GEOTOURISM POTENTIAL IN THE CONTEXT OF THE GEOPARK PROJECT FOR THE DEVELOPMENT OF SANTA ELENA PROVINCE, ECUADOR

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ABSTRACT

The territory of Ancon-Santa Elena stands out for its unique geological diversity which has peculiar characteristics due to the relationships of geodiversity and exuberant biodiversity linked to the marine coastal area. Ancon-Santa Elena is recognized as Cultural Heritage of Ecuador for its great historical value, as it is the place where tar was used in ancient times. In this place, the first Ecuadorian oil well was drilled. Thus, Ancon-Santa Elena is considered an ideal and relevant rural location to carry out a Geopark project due to its uniqueness and aesthetic characteristics. The aim of the research is to analyze the geotourism potential in Ancon-Santa Elena area in Ecuador through the assessment of geosites and industrial sites. Furthermore, the objective is to set up strategies with a Strengths, Weaknesses, Opportunities and Threats (SWOT-TOWS) matrix of the 45 valued sites for local development in the context of the Ancon-Santa Elena Geopark project. Hence, the methodology includes: i) the registration and preliminary inventory of places with outstanding geological and industrial interest in the study area; ii) the preparation of reports and thematic cartographies; iii) quantitative assessment and classification of geosites and industrial sites; iv) development of a SWOT-TOWS matrix which will guarantee the viability of Geotourism as a development pole. The results of the research study are represented through a map using mineral routes as expression of tourism, choosing six relevant sites out of 45 geo- and industrial sites. The researchers focused on a sustainability framework through the preparation of action strategies to ease the compatibility of geodiversity and industrial heritage with current tourism activities. Therefore, this study promotes the conservation and enhancement of the resources in a territory for its sustainable development in rural communities.

Keywords: Ancon-Santa Elena Geopark, geotourism, sustainable development.

1 INTRODUCTION

Since the Declaration of the Rights of the Memory of the Earth was announced in 1991 in Digne, France [1], progress has been made towards the recognition of the value of geological heritage and geoconservation [2]. Outstanding and unique features of geodiversity within an area constitute a geological heritage which deserves conservation [3].

The concept of geoconservation is closely connected to that of geological heritage, as geoconservation means a series of actions intended to preserve the geological heritage of a place [4]. Both, geoconservation and geological heritage have been understood as new challenges in geological research in the last years of the twentieth century [5].

In many countries, mainly outside Europe, wider knowledge about national geological heritage is limited and incomplete. The development of a geosites inventory should be the first step in any geoconservation strategy. The establishment of conservation and interpretation actions without having a complete geosites inventory is an unsuitable start for any geoconservation project [6]. After the conclusion of a geosites inventory, the geoconservation strategy should proceed with the following stages: geosites characterization, quantification of their relevance, protection according to the national legal framework, geosites conservation, valuation and interpretation and, finally, monitoring [7]. Also, for

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geoconservation, in the 1990s, a new concept was developed by UNESCO, aiming to establish parks focused on the conservation and sustainable use of geological heritage described as the "Geopark" concept [8]. At the beginning of the 21st century, UNESCO promoted the Geoparks project in a Global Geoparks Network [9].

Furthermore, Geoparks have evolved as a new strategy for obtaining sustainable development and further enhancing socio-economic status through the participation of local communities in the continuous geopark activities [10]. Thus, people with different characteristics and purposes (academical, scientific, tourism) visit geoparks and promote geotourism [11], [12].

Geotourism or geological tourism [13] relies on the promotion of nature, especially in the geology and geomorphology of a site [14]. Hence, the areas with a geological structure and varied terrain tend to have greater geotouristic potential [15]. The most important aspect of geotourism is the interpretation of the information of Geological Heritage sites or geosites for every audience [16], [17].

