011; Rossi, 2013). The aim of Marine Protected Areas (MPAs) is essentially to relieve vulnerable habitats and species from such pressures. However, frequently, the conservation plans and recommendations do not reach stakeholders, politicians and especially end term users. The vast majority of the conservation work and practice remains obscure in the form of scientific papers, gray literature or technical reports and protocols, creating frustration on both sides: the people who make the rules and the people who have to apply such rules (Bearzi, 2007).

Nowadays, participative Environmental Education (EE) is an approach that is becoming increasingly more popular among conservation specialists and ecosystem managers faced with this information problem (Brewer, 2006; Fien et al., 2001; Hayes, 2009; Kamphuis, 2011; Salm et al., 2000). Recent works state the necessity to determine the goals of conservation, education and management, from an integrative perspective, in order to facilitate the sustainable use and protection of natural habitats, including not only the ecological and biological aspects but also social and cultural elements, with a view to having effective and inclusive management of protected areas (Bearzi, 2007; Hesselink et al., 2007; Pollnac et al., 2010; Sherrow, 2010).

Although considerable progress has been made in the field of community-based management, one of the major difficulties is to move from a passive community participation (e.g. information and consultative processes) to an active community involvement (two way communication, decision making, action for change). In this active involvement people participates in the experimentation and learning process, being the participation seen as one of the main rights of the community and not only a way to achieve project goals

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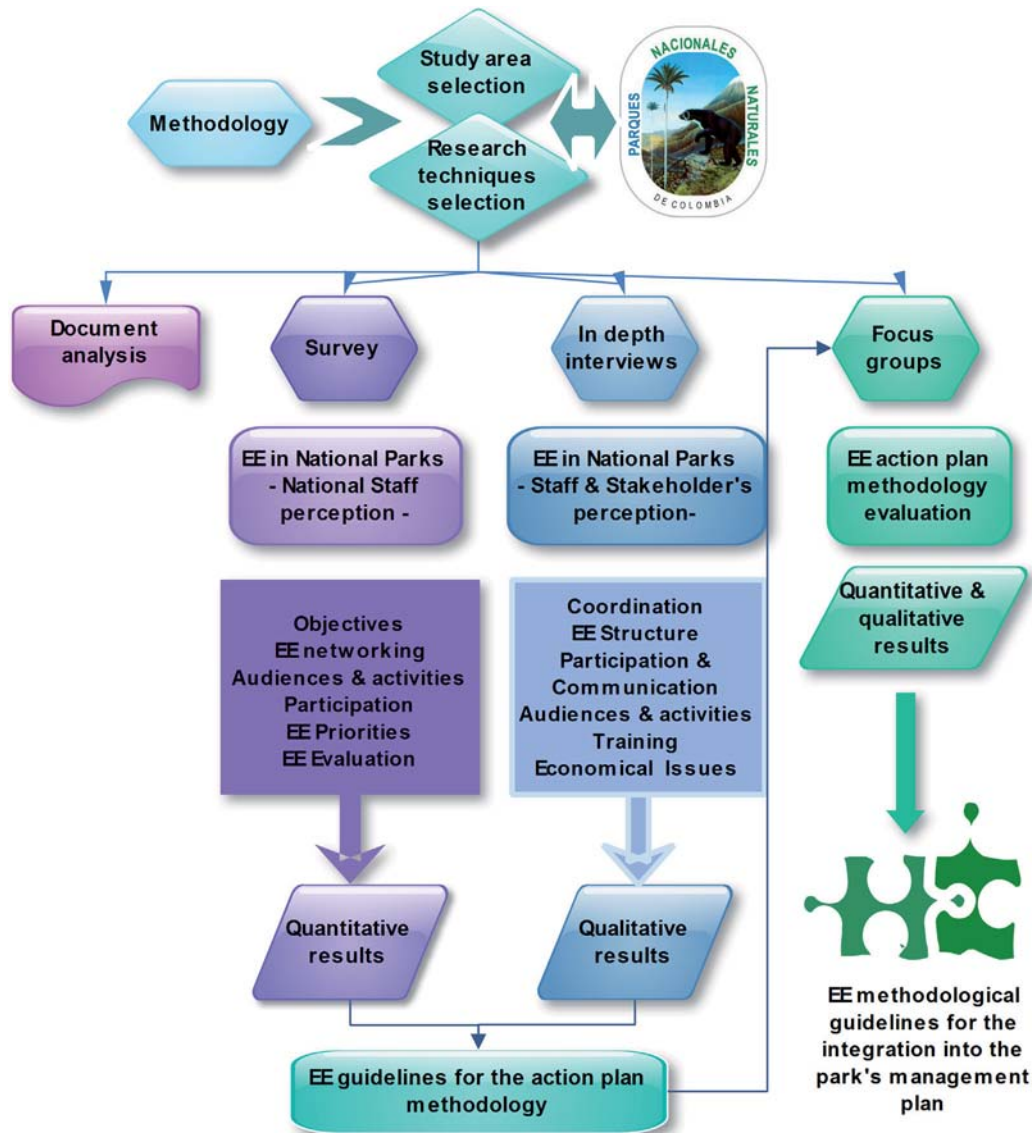
Fig. 1. Scheme of quantitative and qualitative methodology used in the research.

(Cornwall, 2008). The local and external people need something more than laws and policies (top down model), built by institutions (Kearney et al., 2007), but an approach that has to be bottom-up. In fact, it has been demonstrated that local communities have an essential role in this aspect, and a positive effect on the co-management of MPAs (Dahl, 1997; Gutierrez et al., 2011; Kearney et al., 2007; Mills et al., 2011). To achieve better management, the proper transmission of the educational approach has to adapt to the different communities in which they will be developed, and not the other way round; In this context, one of the major difficulties to achieve this active participation and community involvement, is the lack of well-defined objectives, especially in the methodology, systematization and evaluation of the educational programs and their contribution to conservation goals (Kuhar et al., 2010).

