



# Design of a Visitor Impact Management System For SCUBA diving areas in San Andres Island (Colombia)

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*Tourism use potential of recently declared as “Biosphere Reserve” (Sea Flower) by UNESCO includes natural attractiveness for recreational scuba diving, which practice has not still yet been regulated by environmental authorities. Diving community and environmentalists, with academic institution’s support, investigate activity’s impact among bottom communities, to propose sustainable use strategies.*

## Introduction

Visitor Impact Management (*V.I.M*) is a management methodology designed to control the expected impact due to visitors in a given environment, which integrates the *clean Production* concept to tourism industry through sustainable use goals.

The Current coral deterioration has been attributed to diverse factors, including boat anchorage and scuba diving practices. Nevertheless, true effects of scuba diving, even must be characterized to design successful management strategies not negative compromising the economic development neither coralline ecosystem health.

This is particularly important in San Andres Island recently declared as *Biosphere Reserve* “*Sea Flower*” by *UNESCO*. San Andres is a paradise for the scuba divers due to the clarity, warm temperature of its waters, its coral formations, as well as the derived publicity of being a marine protected area.

The *V.I.M* project in San Andres diving areas, was an effort made by Francisco Gallo and Alejandro Martínez students from the Environmental Sciences school at the *Universidad Tecnológica de Pereira* (U.T.P-Colombia-), The project has been carried out under direction by Jorge Ivan Ríos Ph.D(c) and it has been developed like a thesis degree project. It constitutes a new experience in Colombia, and it has been partially sponsored by the project AWARE Foundation , the island diving operators and own resources.

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## Main Objective

To develop an environmental impact management methodology for diving areas in San Andres Island (Colombia) with emphasis in the use of a mooring buoys system and contemplating variables of technical, financial, environmental, cultural and institutional type, letting: a) to safeguard the health of the coralline formations and benthic communities; and b) to promote the attractiveness for scuba diving as specialized eco-tourism.

## Obtained results

The information brought to *CORALINA* (Environmental authority in San Andres island) includes: Description and cartographic localization of the diving areas; Identification of the diving spots that require mooring buoys system; To prioritize 10 diving spots to include them in a mooring buoy system as well as an indication of their visitors carrying capacity and the methodology used to obtain it; To propose the appropriate protocol for the operation of the diving spots with mooring buoys; and to recommend strategies for protection, conservation and using the diving areas in accordance with Marine Protected Area zoning criteria. Additionally the thesis team intends to generate consciousness inside the business, and institutional environment about the importance of coral reef conservation for our future generations.

## Kind of research



The outlined scheme to carry out the project, lets to divide it on two different portions: first one, constitutes a *quantitative-descriptive* research, while to reach the remaining goals, are in frame of *Qualitative Investigation* as described by Dr. Lerma (1999) like *Investigation-Action-Participation*.

This way, field work includes an extensive series of diving operations and community consultations developed through *Semi-structured interviews*, *Social Cartography* and *Rapid Participative Diagnosis* techniques, obtaining after statistic processing, inedited information, an unquestionable contribution to current knowledge

state.

## Time Frame

Authorization of the project by environmental authority in San Andres Island, was approved by December 2000, to be begun on March 2001. The first results has been given to the community and the entities involved on December 2001, and final inform on March 2002. The results implementation will be carried out by September 2002. On September 2001, partial results were included in memories for *IX Congreso Latinoamericano y del Caribe de Ciencias del Mar Colacmar* (INVEMAR, Univ. Nacional de Colombia, y *CORALINA*).

## Current State

It has been carried out the fieldwork (including 96 dives in 27 different spots (39 sites), 32.480 datum about coral condition and direct observation of 589 *SCUBA* divers during 3.824 accumulated minutes to know coral condition, offers, demands and restrictions to recreational use. A participate and educational process has been generated with the diving community, and on December 2001 results and recommendations has been presented to diving community and *CORALINA*, including *Scuba Diving Effects On Coralline Bottoms*, *Carrying Capacity*, and *Recommended Management actions*.

## Methodology

- Localization of anchorage points, which are acknowledged by oral tradition, were recorded using *GPS* and portable sonar. Current assessment of coralline formations condition was carried out through measuring bottom composition proportion of alive coral, dead coral, alga growing and others, supporting observations on photographic record developed along customary dive paths by dive shops, used like transects. Vulnerability was studied on terms of branched species proliferation, sponges and others.
- Diver behavior and their impacts were characterized according to anchorage costumes, diving briefings, buoyancy control, contact tendency and visible damage; Visitor affluence to every dive spot were analyzed in order to establishment of a probability function of damage happening (Hazard) as a result of diving. It was searched for probable relationship between current environment condition and diver pressures to track cumulative damages.
- Following that, visitor carrying capacity were determined for different diving sites, through Cifuentes methodology (1999) modified by Gallo y Martinez for coralline environment.
- General management strategies were proposed and assessed using *TOW* matrixes for diverse dive sites accordingly to varied biophysical, socioeconomic or cultural conditions, use intensity and observed impacts. During such process, community participation was intensified, and was carried out a *Risk Management Analysis*, a classification and prioritization for mooring buoy installation and management at diving sites and ten initial points were selected.
- Finally acceptable protocols for diving operation among buoyed sites, were agreed.

## Financial

Total amount to execute the project, was calculated on 2001 in 11,5 thousand US dollars, from which *Project AWARE Foundation* (USA) have sponsored US\$2.132; Dive shops about US\$3.500\*; other private sources have contributed nearly US\$280 and remaining amounts form personal credits. *El Centro Regional de Información Geográfica GIS* from *FCA* brought temporarily their equipments for data analysis. Value to repeat the experience on other spots, would vary according to travel and diving expenses.

\*Note: US\$ equivalences from Colombian money, are exchange dependent among time, so values were approximated.

## Human Team

### Francisco Gallo Mejia

Senior student in Environmental Management of the Environmental Sciences faculty *FCA*, from Universidad Tecnológica de Pereira *UTP*. Besides his professional diving instructor rating, (Professional Association of Diving Instructors *PADI- USA*, 2377 logged dives, instructor of 5 specialization and *MFA*) his commitment with the coral reef environment has led him from San Andres Island to the university and get back into the sea to bring back his learning results.

### Alejandro Martinez Carvajal

Senior student in environmental management from the Universidad Tecnológica de Pereira. *PADI* divemaster candidate; returned from the experimental expedition across the Pacific Ocean *Manteña Huancaivilca* to develop his thesis degree project in coral reef environments, remarking his maritime vocational propeension.

### Jorge Iván Ríos P. Ph. D (c)

Industrial engineer from the Universidad Tecnológica de Pereira *UTP*, Doctor (candidate) in Artificial Intelligence from the Polytechnic University of Madrid. His remarkable experience modeling natural systems in Europe, makes of him the ideal director for the first experience in marine environmental quality research by the *UTP*.

The human team has been supported by professionals of diverse disciplines (including, conservation, tourism, development, economy, marine biology, statistic, and laws), *CORALINA* and partially sponsored by project AWARE.

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