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Gestión Costera y Sostenibilidad - El caso de las Playas en el Ecuador

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Abstract: The article gathers from Ecuador the contributions to the fulfillment of some goals of the Sustainable Development Goals: Goal 8 on decent work and economic growth, Goal 12 on sustainable production and consumption and Goal 14 on marine life, based on the implementation of activities and low-cost collaborative projects proposed by the Proplayas Network. These were developed from 2019 to 2022, with the participation of academic, business and civil society nodes from several Latin American countries. The final and partial results of the projects on: validation of a methodology for measuring solid waste on tourist beaches in Latin America, carried out from 2019 to 2022; determining possible changes in the ecosystems of tourist beaches without human presence, on the occasion of Covid19, from 2020 to 2021, and the ongoing citizen science project on the management of cigarette butts on tourist beaches.

Keywords: Citizen Science, Management, Beaches, Sustainable, Tourism, Solid Waste, Review, Proplayas.

Resumen: El artículo recoge desde el Ecuador los aportes al cumplimiento de algunas metas de los objetivos de desarrollo sostenible: El 8 sobre trabajo decente y crecimiento económico, el 12 sobre producción y consumo sostenibles y el 14 sobre vida marina, con base en la ejecución de actividades y proyectos colaborativos de bajo costo, propuestos por la Red Proplayas. Estos se desarrollaron desde el 2019 hasta el 2022, con la participación de nodos académicos, empresariales y de la sociedad civil, de varios países latinoamericanos. Se presentan los resultados finales y parciales de los proyectos sobre: validación de una metodología para la medición de residuos sólidos en playas turísticas de Latinoamérica, realizado del 2019 al 2022; determinar posibles cambios en los ecosistemas de playas turísticas sin presencia humana, con motivo de la Covid19, de 2020 al 2021, y el proyecto de ciencia ciudadana sobre gestión de colillas en playas turísticas en curso.

Palabras clave: Ciencia Ciudadana, Gestión, Playas, Sostenible, Turismo, Residuos Sólidos, Revisión, Proplayas.

Introduction

The Sustainable Development Goals - SDGs proposed by the United Nations - UN, despite not being legally binding for States, have been widely accepted by most of the world and constitute a framework and a guide to try to achieve a balance between the economic, social and environmental axes of the development of the human species on planet Earth.

While it is true that the current 17 SDGs and their 169 targets, approved by the UN at its 70th General Assembly in 2015, have been subject to serious criticism and observations for their overly ambitious scope, their ambiguity in some of them; likewise, for certain apparent contradictions and bias towards the interests of the so-called developed countries that maintain their hegemony and appear as advisors of sustainable development processes despite being the ones most responsible for the current situation (Gómez Gil, 2018)are still very useful for the achievement of common objectives of humanity necessary to achieve in order to survive as a dominant and responsible species on the planet.

This paper describes the contributions to the fulfillment of some of the goals of the Sustainable Development Goals, specifically: No. 8 on decent work and economic growth, No. 12 on sustainable production and consumption and No. 14 on marine life, from the point of view of the Scientific Node C49 ECUPAC, in Guayaquil, Ecuador, in its articulated work with other nodes in the region, under the coordination mechanisms proposed by the Beach Management and Certification Network - Proplayas.

These contributions have been made mainly based on the development of low-cost collaborative activities and projects (PCBC), proposed by the Proplayas Network, a network that, according to Botero and Cabrera (2019)seeks to be a platform for the exchange of knowledge, methodologies and experiences among the different sectors linked to beach management and certification in Ibero-America.

According to the same authors, the PCBC allow Nodes that have already developed a methodology to extend its range of application to the entire continent, since the 'Source Nodes', as they are called, propose a work idea to all the nodes of the Network and the groups that feel akin to the topic and have the possibility of responding to the call, respond to the work proposal. (Botero Saltaren & Cabrera Hernádez, 2019, p. 143)..

The Proplayas Network operates through the activity of scientific or academic, activist or civil society, business and public function nodes in the 16 countries that comprise it, including Ecuador, where our C49 node called ECUPAC, has been working since October 2018, in the academic field, from the Universidad Del Pacifico. Notwithstanding the above, the work carried out, which is presented in this article, has not been an isolated effort of the C49 Node but, on the contrary, is the result of the guidance and collaboration obtained from the Proplayas Network through various types of Source Nodes, from other countries, which will be indicated in each case, as appropriate.

The presentation of the contributions to the SDGs is made from 2019 to 2022, at the close of this article, in chronological order. First, the PCBC on Solid Waste on Tourist Beaches - Latin America (RSPT LATAM) is presented, its results and how it became the research program on monitoring the environmental quality

of tourist beaches in Ecuador, which is carried out at the Faculty of the Sea and Environment of the Universidad Del Pacifico; then the contributions made in the framework of the COVID19 pandemic, in 2020 and 2021, which include the contribution to a Proplayas book on tourism in times of COVID19 and a series of videos on the same topic; as well as the participation in two PCBC related to bioindicators in the beach ecosystem during beach closures. Contributions at the national level from members of the network with other institutions are included.