The present research seeks a change instead of reaching theoretical conclusions. The problem is closing the gap between pure theory and practice, where such conclusions are focused on applications that would enable reality to be transformed. It also seeks a continuous improvement in quality and must be based on shared criteria and a comparative analysis of different points of view (Benayas et al., 2003).

In order to gain a better understanding of the tools that have to be implemented to pass from a theoretical to a more practical approach in the transfer of information from scientists/managers to users, we accomplished in the present study three different targets: 1) Perform a diagnosis of the EE program not only in our study area but also to the whole National Parks System. 2) Establish the main rules of EE in MPAs with solid participation of Park staff members and stakeholders and 3) Integrate these rules into the Park's management plan with a focus on quality and long term practice alongside prioritized social actors. In order to do this, a first national survey was carried out including 20 National Parks (44% of the National Park's network) with a special focus on Gorgona National Park and Utria National Park, both located in the Eco-region of the Choco Biogeographic area (Mittermeier et al., 1998; Olson and Dinerstein, 1998). They were selected because of their biological value, location, socioeconomic and political situation, similar protected area dimensions, reference point for diverse researches in coastal and marine habitats and time within the National Parks System (UAESPNN, 2008a,b).

It is expected that the EE plan will contribute to integrate those stakeholders with major implications in the protected areas, reducing threats and anthropogenic pressures, and improve the

state of conservation of MPAs, from a perspective of EE as a process and long-term action. The final aim of this paper is to provide clear EE tools, which can be transferred from scientific and technical managers of MPAs to different social groups everywhere, with a view to the methodology being potentially extrapolated to other areas worldwide.

2. Material and methods

To carry out the present research, the study was conducted using a quantitative and qualitative methodology (Fig. 1) in order to obtain a general and detailed picture of the complexity of the process studied. The combination of both methodologies allows us to obtain a more solid basis to work at a national and local level during the study, being able to contextualize the research at the different management levels we were working with. For the diagnostic study, we took into account the viability of working together with these two kinds of methodologies, which is acceptable for a diagnostic study (Benayas et al., 2003; Dillon and Wals, 2006; Meyers, 2006; Russell, 2006; Sauvè, 2000).

The quantitative methodology consisted of questionnaires exploring the perceptions of educators related to the EE program of the National Parks System.

The questionnaire was delivered by e-mail to all EE teams in the National Parks System during the second trimester of 2011, with the exception of Gorgona and Utria National Parks, which were delivered in hard copy during the fieldwork.

The structure of the survey included 7 sections divided into the following topics: EE objectives, institutional coordination and support, audiences and activities, communication and participation, priorities in EE, evaluation process, and personal information. The questionnaire was validated at the central office of the Park system, in order to detect failures and adjust the instrument before sending the document to the educators. They were asked to fill in the questionnaire on the basis of available data and their own experience of the management tasks of the park.

The qualitative data was obtained by means of 15 semi-structured interviews with staff members from the central and local offices including Gorgona and Utria National Parks. The interviews also integrated local stakeholders and environmental NGOs that work in the study area and also at a national level. Atlas.ti 6.2.27 supported all qualitative data analysis, allowing us to use the same categories used in the interviews and surveys (For Supplementary material: Refer to : http://doi.pangaea.de/10.1594/PANGAEA.829071?format=htm).

In addition to interviews, two focus groups were carried out with representatives of local, regional and national management offices of the Park's system, being composed of homogenous groups of people. The common characteristics in both groups were their position at the Institution (regional environmental educator coordinator or local environmental educator) that is relevant to the topic of the study (Krueger and King, 1998). In order to evaluate the route for EE local action plans, focus groups give us information about perceptions, feelings, and attitudes of the new proposal and its application viability. The characteristics of a typical smaller focus group project are that the sample can be taken from two to four groups, being the recruitment of participants easily available (i.e. doesn't require a complex analysis or fully transcription, and produces a brief report with conclusions (Morgan and Scannell, 1998)). With this technique, we can be able to see reality from a bottom up point of view, and not from the top down as usual. The use of this technique facilitates the identification of project strengths, weaknesses, and the generation of new ideas and recommendations (Krueger, 1988), regarding the methodological route to guide the educators in the local sphere to construct the local EE action plans.

The first focus group was composed of local staff members from 10 national parks, with a total of 11 participants, five of which belonging to the MPAs. The EE national committee constituted the second panel, with a total of 10 participants from all regions of the Park System is divided.

The questions that guided the focus groups were:

1. What do you think about the actual structure of the proposed methodology?
2. Do you think this methodology is needed and will help through the process of elaboration of local EE action plans?
3. Which changes would you propose in order to make it practical for its use? (You can change boxes order or rephrase them)
4. Would you include or delete any box from this proposal?

At the end of the session, we delivered a participative evaluation to record the group perception about the session during the discussion and the preliminaries results.

3. Results

The questionnaires were delivered to a total of 45 National Parks that have an EE program running (80% of National Parks) and also to the UAESPNN central office, where a total of 46 surveys were registered. Of the total gathered, 20 surveys (43%) were fully completed, and were used as the sample size for the analysis (Fig. 2). The 26 remaining surveys (56%) were not included in the analysis because answers were not complete or were inconsistent.

3.1. Objectives

The results from the survey in Table 1 indicate that the objectives of the EE programs are well defined and follow the SMART categories: specific, measurable, realistic and timely. Nevertheless, the condition attainable presents a major disagreement within the survey, in over 50% of the respondents.

In the qualitative analysis, the results show that the objectives are too generalist and that economic resources are not sufficient in order to attain and achieve the proposed goals.

…*"I think there should be more clarity: a general objective and clearer specific objectives. What I perceive in general is that there are many loose wheels; there is a need for projection, a scheme with a large target or goal with objectives to fulfill. Obviously, if you're not clear you cannot project anything; methods, stakeholders, anything." (NGO director)*

…*"While environmental education in parks is not appreciated in its true dimension and there are not sufficient resources to meet objectives, the results will always be occasional and linked to the individual efforts of the staff members." (Park staff member)*

…*"There are not enough economic resources from my point of view." (Park staff member)*

On the other hand there are some cases in which EE has been working in coordination with the local staff and management plan.