The PCBC involving citizen science, in execution since June 5, 2021 to date, and which refers to the management of cigarette butts on tourist beaches in Argentina, Brazil, Colombia, Ecuador and Mexico, will be addressed. Likewise, the relationship of the UPACIFICO's social linkage project, associated with the research program on environmental quality of beaches, will also be indicated in this framework.

Materials and methods

The scientific field activities described in the chapter were carried out at 18 beaches initially chosen to be studied within the framework of the PCBC on solid waste on Latin American tourist beaches. The beaches are located in the provinces of Guayas and Santa Elena, in the coastal zone of continental Ecuador, bordering the Pacific Ocean and whose location is shown in Figure 1 and Table 1 of this document.

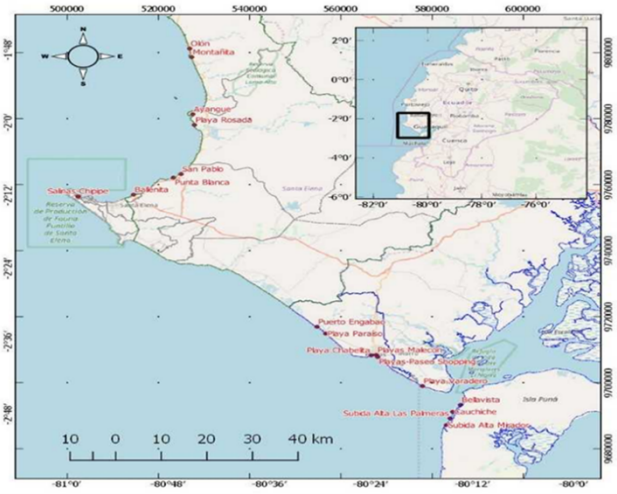

Figure 1.
Location of the 18 study beaches on the coasts of Ecuador.

Table 1
List of the 18 beaches monitored

Beach names / Province	UTM coordinates zone17S	
	This	North
Varadero / Guayas	577820	9698932
Malecon Playas / Guayas	567472	9708430
Chipipe / Santa Elena.	502265	9756928
San Lorenzo / Santa Elena	502983	9756295
Ballenita / Santa Elena	514122	9756524
Punta Blanca / Santa Elena	523260	9762098
St. Paul / St. Helena	525137	9763740
Pink / Santa Elena	527873	9778102
Montañita / Santa Elena	527355	9798100
Olon / Santa Elena	526721	9801190
Chabelita / Guayas	56666	9708301
Puerto Engabao / Guayas	554755	9716943
Paraíso Engabao / Guayas	556665	9714880
Paseo Shopping/Playas/Guayas	568040	9707793
Bellavista/Puna/Guayas	586222	9693293
Cauchiche / Guayas	584534	9691194
Subida Alta / Guayas	583113	9687149
Las Palmeras / Guayas	583957	9689195

The contributions of each of the activities described chronologically are related to the SDGs, their targets and indicators, which are included in the document entitled "The 2030 Agenda and the Sustainable Development Goals: An Opportunity for Latin America and the Caribbean" prepared by the UN Economic Commission for Latin America and the Caribbean (ECLAC). (United Nations - ECLAC, 2018).

For each scientific activity there is a brief description of the background, especially those related to its articulation with the mechanisms of the functional and thematic structure of the Proplayas Network. For each case, the Nodes involved, their main characteristics and their role in the activities and projects are indicated.

The Proplayas Network and its Nodes

In 2018, Universidad Del Pacífico was invited to join the Proplayas Network through the creation of a scientific node that we call ECUPAC and whose identification code in the Network is C49. It is important to note that the Network has had nodes since 2007, year in which it started its operation with 5 and has been gradually growing steadily. Thus, in 2008 two more nodes were added, in 2011 one more, and in 2012, when its creation was made official, 16 nodes were established. In 2014, 14 were added and in 2015 one, in 2016 five more, as well as in 2017. In 2018, 2019 and 2020 there was a significant upturn with the integration of 7, 8 and 16 nodes respectively and, finally, in 2021 three more were added, for a total of 76.

The Network has, as mentioned above, four types of nodes: scientific (C), business (E), public function (F) and civil society or activist nodes (A). Currently, the number of nodes as mentioned above is 76, but there are some inactive ones.

Of the 76, 47 are scientists, 13 are activists, 13 are business people and 3 are civil servants. There are nodes in 16 countries. The country with the most Nodes is Colombia with 17, followed by Mexico with 10, Brazil with 9, Argentina with 6, Spain with 5, Cuba and Ecuador with 4, Chile, Peru and Venezuela with 3, Costa Rica, Guatemala, Panama, Portugal and Puerto Rico with 2; and the Netherlands and Uruguay with 1. The above information was kindly provided by the Proplayas Network Coordinator Dr. Omar Cervantes, from the C24 Bikini Node, Mexico.

When the C49 ECUPAC Node started activities in October 2018, Ecuador had another older scientific node, the C38 ECUADOR-CN node, in the coastal city of Manta, established in 2017. Currently, the country has two scientific nodes, C38 in Manta and C49 in Guayaquil; a business node, E70 Sim Atlantis, in Guayaquil, established in 2020; and a civil society or activist node, A74 Ciudadanía Activa, established in 2021, also in Guayaquil.

The conformation of this last Node A74 arose as a product of the interrelationship that Node C49 began to develop with the beach community, since 2019 and with this Node we are currently participating in the citizen science project on cigarette butt management that we will describe below.

Low Cost Collaborative Projects - PCBC

The PCBCs are one of the most useful and versatile work tools of the Proplayas Network. It is worth noting that this Network has no membership fee or monthly fees, it is completely free and to motivate the articulated and collaborative work of the 16 associated countries and the 76 Nodes, it proposes several activities such as information exchange, consultancies, Webinar, workshops, etc. and within these are the PCBC, which are mainly proposed by the academic or scientific nodes, Source Nodes, to all the Nodes so that they voluntarily, according to their interests and capabilities, join in its realization.

PCBC On Solid Waste At Tourist Beaches - Latin America (RSPT LATAM)

It is important to mention that when the Source Node proposed the idea of this PCBC, in 2018, the C49 Node did not exist; however, the relationship with the Proplayas Network had been established since 2012, with the participation of Dr. Camilo Botero in a workshop organized by UPACIFICO, in Guayaquil, Ecuador. Based on that contact we were proposed to be part of the study of solid waste in Latin American tourist beaches for which we became part as a node of C49 and began to work together with 5 other countries of the Network: Argentina, Brazil, Colombia, Guatemala and Puerto Rico.

In this case the Source Node was E07 Coastal Systems, from Colombia, through the principal investigator Camilo Botero, and the nodes that accepted the application of the methodology were: C28 UNMDP with researcher Marcelo Lucero, in Mar del Plata, Argentina; C34 PARANOA, with José Rodríguez, in Salvador de Bahía, Brazil; C46 CARIGUAT, with Hugo Hidalgo, in Livingston, Guatemala; C25 UPR, with researcher Pablo Méndez, in San Juan, Puerto Rico, and C49 ECUPAC with Mario Palacios, in Guayaquil. It is important to note that in this case the Source Node was a Business Node and not a Scientific Node.

The objective of this PCBC was to validate a methodology for the evaluation of solid waste on tourist beaches that represent the particularities of the coastal areas of Latin America and the Caribbean.

The main justification for this is that the scientists who are experts on the subject, grouped in this Network, considered that the methodology that was being used for solid waste studies on tourist beaches was a methodology that did not adequately reflect the idiosyncrasy, culture and the same types of waste found on our beaches in Latin America, and therefore proposed the creation of their own methodology.

These types of studies are very important for Latin America and especially for a country like Ecuador, which has an enormous potential in its tourist beaches and unfortunately to date has no certified beaches and, on the contrary, has serious solid waste problems that hinder the progress of tourism and the sustainable management of beaches by affecting this delicate ecosystem.

Results

Of the six countries that participated, Colombia, Ecuador and Brazil continued to the elaboration phase of the agreed international article entitled "Beach litter in three South American countries: A baseline for restarting monitoring and cleaning after COVID-19 closure" prepared by Camilo Botero, Mario Palacios, José Rodrigues and Celene Milanes. (Botero Saltaren, Palacios Moreno, Rodrigues de Sousa, & Milanes Bautista, 2023).

On March 11, 2020, the World Health Organization declared a pandemic of COVID-19, so most countries in the world established strong precautionary measures. Among the various actions to prevent the spread of the disease, many governments closed access to beaches, affecting scientific monitoring in thousands of coastal areas around the world. This paper presented the status of beach litter in three Latin American countries (Brazil, Colombia and Ecuador) prior to closure

by COVID-19 and establishes a baseline to reinitiate beach monitoring upon reopening. Data were obtained at 25 beaches using a technique that assesses beach litter in fifteen types focused on wastewater management, during 2019 and 2020; additionally, a sample was taken in 2022 as a new baseline. In Brazil, two beaches were identified with very low beach cleanliness during the three years of sampling, while Colombia only one beach presented waste management problems and Ecuador none. In terms of types of garbage, Brazil had weaknesses in the management of bulky garbage, polystyrene and cigarette butts. Colombia should improve the management of coarse plant debris, small leaf litter and cigarette butts. Finally, Ecuador should pay more attention to organic animal waste and cigarette butts. The results are shown qualitatively and quantitatively to facilitate understanding by managers, academics and activists interested in monitoring beach litter. (Botero Saltaren, Palacios Moreno, Rodrigues de Sousa, & Milanes Bautista, 2023)..