…*"The objectives of EE in our protected area are developed on the basis of the problems encountered by the park annually. In that sense, the park develops a specific required educational action in those communities that demand special environmental actions." (Park staff member)*

…*"EE objectives are consistent and have been developed with team members taking into account the management plan, conservation*

Fig. 2. Geographic distribution of the Natural National Parks involved in the survey including the study area. (1) Flamencos, (2) Sierra Nevada de Santa Marta, (3) Paramillo, (4) Tama, (5) Cocuy, (6) Pisba, (7) Guanetá − Alto Fragua, (8) Iguaque, (9) Chingaza, (10) Sumapaz, (11) Tatama, (12) Las Hermosas, (13) Nevado del Huila, (14) Serranía de Chiribiquete, (15) La Paya, (16) Otún − Quimbaya. Detail Area 1 − Utria and Detail Area 2 − Gorgona.

targets and projects that fall under different strategic lines." (Park
staff member)

3.2. Coordination

The results from the survey show that from a local perspective,
there is a general consensus regarding knowledge of the park's
management plans and its alignment with the EE program, but not
regarding conservation targets. The constant claim by the

participants is that financial resources are very scarce to achieve the
objectives and the goals proposed.

*"EE in Gorgona National Park is not coordinated with the different
institutional management offices: local, regional, central."* (Park
Staff member)

*"Now, in Gorgona National Park, whale watching can only be
carried out by tourist concession holders, but there is no commu-
nication with researchers, and what is happening is there is a leak
of resources from both parts."* (NGO director)

Table 1
Percentages results from the National Parks' survey completed by the Environmental Education (EE) staff members ($n = 20$) according to objectives, institutional coordination and assessment.

	% Agree	% Disagree
Objectives		
Understandable	100	0
Clear and specific	90	10
Realistic	85	15
Time defined	80	20
Consistent	80	20
Measurable	75	25
Written plan	75	25
Attainable (availability of resources and capabilities)	45	55
Institutional coordination and support		
Management plan knowledge	95	5
EE alignment with management plan	90	10
EE institutional transversality	75	25
EE transversality in management plans	70	30
Institutional networking	45	55
Human resources	35	65
EE alignment with conservation objectives	30	70
Similar Parks management plan knowledge	30	70
Economic resources	15	85
Assessment		
EE improves conservation	90	10
EE achieves its objectives	70	30
Existing EE program	55	45
EE objectives are known by the staff	55	45
EE is systematic and consistent	55	45
Drafting of EE Annual Report	45	55
Reflection process	45	55
Feedback	40	60
Continuous assessment and monitoring	30	70
Existence of indicators	20	80

"When we say that the EE is not coordinated it's because we don't receive any support or alignment from regional or national offices." (Park staff member)

"We have resources such as radios, documentation centers, staff exchanges with other parks, which facilitate a better approach to the different works they implement. However, there is a lack of a flow of communication regarding the information and more alignments that hinder us from doing a better job." (Park staff member)

3.3. Assessment

According to the participants, it is evident that the work carried out through EE helps to improve the state of the conservation targets, and the objectives set through the EE program are achieved. Yet, when they are asked about the existence of an established EE program, previous knowledge and awareness of the EE objectives, and activity coherence, almost 50% of participants disagree on these statements.

Taking a look at the evaluation process, the data indicates a gap in the systematization practice, such as the activities of recording information, annual reports and reflections on the educational activity.

This gap increases when we delve further into the evaluation techniques. The surveyors indicated that feedback on the activities monitoring is not frequent in more than 60% of the parks examined. These indicators are the most worrying aspect of evaluation due to their limited use in almost 80% of the parks surveyed. The remaining 20% should be reviewed because most of the indicators are focused on the number of participants/assistants, but are not focused on the educational impact.

3.4. Audiences, participation and communication

As shown in Table 2, the most frequent activities registered that fall under all kinds of audiences are communication and dissemination of the National Park's mission and conservation target values, followed by conferences, workshops and inter-institutional work.

One of the most important activities carried out is the participative formulation of projects and also community projects. However, their design and construction hardly reach 25% of the parks surveyed.

Participation and communication are essential in EE and management decision-making. The survey demonstrates that the majority of participants feel that neither internal nor external participation in the park system takes place. As regards the relevance of the individual opinion, the perceptions are divided, indicating that this depends very much on the way in which the park's team functions, and not on the entire sample and the UAESPNN. However, team opinion prevails rather than individual.

3.5. Priorities in EE

The main priority identified by the educators is the integration of EE into the management plans and the development of educational programs that are consistent with the local environmental problems (Fig. 3). In addition to this demand, the environmental literacy of educators and participation problems are the other criteria that require more attention in order to work within the subprogram of EE within the UAESPNN. Furthermore, methodology design, identification of stakeholders, planning, positioning and socialization of the park legislation are considered important matters in order to succeed, but not on such a wide scale, and with a more individualized and unique character for each park.

3.6. Focus groups

According to the survey, interviews, and workshop results, we identified the key points in order to systematize the EE process and integrate it with the management plan and social actors. To accomplish this target, we developed an EE methodological route to guide the development of EE local action plans in the National Parks in Colombia. This initial proposal was discussed with specialists and EE staff members at the central management office, in

Table 2
Percentages from the National Parks survey completed by the Environmental Education (EE) staff members ($n = 20$) according to audiences, activities, and participation and communication criteria.

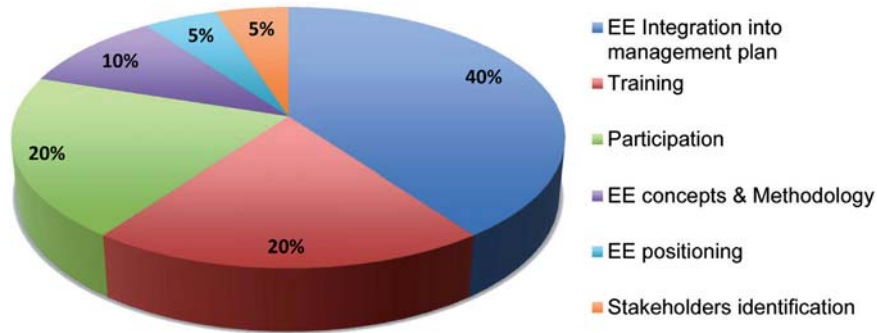|	Always	Frequent	Infrequent	Never
Audiences and activities				
Academic Institutions	26	63	11	0
Rural communities	22	61	11	6
Visitors	26	42	26	5
Institutional actors	16	53	32	0
Overlapping areas	11	47	11	32
Indigenous communities	19	6	25	50
General public	6	22	72	0
Black communities	16	5	21	58
Specialized audience	0	17	83	0
Participation & communication				
Internal participation	0	35	65	0
External participation	0	30	65	5
My opinion matters	0	45	50	5
My team opinion matters	30	45	25	0
Communication is key for EE	75	25	0	0
Training needs	85	5	5	5
Community participation	15	60	25	0

Fig. 3. Results of first line Environmental Education (EE) priorities identified in the survey ($n = 20$).

order to adjust the application to their structure and needs, before working with focus groups.

In both focus groups, all participants agreed that the proposal fulfill the need of an integrated methodology of EE within the park's management plans and its management model, being the methodology approved in this last evaluation process, except in cases that the management model has another structure because of local issues as happens in the Amazonian region.

The panels also agreed that this tool will facilitate the process of the elaboration of local plans, even though in some cases, they will have to adapt some guidelines to their local situation, and let the general structure serve as a flexible and dynamic guideline but not a fixed one.

From the original proposal, the structure remained the same, but some boxes were rephrased from the original version, new highlights were included and other boxes changed their order within the structure.

As a final result, we found that both focus groups arrived to the same conclusions and modifications of the original proposal, which facilitates the process of the final version of the EE methodology.

A more detailed focus on the regional and local context was suggested, especially in those cases where indigenous and black communities were overlapping in the protected areas.

The monitoring and evaluation section was changed considerably and improved, and all participants supported the incorporation of a dissemination of results section, absent on the management-planning model. All the participants agreed that recommendations should be included in the new version. Initially, the methodological route was being developed to respond to MPAs needs, especially in the study area. However, during the research and because of the active participation of the EE staff, more parks were willing to be included in the initiative in order to establish this method as a national proposal and an essential component to be included in the EE Strategy of the National Parks of Colombia (Fig. 4).

4. Discussion

The present results clearly support the establishment of a standardized methodology path to improve EE within the National Parks System. There is a consensus that this target has a first priority interest in order to promote systematization of the process and its inclusion in the management plan and operational structure, not only to MPAs as proposed initially but also to the National Parks System, contributing to conservational targets and management effectiveness (Lundquist and Granek, 2005).

4.1. EE objectives and assessment

The survey data indicates that a significant majority of participants found that the objectives were adequately clear, concrete, and attainable. However, almost 50% admitted that they did not have a written EE local plan, and objectives were more a statement of intent without a logical framework. Defining the objectives is one of the most important steps for managing and planning EE information transfer in MPAs. In this study, EE staff recognized that a minimal training was required in order to develop these tasks and highlighted the scarce communication between different levels of management, leading to unstructured and misaligned EE local action plans with conservation objectives.

One possible explanation for the absence of well-defined EE objectives and measures to evaluate them in the park system lies in the fact that management plans are outdated, and often have wide-ranging objectives that make it difficult to shape EE actions into specific goals, a situation common in other studies (Abdulla et al., 2008; Dahl-Tacconi, 2005).

On the other hand, measures allowing us to explain the achieved results in terms of social impact and a better state of the conservation objectives do not exist, except limited indicators which do not go beyond simple data (number of workshops held, brochures delivered, number of assistants and visitors, etc.). Impact indicators such as change in knowledge, attitude, networking, and participation quality are not found in any of the parks studied, and it is an area that requires further research. This is a crucial field to explore in order to evaluate the effectiveness of the work done, and to support management decisions.

4.2. Audiences and activities

We found low consistency in the EE process among the goals proposed, the activities set and the way in which results and impacts are measured. Specialists, stakeholders and Park staff members, see EE as a long-term process that seeks the comprehension and responsible action of the community in order to preserve our natural and cultural heritage within the framework of sustainability (Fien et al., 2001; UNESCO, 1979). However, analyzing our results, the most common actions are short-term events such as conferences, environmental talks, inter-institutional meetings and environmental interpretation. True environmental literacy goes beyond awareness and rote learning but involves critical thinking, integrating principles, and using acquired skills to turn knowledge into action (Bickford et al., 2012).