Likewise, also in response to what was agreed in the rules of participation of the PCBC, the Ecuadorian local node C49 wrote its national scientific article, entitled "Contributions to the Validation of the Joint Methodology for the Evaluation of Solid Waste in Tourist Beaches (RSPT) in the Provinces of Guayas and Santa Elena, Ecuador".

In which the results of the contributions to the validation of the PROPLAYAS methodology for the evaluation of Solid Waste on Tourist Beaches (RSPT), supported by the use of mobile devices, on 18 beaches in the provinces of Guayas and Santa Elena, Ecuador, are presented. The validation was carried out between February and April, high season, and June to September 2019, low season. The methodology applies 5 categories from "A" to "E", the latter being assigned to beaches with a higher presence of RS (solid waste). Common waste is present in 100% of the beaches, mostly with an "A" rating corresponding to the cleanest beaches. Four beaches on Puná Island and Puerto Engabao, Playas, were rated "D". Two beaches registered category "E", Subida Alta in Heces typology and Cauchiche in Aceites. The least frequent wastes were Coarse and Oils, appearing in Subida Alta and Cauchiche, respectively. Montañita and Punta Blanca reported "C" ratings for: Potentially Hazardous and Non-bulky Vegetables, respectively. The generation of MSW for the 14 continental beaches is of local origin, as a result of tourist activity, while in Puná, it is of external origin, coming from the city of Guayaquil and carried to the island by tidal currents.

It is important to highlight the results of other projects developed in Ecuador, where Mestanza et al. (2019) developed a baseline for the characterization of beach litter, who according to the EA/NALG methodology (2000); monitored 59 sites across four provinces of Ecuador, three mainland provinces and the Galapagos Islands Province to classify beaches into four grades (from "A" - excellent to "D" - poor) according to the content of nine types of litter. As a result, it was determined that the province that showed excellent trash grades was the Galapagos Islands, where 88% of the beaches obtained Grade "A", while the provinces of Santa Elena and Esmeraldas had the worst beaches in terms of trash content and abundance (Mestanza et al. (Mestanza et al., 2019)..

The aforementioned authors continued with the process of characterizing the 3S of Sea, Sun and Sand as relevant and determining elements for the choice of a tourist destination in Ecuador. Galapagos had the best results, with attractive white sandy beaches, blue water color and high sunshine; the mainland presented

poor beaches with dark sand and unattractive water color (Mestanza-Ramón, Pranza and Pranza, 2006; Mestanza-Ramón and Pranza, 2007). (Mestanza-Ramón, Pranzini, et al., 2020)..

Landscape, safety, facilities, water quality, and the amount of garbage in coastal areas are relevant and determining elements in the choice of a tourist destination, which was studied by Mestanza et al. (2020). It was established that the most attractive beaches were in the Galapagos Islands due to their magnificent physical and environmental characteristics, while the province of Esmeraldas presented sites of less scenic beauty due to low natural scenic value and increased human impacts. In total, 22% (15 out of 67) of the beaches investigated belonged to Class I, 12% (8) to Class II and 15% (10) to Class III. The latter two classes included 51% of the beaches (i.e., 34 out of 67), of which 31% (21) were in Class IV and 20% (13) in Class V (Mestanza-Ramón, Anfuso, et al., 2020)..

Tourism in coastal areas is becoming increasingly important in the Integrated Coastal Zone (ICZM) as an integrated approach that balances the requirements of different sectors. Within the studies developed in Ecuador, it was defined that the country has not materialized public policies that allow the integrated management of 3S tourism and are considered as productive and valuable alternatives. It is necessary to consolidate and promote 3S tourism as a state policy and as a means to improve the economies of coastal areas. (Mestanza-Ramón, Chica-Ruiz, et al., 2020)..

As a result of efforts in monitoring anthropogenic marine debris during 2019 and 2020 Gaibor et al. (2020) found evidence of 60% presence of plastics on 26 beaches, including in the Galapagos Islands (Gaibor et al., 2020)..

In relation to the Proplayas Network, it is worth commenting on the low cost of the project, which in our case was achieved thanks to the fact that the location of our headquarters in Guayaquil allowed us to travel to several of the selected beaches on the same day, mainly on weekends, to carry out the sampling, optimizing the available resources.

Likewise, the methodology proposed by the Proplayas Network is very simple and low-cost, since it basically consists of three zones on each selected beach: Services, where the service providers are located; Rest, where tourists and beach users rest; and the Active zone, where they interact with the waves and carry out recreational activities.

In each of them, 100-meter parallel transects are walked, identifying waste in the 15 typologies indicated in the methodology, ranging from wastewater waste, through waste from the sea, to consider some more specific types such as vegetables, bulky and non-bulky, polystyrene, cigarette butts, up to feces.

Another innovation of the methodology is that instead of having four categories as the traditional methodology proposed for the study of solid waste on beaches, it includes five categories that are indicated in the last summary of the national article, where "A" is for very clean beaches up to "E" which have more pollutants, more solid waste.

Another key point of the low-cost collaborative project is the use of the KoboCollect application for cell phones, which can be downloaded free of charge. The project coordinator, Dr. Camilo Botero, developed the data capture forms that allow real-time reporting of the waste identified in the 100-meter transects on each of the beaches.

As a result of the COVID19 pandemic, sampling was modified for 2020 and 2021, years in which it was impossible to carry out the usual normal field activities from March 2020, which altered the sequence of monitoring in the two seasons, the high and low tourist season on the 18 beaches. This required a final monitoring for the elaboration of the international publication in 2022, and in the case of Ecuador it also implied eliminating 5 of the beaches from the study, which went from 18 to 13.

In conclusion, to date we managed to make an Ecuadorian scientific article with the results of the 18 beaches in 2019 and 2020, and an international one, with the results of the analysis of 13 beaches and with monitoring from 2019 to 2022, both are published. The local one is under the authorship of three researchers: Teresa Vera, Mario Palacios and Othoniel Palacios and two students, research assistants Issabo Flores and Cristopher Valencia. Likewise, in the international article, of the six countries, only three continue: Brazil, Colombia and Ecuador, headed by researchers José Rodríguez, Camilo Botero and Mario Palacios respectively.

Another important result is that the data collection we have in the 18 beaches in the three zones on the 15 types of solid waste will allow us to make many other scientific publications of interest to managers and decision makers in Ecuador's tourist beaches.

The most important result is that this PCBC proposed by the Proplayas network allowed us to propose to the Universidad Del Pacífico, to form a program to contribute to the study of the environmental quality of the tourist beaches of Ecuador, in the decade 2020-2030, entitled "Permanent monitoring program of the environmental quality of tourist beaches of Ecuador" whose general objectives are: To provide scientific information for the management and certification of Ecuador's tourist beaches through the periodic measurement of the recreational quality indicator - ICAR of beaches, consisting of seven parameters standardized by the ICAPTU III consortium. (Botero & Tamayo, 2021) and to carry out the new collaborative, short and low-cost projects proposed by the PROPLAYAS Network, related to the Environmental Quality Monitoring of the country's beaches.

This program is also a contribution to the decade of ocean science in support of the achievement of the Sustainable Development Goals, proposed by the Intergovernmental Oceanographic Commission - IOC of UNESCO from 2021 to 2030.

This program covers many more issues than solid waste, hence its general objective is to monitor the environmental quality index of tourist beaches through the permanent and periodic measurement of indicators and parameters that comprise it in the main tourist beaches of the country.

Stage 1 of the program is being implemented on the same 18 beaches located near our institution, which greatly reduces costs. This general objective allows us to cover much more than solid waste, which is one of the parameters of the ICAR and in turn is part of the environmental quality index of beaches.

Scientific Activities and PCBC During COVID 19

Another important objective of the Program mentioned above is to carry out short, low-cost collaborative projects, which made it possible not to stop activities completely during the closure of the beaches due to the COVID 19 pandemic, and PCBCs were chosen whose objectives contribute directly or indirectly to the achievement of the Program's general objective.

Thus, we participated as Node C49 in the preparation of the book "El Turismo de Sol y Playa en el Contexto de la Covid-19. Scenarios and Recommendations". Publication of the Proplayas Network, which was published in Spanish and Portuguese and came out on April 30, 2020. We contributed with the section entitled "Quarantine for Ecuadorian beaches. An opportunity to adapt them to the new paradigms post Covid-19" It is important to highlight that the C38 node of Manta, Ecuador also contributed to the book by writing the section entitled "Natural restoration of beaches in times of pandemic, synchrony with post-pandemic tourism in the province of Manabi, Ecuador 2020. Both sections are located in Part II of the book entitled "The Experts' Criteria in the Framework of the Covid-19 Crisis and Sun and Beach Tourism in Ibero-America" (Botero, Mercadé, Cabrera, & Bombana, 2020, p. 46)..

In Ecuador, the C49 Node widely disseminated the book to the authorities, the media and organizations concerned with the issue of beaches, such as the NGO Mingas por el mar, with which there is a cooperation agreement in force.