Most of the activities are addressed to formal education tools such as school environmental programs (Kuhar et al., 2010; Muñoz-Santos and Benayas, 2012), probably because these comprise an audience that is already established and structured (Lundquist and Granek, 2005; Rice, 2011), where the implementation of actions proves to be less difficult than with other social actors (Zorrilla-Pujana, 2008). Conservation biologist, need to be much more strongly proactive in their approach to communicating, in formal educational settings as well as in other
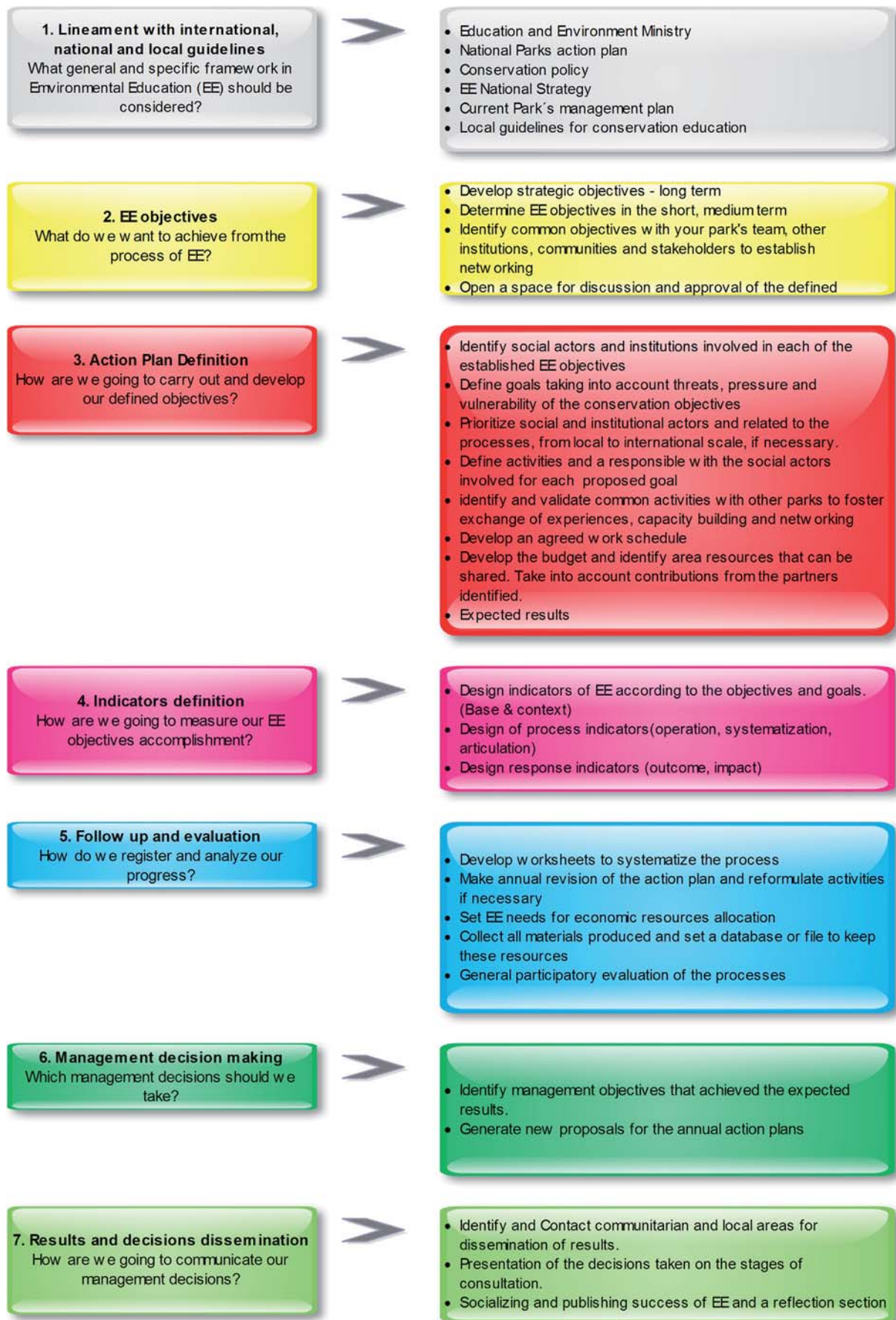
1. Lineament with international, national and local guidelines
What general and specific framework in Environmental Education (EE) should be considered?

- Education and Environment Ministry
- National Parks action plan
- Conservation policy
- EE National Strategy
- Current Park´s management plan
- Local guidelines for conservation education

2. EE objectives
What do we want to achieve from the process of EE?

- Develop strategic objectives - long term
- Determine EE objectives in the short, medium term
- Identify common objectives with your park's team, other institutions, communities and stakeholders to establish networking
- Open a space for discussion and approval of the defined

3. Action Plan Definition
How are we going to carry out and develop our defined objectives?

- Identify social actors and institutions involved in each of the established EE objectives
- Define goals taking into account threats, pressure and vulnerability of the conservation objectives
- Prioritize social and institutional actors and related to the processes, from local to international scale, if necessary.
- Define activities and a responsible with the social actors involved for each proposed goal
- identify and validate common activities with other parks to foster exchange of experiences, capacity building and networking
- Develop an agreed work schedule
- Develop the budget and identify area resources that can be shared. Take into account contributions from the partners identified.
- Expected results

4. Indicators definition
How are we going to measure our EE objectives accomplishment?

- Design indicators of EE according to the objectives and goals. (Base & context)
- Design of process indicators(operation, systematization, articulation)
- Design response indicators (outcome, impact)

5. Follow up and evaluation
How do we register and analyze our progress?

- Develop worksheets to systematize the process
- Make annual revision of the action plan and reformulate activities if necessary
- Set EE needs for economic resources allocation
- Collect all materials produced and set a database or file to keep these resources
- General participatory evaluation of the processes

6. Management decision making
Which management decisions should we take?

- Identify management objectives that achieved the expected results.
- Generate new proposals for the annual action plans

7. Results and decisions dissemination
How are we going to communicate our management decisions?

- Identify and Contact communitarian and local areas for dissemination of results.
- Presentation of the decisions taken on the stages of consultation.
- Socializing and publishing success of EE and a reflection section

Fig. 4. Methodological route contents for the elaboration of EE local action plans in the National Parks of Colombia.

venues and via alternative methods to a diversity of audiences (Bickford et al., 2012).

Another limitation found is the deficient condition of the relations between National Parks and local stakeholders, which hinders any EE participative approach with the community, at least in the study area, leaving behind actions with a long-term impact, such as management agreements through communitarian and participative projects with the audiences prioritized by the protected area. In MPAs the role of the community is essential for the approval and monitoring of rules. In a South California MPA, the bottom-up management and EE makes the difference in the increased ratio of fish biomass because of the clear and accepted rules which were correctly transmitted from managers to users from 0.75 tons of fish ha^{-1} to 4.74 tons of fish ha^{-1} in a decade (Aburto-Oropeza et al., 2011).