Likewise, the C49 Node participated, through teachers Teresa Vera and Mario Palacios, in the recording of a series of videos proposed by Proplayas on the same topic, i.e. Sun and Beach Tourism in times of Covid19. This series of 7 chapters is available on the YouTube page of Proplayas (Proplayas, 2022).

Finally, and within the same theme of beaches and Pandemic, the C49 Node, taking advantage of the alliance through an agreement with the Ecuadorian Association of Plastics - ASEPLAS organized the Webinar "Beaches and COVID 19 What to do now?" in which the expert from the Proplayas Network, Camilo Botero, discussed the topic with the Ecuadorian participants. The event was held on May 26, 2020.

Figure 2.
Poster of Dr. Camilo Botero's Webinar, organized by UPACIFICO and ASEPLAS in May 2020

Other Activities and PCBC

Additionally, during the COVID 19 pandemic beach closure, following Proplayas' offerings, we participated in two low-cost collaborative projects described below:

Low-cost collaborative project on beach applications

This multidisciplinary project was carried out in collaboration with students from 7 nodes of the Network, in this case led by researcher María Elena González from Node C51 SDC, Mexico, who sought to find out how many and which applications for mobile devices are available for free download and are related to beach studies or topics.

The project, conducted in a virtual environment, consisted of downloading, reviewing and characterizing applications (app) for cell phones focused on providing various services and information on the beach environment worldwide, the search was conducted on the two main cell phone platforms, IOS and Android.

Among the results of the C49 node in Ecuador were the downloading and characterization of 34 applications, the proposal of a categorization based on the findings and functionality evaluated, the identification of the strengths and weaknesses of each app, and the proposal of improvements for the applications from the point of view of the user and the beach manager.

Figure 3.
Poster of the Webinar with the participation of three students from the C49 ECUPAC Node, Fátima Morán, Emily Luna and Cristopher Valencia.

Effects of beach closures during COVID19

In 2020 the Chilean URCCC Node C39 was the Source Node headed by researcher Eulogio Soto, who proposed to work on a PCBC on the behavior of beach ecosystems during the Covid-19 pandemic.

Among the Nodes that responded to the call for Ecuador, C49 participated and the result was the publication: How does the beach ecosystem change without tourists during the emergency closure due to COVID-19?

This study examined bioindicators of 29 urban tourist beaches in seven Latin American countries and evaluated their response to blocking some relevant anthropogenic stressors, such as pollution, noise, human activities and user density.

The presence of animals and plants, as well as the intensity of stressors, were evaluated through a standardized protocol during confinement conditions. In addition, the environmental conditions of the beaches before and during confinement were compared qualitatively using multivariate methods and non-parametric statistics.

Notable positive changes in biological components and a clear decrease in human stressors were found on almost all beaches. Dune vegetation increased at most sites.

Due to the closure, there was an exceptionally low frequency of beach users, which in turn reduced litter, noise and unnatural odors. The observed patterns suggest that tourist beaches can be restored to natural environments relatively quickly.

We propose several indicators to measure changes in beaches once confinement measures are relaxed. Adequate conservation strategies will make the recreational service of tourist beaches more environmentally friendly. that

allowed to determine possible changes in the ecosystems of tourist beaches without human presence due to the pandemic was going to be a baseline where we contributed and 649 with some sampling on the beaches. (Soto, et al., 2021).

Project of linkage with society "Strategies for the problem of solid waste". Phase I to III.

The project director is another member of the C49 Node, Professor Mario Palacios. Under the framework of this and in order to execute the PCBC, a group of students has been assembled that is permanently renewed as they complete the legally established hours of projects of linkage with society, being these 96 or 160 depending on the academic program in which they are enrolled.

Starting in 2019, these groups of students will attend the activities of the PCBC and at the same time learn about the beach ecosystem, in terms of its biotic and abiotic components, and also work on the social component of the human communities that depend on it, directly or indirectly. This also creates and strengthens their awareness of the importance of protecting beaches and in general the importance of supporting their sustainable use in light of SDG 14 on marine life, to cite the most relevant.

At present, specific monitoring, training and consultation activities are being carried out with the communities. Students are becoming more involved in field work, not only within the framework of the Social Outreach Project, but also as research assistants, which allows them to fulfill their degree requirements and at the same time take their first steps as researchers.

It is important to clarify that since 2019 to date an average of 8 students per academic semester have participated for a total of 94 who have obtained the benefits outlined above.

For the topic of environmental education and motivation to participate in the PCBC on cigarette butt management, with a citizen science component, students make posters, T-shirts, caps, vests, pencils and banners, with which they campaign and are also disseminating and raising awareness and education through the social networks of Nodo C49, on Facebook: Nodo ProPlayas Ecuador and Instagram: @nodo_c49_proplayas, under the supervision of teachers.

Figure 4.
Poster of the stand staffed by students on the cigarette butt project at UPACIFICO's Guayaquil campus for the celebration of World Oceans Day, June 8, 2022.