EE is a crosscutting program in the management process of MPAs and the scarce resources are a common issue that appears in most of the analyzed criteria, but relevant data regarding the benefits of social issues in protected areas are not well covered in local, regional and national accounts (Leverington et al., 2010), which in that case could help to justify an increase in the budget in this multidisciplinary field. A lack of job stability for EE staff and undefined funds generate discontinuity and regression in most of the programmed activities (Zorrilla-Pujana, 2008). Although EE is recognized as a first priority for MPA management and other skills development (Dahl-Tacconi, 2005), reality reveals the contrary: the education program does not present stability in human and economic resources allowing continuity of the established processes (Kullenberg, 2010).

4.3. Coordination, communication and participation

The need to clarify the mechanism of educational conservation objectives has been demonstrated, but even more important than this is the need to break the current dynamic of environmental information transmission, which is not properly aimed at the different groups, because there is a lack of connection between managers, scientist and users in MPAs (Lundquist and Granek, 2005). Scientist and managers need to be more provocative, proactive, and purposeful in how we communicate to create an environmentally literate society that enacts decisions based on both sound science and the needs of humanity (Bickford et al., 2012).

The results indicate a low perception of institutional coordination between local, regional and national management offices by staff members, stakeholders, and some researchers. This situation is visible at different management levels, and in most cases is the result of wastage in the same institution, loss of knowledge, economical opportunities, and inexistent networking between similar parks, that share biological, social values, programs and projects within the EE strategic line. MPA networks are important not only for the conservation of biodiversity but also as a form of management (Guidetti, 2002). Communication efforts can also help to inspire new ideas for research that inform about management questions and may generate connections with other scientists outside a narrow range of expertise (Grorud-Colvert et al., 2010), but scientists actually make surprisingly few direct contributions to environmental conservation, when there is an evident necessity of a more proactive dialog between conservation scientists and practitioners when devising research priorities (Laurance et al., 2012; Primack, 2006) and the dissemination of those results to the managers and the community involved.

Despite the key role that communication and participation play in the educational process, this is still one of the most difficult tasks within the Park system in which more than 60% of respondents and interviewees perceived that participation in decision-making is infrequent and communication leaks are very common at all management scales. This situation can be explained from different standpoints: 1. The gap between the Park's local and national scope is still hard to bridge. 2. There is a poor contextualization among local realities and national alignments, and 3. The absence of a peer EE at the regional management office disrupts any communication channels in the local and national spheres. Studies demonstrate that MPAs are effective when information is properly transferred and participation of the different users is solid (Pace et al., 2010).

It is not true that local people have a negative reaction toward protected areas. It has been demonstrated that good information and a clear rule statement in which there is direct community participation has a positive effect on final users (Aburto-Oropeza et al., 2011; Triguero-Mas et al., 2009). The lack of effective spaces for communication and participation has led to a negative perception among the team members, stakeholders, researchers and the community who are involved either directly or indirectly with the park's management. Because of this condition, many conservation initiatives are isolated from the park's initiatives, wasting synergies that could be beneficial for the MPA management.

5. Conclusions

The present study demonstrates the urgent need to establish a common methodology for the development and implementation of EE local action plans in National Parks. EE is a multidisciplinary component that works with humanity and its relationship to the environment, linking both natural and social sciences, in order to achieve conservation goals (Bickford et al., 2012). There is a need for cooperation at an inter-disciplinary and inter-sectoral level, that requires exchanges between the scientific disciplines as well as a cultural exchange (Kullenberg, 2000). The new proposed methodology hopes that EE will play a catalyst role between the community and MPA management.

It is necessary a more active, open and conciliatory attitude in order to promote stakeholders' participation in and contribution to MPA conservation. For this reason, EE must focus on those audiences that generate the strongest pressure on the area.

EE should establish itself as a crosscutting program integrated in the management process, in order to contribute to improving the state of the protected ecosystem, enhancing a better protection of natural assets and facilitating the connection between various fields and sectors in the community to implement an effective EE (Kobori, 2009). But if EE limits itself to political and theoretical papers, scholar activities, the celebration of environment day and environmental conferences, it will be difficult to achieve long-term conservation objectives.

In order to support and strengthen the EE program within the management of National Parks System, it is essential that the human resources structure is maintained at the local, regional and national level with an EE responsible at all management scales or disruptions and communication flow will occur, interrupting ongoing processes.

After accepting the proposed route for EE local action plans, and validated at the study area, Colombia National Parks approved its inclusion in the National EE strategy and remarked on its consistency and the integrated perspective with the management and conservation objectives, involving the local community and prioritized stakeholders from the start. Utria and Gorgona National Parks are constructing the EE action plan following this method as other parks from the network. We now have a real opportunity to implement ecosystem-based management in MPAs, but the transmission of essential values and roles in MPAs has to be clearer (Rice, 2011). The results determine that it is imperative to work on the

conscious and assertive establishment of objectives for both the MPA management plan and EE programs, as one of the most important steps for the planning, and effectiveness of EE in the park system (Lundquist and Granek, 2005).

Acknowledgments

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Photographic Appendix

Parque Nacional Natural Gorgona
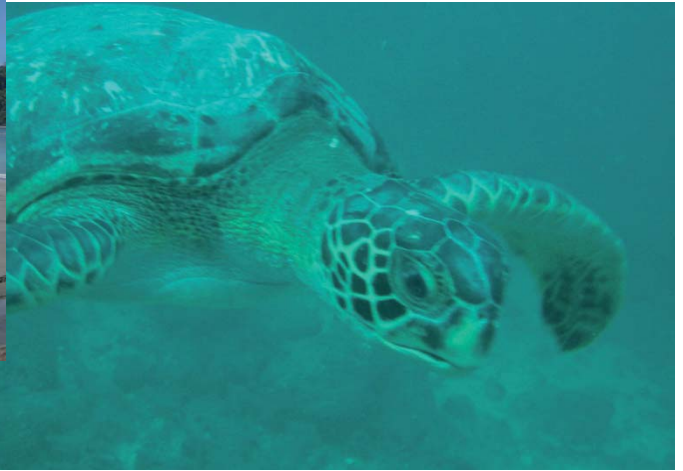
El PNN de Gorgona hace parte del Corredor Marino del Pacífico Este Tropical, una iniciativa de los gobiernos con Colombia, Ecuador, Costa Rica y Panamá, que busca fortalecer el manejo y la conservación de la biodiversidad y los recursos y las zonas costeras de influencia, haciendo énfasis en las especies endémicas, emblemáticas y/o en peligro de extinción o que tienen una importancia ecológica y económica relevante para esta región geográfica.

Actualmente Gorgona es habitada únicamente por personas que desarrollan actividades relacionadas con el Parque Nacional entre ellos los funcionarios de la Unidad de Parques, privados que prestan los servicios ecoturísticos, miembros de la Policía y de manera temporal por Guardacostas, Guardaparques voluntarios, Investigadores y Visitantes


La isla prisión contó con tres comedores diseñados para recibir 500 personas, sin embargo, durante ciertas épocas alcanzaron las 750 personas. Estos espacios también cumplieron la función de aulas de clase.

GORGONA

Grupos de trabajo con el equipo de planeación de manejo del Parque Nacional Natural Gorgona para determinar puntos de articulación y objetivos comunes con el programa de Educación Ambiental.
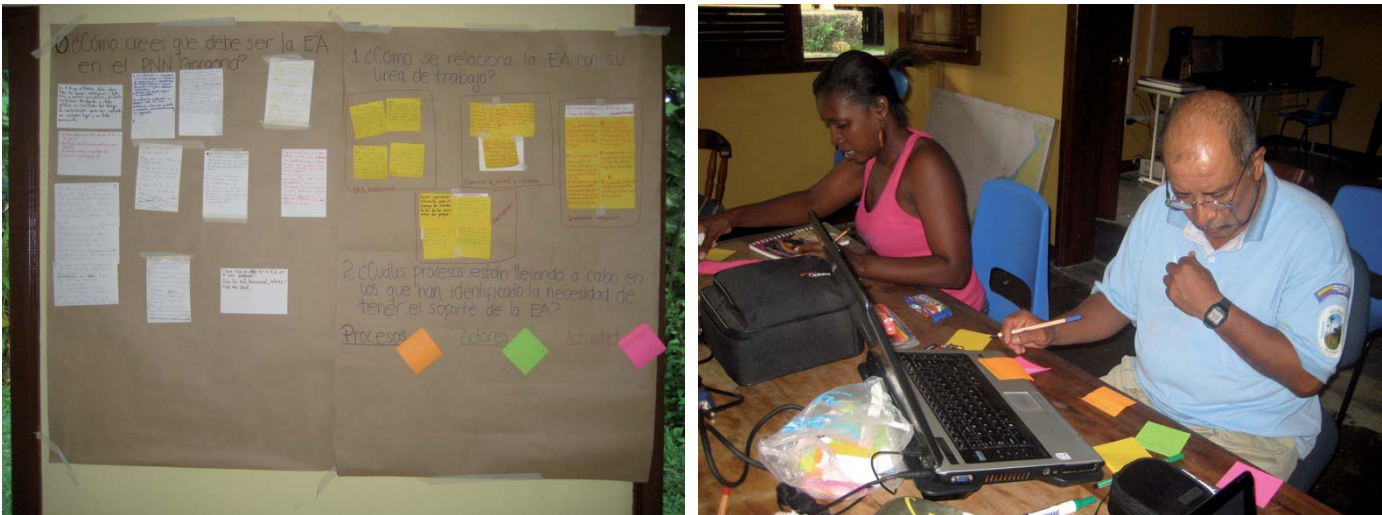
Trabajo específico con el equipo de Educación ambiental del Parque Nacional Natural Gorgona para definir objetivos de Educación Ambiental local enmarcados en la Estrategia Nacional de Educación Ambiental
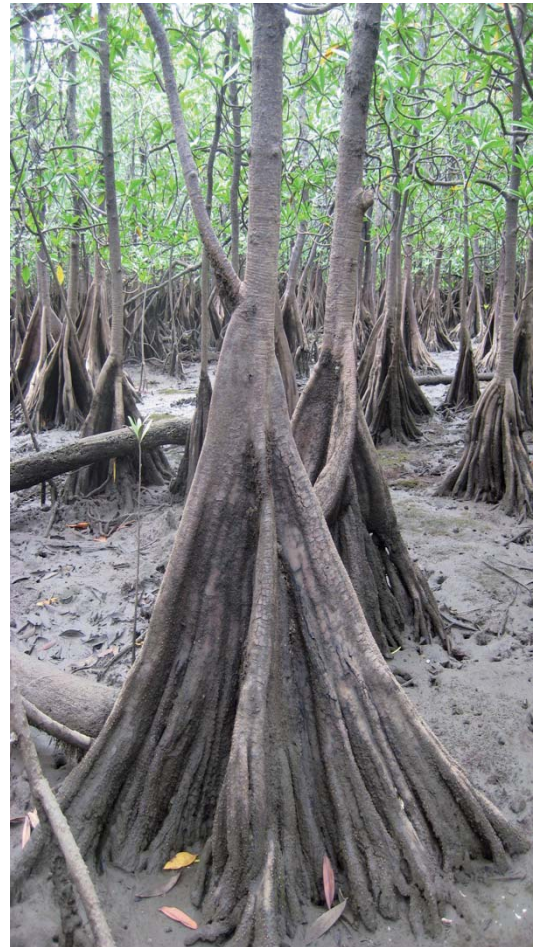
Parque Nacional Natural Ensenada de Utría

En pocos lugares del mundo confluyen e interactúan tan íntimamente algunos de los ecosistemas más diversos y productivos -arrecifes coralinos, manglares, litorales rocosos y la selva húmeda tropical- como ocurre en el PNN Utría.