CIVIL SOCIETY NODES OF PROPLAYAS TOWARDS CITIZEN SCIENCE

Citizen science PCBC on cigarette butts on tourist beaches.

As a result of the coordination work carried out since mid-2020 by some of the civil society nodes, with minority participation of scientific (C49 ECUPAC) and business (E43 AXISIMA) nodes, to carry out activities such as the joint celebration, in 7 countries, of the World Beach Cleanup Day, on September 19, the idea of applying the concept of citizen science in future activities also arose.

This occurred during the course of the intense work meetings that were held uninterruptedly every week and led by Paloma Arias of node A61 IEMAR, in Brazil, where some examples of citizen science projects were heard, in which some of the nodes participated, without having greater knowledge of the transcendence and importance of the subject.

In order to make up for this lack and to concretize the possible linkage of the nodes to the realization of citizen science projects, it was agreed to have a clear theoretical framework and to know what would be the best way to do it in Proplayas. Thus, after the development of three workshops, the first of an internal nature on November 5, 2020, with the participation, as an external expert, of Dr. Martin Thiel, from the "garbage scientists" of Chile, who shared his experiences on the subject, and two other open workshops in December 2020 and early 2021, it was decided to begin work by formulating a PCBC with a citizen science component, on the management of cigarette butts on beaches in 5 countries.

With the advice of the general coordinator of Proplayas at that time, Camilo Botero, the C57 PSC node from Cartagena, Colombia, headed by researcher Claudia Díaz, an expert on the issue of cigarette butts and therefore the project leader, joined the working group as the Source Node. The project was joined by nodes C56 Bahía Blanca, Argentina, headed by María Lujan Bustos; A61 IEMAR, Cabo Frío, Brazil, headed by Paloma Arias; C49 ECUPAC and A74 Ciudadanía Activa, Guayaquil, Ecuador, headed by Mario Palacios and Martha Vallejo, respectively, and C24 BIKIMI, Manzanillo, Mexico, headed by Omar Cervantes.

The objective of this PCBC is to establish the potential generation of cigarette butts on tourist beaches in five countries: Argentina, Brazil, Colombia, Ecuador and Mexico, through citizen science strategies in a process that articulates collection, referencing of the area to intervene and determination of the weight of the cigarette butts collected, in addition to an environmental awareness strategy.

This project was implemented from June 5, 2021, the commemoration of World Environment Day, with monthly sampling and collection of cigarette butts and cigarette butt fibers until December 2022, for quantification and weighing.

Subsequently, the possibility of extending one more objective regarding the monitoring of microplastics in sand was analyzed, of which four samplings have already been made in the case of Ecuador. Likewise, sand temperature measurements will be taken starting with the February 2022 sampling.

As an expected product of this PCBC with a citizen science component, two articles are expected to be published in the academic field, one on the potential for cigarette butt generation in the five countries and the other on the perception of the cigarette butt problem among beach users, which has been worked on through surveys carried out simultaneously with the collection days.

Figure 5.

Photograph of student research assistants in an environmental education campaign with service providers in Playas Villamil. The survey prepared for the project is applied in these scenarios.

Likewise, in the area of environmental education and linkage with society, we hope to create permanent education and awareness campaigns for beach communities in the five countries. In the case of Ecuador, significant progress has been made with the municipalities of Playas Villamil and the Prefecture of the Province of Santa Elena.

Photo 1.
Photograph of the group of authorities, headed by the Mayor of Playas General Villamil, Dany Mite and beach entrepreneurs, as well as members of nodes C49 and A74, at the Tenso Membrana del Malecón de Playas, on August 5, 2022.

Finally, an attempt was made to broaden the scope of the project through a proposal to a European financial agency, CYTED, including the possible evaluation of alternatives to reduce the environmental risks generated by inadequate disposal of cigarette butts on 6 tourist beaches in Latin America, for which the support of the C46 CARIGUAT Node, headed by Hugo Hidalgo, was requested, so that there would have been six participating countries, from north to south: Mexico, Guatemala, Colombia, Ecuador, Brazil and Argentina. Unfortunately, the proposal was not accepted.

Safe Beaches Course

The last activity to highlight is the course called "Safe Beaches" given by several experts, among them 60% belonging to the Pro Beaches Network, through the C49 ECUPAC Node, at the Universidad Del Pacifico, to officials of the Association of Municipalities of Ecuador - AME. The course was organized and delivered through an agreement signed between UPACIFICO and Conservation International Foundation - CI Ecuador.

The objective of the course was to strengthen the capacities of municipal officials of the coastal zone and Marine and Coastal Protected Areas (MPAs) for the integrated management of sea beaches under their jurisdiction and competence.

The specific objectives of the course were:

·Provide knowledge and tools for integrated coastal management.