La mayor parte del territorio del área protegida (80%) se encuentra traslapado con tres resguardos indígenas de la etnia Embera, los cuales están legítimamente reconocidos. En la zona de influencia del parque se ubican las comunidades negras de Bahía Solano y Nuquí. Estas comunidades desarrollan actividades de agricultura de subsistencia y pesca artesanal tanto fluvial como marítima. La pesca fluvial es muy común en el área y en mayor medida entre los indígenas, mientras que la pesca marina es realizada en mayor medida por las comunidades negras. De esta forma
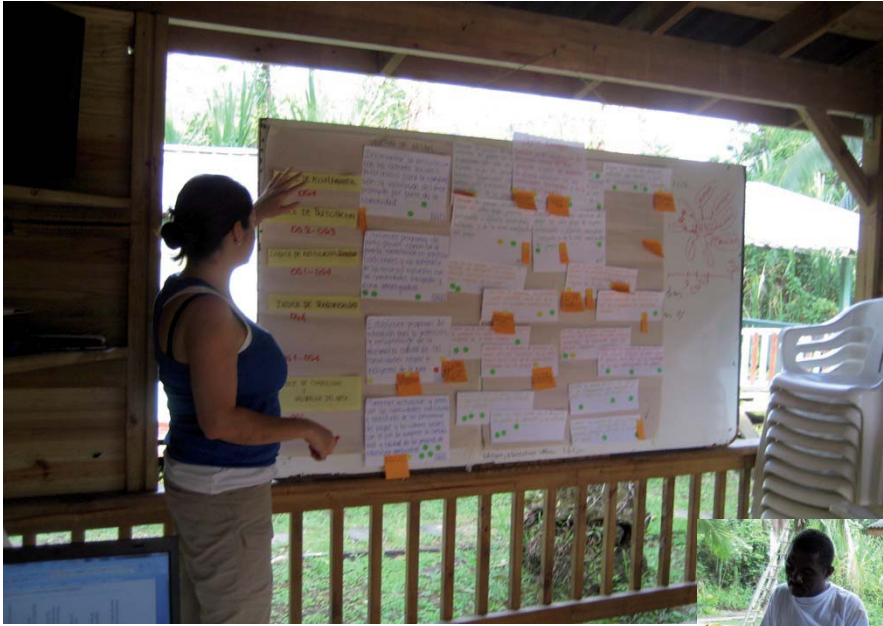
Presentación de la investigación a la comunidad del corregimiento del Valle – Límite PNN Utría

Talleres de trabajo con el equipo de planeación de Manejo del Parque Nacional Natural Ensenada de Utría para determinar puntos de articulación y objetivos comunes con el programa de Educación Ambiental

Proceso de definición de objetivos de Educación Ambiental y presentación de indicadores en el Parque Nacional Natural Ensenada de Utría

Encuentro Nacional de Educación Ambiental

Presentación y evaluación de la ruta metodológica para la elaboración de los planes de Educación ambiental Local – Julio 2011
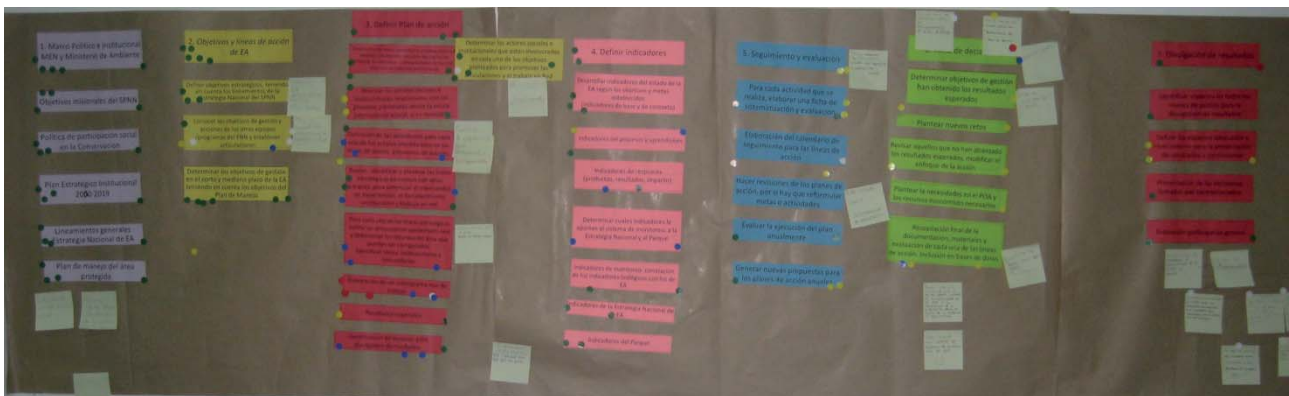

Grupos Focales para la evaluación de la Ruta metodológica, representada por el Comité Nacional de Educación Ambiental y Representación local de Educadores Ambientales Parques Nacionales

Representación de Educadores de PNN Locales

Comité Nacional de Educación Ambiental de PNN

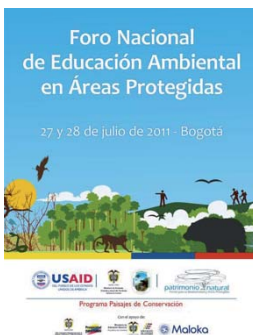# Primer Foro Nacional de Educación Ambiental
Presentación Resultados Iniciales y Mesa temática de Evaluación y Gestión ambiental – Julio 2011

Dinamización de la Mesa temática de Evaluación en educación ambiental con énfasis en áreas protegidas.

Presentación de Resultados de la primera fase en el Primer Foro Nacional de Educación Ambiental en Áreas protegidas.

Encuentro Nacional de Educación Ambiental
Presentación de resultados finales y propuesta de indicadores
Islas del Rosario, Agosto 2012

Presentación de resultados y propuesta de indicadores

Taller práctico de la propuesta de indicadores de educación ambiental aplicados a la gestión de áreas protegidas