·Improve the skills and abilities to manage the ecosystems and biodiversity present within the cantonal jurisdiction.

·Improve the skills and abilities of officials to efficiently manage the spaces within the tourist beaches of marine and coastal protected areas and zones.

·Develop tourism management and visitor management skills.

·Provide knowledge and skills to provide safety to residents, visitors and tourists.

·Improve skills for the management and maintenance of tourist facilities and informational and directional signage.

·Provide knowledge and tools to design, plan and implement environmental education and communication activities.

The course was held from January 26 to April 8, 2022, had a duration of 60 hours and had the academic coordination of Camilo Botero from Node E07 Coastal Systems, in the preparation phase of the course and concluded in the same role, but in the execution phase, with the coordination of Alfredo Jaramillo from Node C31 URABA.

Acknowledgements of the participation of the node C49 Ecuador

In relation to the international recognition of the participation of the C29 node, on November 18, 2022 the Alfafar City Council in Spain, gave recognition to the Universidad Del Pacífico for its good practices in the Sustainable Development Goals and the 2030 Agenda. The award was given at the International Summit on SDGs and Agenda 2030.

Subsequently, on January 18, 2023 in Madrid, Spain, the Excelencias Group presented the Universidad del Pacifico with the award in the "Blue Tourism" category for its Citizen Maritime Council project and the tasks carried out. received recognition from the Global Compact Network Ecuador - United Nations for its participation in the international Citizen Science Project of the Proplayas Network on the management of cigarette butts.

Contributions to the SDGs

The results of the PCBC and the activities described will allow defining management tools for decision makers, both governmental and non-governmental, in terms of tourist beach management. These tools will be able to generate permanent monitoring programs, at low cost and maximum performance in terms of control and surveillance of the condition of tourist beaches and therefore their international certification for the benefit of the economy of the countries based on sustainable tourism.

In the case of Ecuador, its implementation also has a direct impact on compliance with its Ocean and Coastal Policies and in turn contributes to the country's compliance with Sustainable Development Goal No. 8 on decent work and economic growth, target No. 8.9, which states that "by 2030, develop and implement policies to promote sustainable tourism that creates jobs and promotes culture and local products".

Likewise, they are considered to contribute to the fulfillment of SDG No. 12 on ensuring sustainable consumption and production patterns, target No. 12.b "Develop and implement tools to monitor the impact on sustainable

development, in order to achieve sustainable tourism that creates jobs and promotes culture and local products".

They are also seen as contributing in particular to SDG 14 on marine life which states "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" target: 14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution, 14.2 "By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action to restore them to restore the health and productivity of the oceans, and 14.7 "By 2030, enhance the economic benefits that small island developing States and least developed countries derive from the sustainable use of marine resources, including through the sustainable management of fisheries, aquaculture and tourism."

All of the above considering that it provides scientific information and environmental education so that the competent national authorities, in the case of Ecuador the ministries of: Tourism, of Environment and Water and Ecological Transition and the cantonal authorities, can carry out environmental management and certification of tourist beaches in the country that to date does not have any internationally certified beach despite the enormous tourism potential that these have and that the country has one of the best developed technical standards for the effect of tourism certification of beaches as is the Ecuadorian Technical Standard NTE INEN 2631:2012. (ECUADORIAN STANDARDIZATION INSTITUTE - INEN, 2012).

These in turn will directly favor the sustainable development of the countries by taking advantage of one of their most valuable resources, their beach ecosystems.

Although our activities have been focused on the beach area, the projects and activities described here have sought to reach the conscience of the academic community of which we are a part and that of the common citizen of which we are also a part, emphasizing the responsibility and commitment of each person on the planet to pursue sustainable development in all aspects that concern us with the firm belief that we can be agents of change.

Conclusions

Alliances are and will be indispensable for scientific research, especially for developing countries with very limited resources. It seems a truism to say that alliances are indispensable for research, but unfortunately experience shows that much is said, but not done, whereas with this alliance we have the possibility of saying yes, it can be done and there are concrete results such as those shown in this chapter.

The results are very important, in our case they allowed us to move from a low-cost collaborative project to a long-term research program. This has allowed us to maintain permanent spaces for student involvement in community problems that affect us all.

We are in a time of collaboration and not competition and research alliances, besides being scientifically very productive in terms of books and articles, can also be productive in areas such as environmental education and beach certification,

the latter being another very important point for Ecuador in terms of sustainable use of the enormous potential of beaches for traditional tourism but also for ecological or scientific tourism, which requires identifying remote beaches in order to certify their landscapes.

Finally, it is provided of tools to comply with the organic code of the environment that conceptualizes the management plan of sea beaches and adjacent strips as a planning instrument for the coastal marine space this can be reference to the subject that leaves to count on the SMA and the course that we just made.

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