The Ancon-Santa Elena Geopark Project seeks to be a development opportunity for the communities of the province of Santa Elena through resources such as sustainability, the increase of tourist activity and the creation of jobs, aimed at protecting Heritage and the preservation of the territory. Ancon-Santa Elena Geopark, as a territory, includes diverse aspects: i) Aesthetic (unique natural landscape, defined by a coastal profile), ii) Geological (Ancon oil area comprises the sedimentary sequence from the Cretaceous to the Lower Tertiary (Paleocene-Eocene), developed on oceanic crust), iii) Archaeological (superficial pre-Hispanic settlements), iv) Historical and Cultural (San José de Ancon was the place where the first oil well was exploited in Ecuador in 1911) and v) Tourist (located in the "Ruta del Spondylus", important tourist corridor positioning in the domestic and international market).

The aim of this paper is to analyze the potential of geotourism in the Ancon-Santa Elena area in Ecuador by gathering, describing, evaluating and analyzing the sites of geological and industrial interest, for the approach of strategies to ensure the viability of geotourism as a development pole.

2 GEOGRAPHIC AND GEOLOGICAL SETTINGS

Fig. 1 illustrates the location of the province of Santa Elena situated west of Ecuador. The province has three counties: Santa Elena, Salinas and La Libertad. Wedged between the south-west flank of the coastal marginal mountain range Chongon-Colonche and the Pacific Ocean. Almost perpendicular to the Andes, the Santa Elena province has a strong influence/dominance of Tertiary and Quaternary detrital, compacted and lithified material, where Cretaceous rocks of marine origin form the core of the province. This axis forms a basin called "Progreso" or "Santa Elena" [18], where we find younger rock material.

3 METHODOLOGY

The methodology used in this article is shown schematically in Fig. 2 by i) a flow chart that comprises three phases and combines general starting information, ii) the scientific evaluation following the method of [19] and iii) the integration of geotourism aspects in consideration of a SWOT analysis for the establishment of a TOWS strategy matrix.

3.1 General starting information

This information includes the collection and integration of all the references and the projects related to the theme in the analysis area. The classification of this information is relevant

Figure 1: Location of study area.

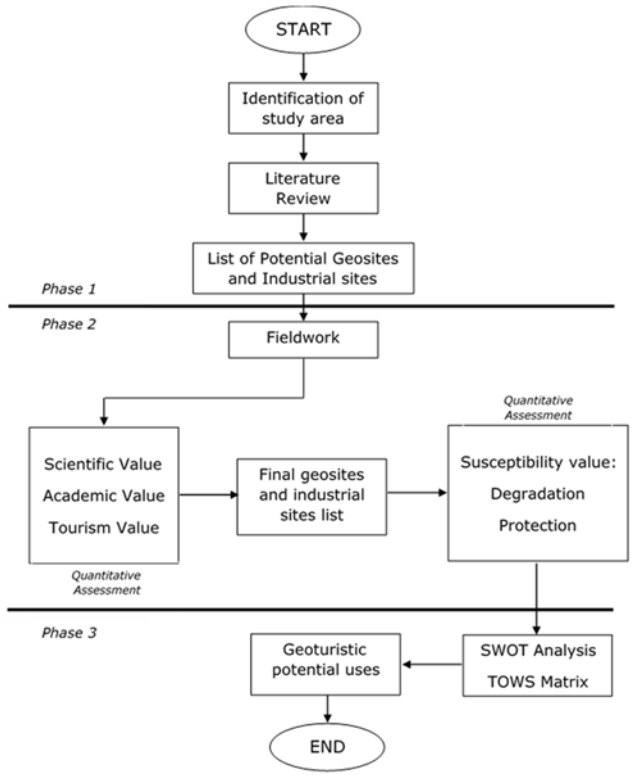

Figure 2: Methodology flowchart. *(Source: Adapted from [19].)*

because it allows categorizing sites of geological interest and sites of industrial interest. The inventory of registered sites provides a preliminary idea of the geotouristic study potential. Subsequently, geological reconnaissance-type field trips were carried out for the validation of the sites through the interaction of a broad spectrum of stakeholders such as government delegates, university students and community leaders.

3.2 Evaluation and classification of geological and industrial sites

Starting from the inventory made in STAGE I of this methodology, we proceed to the valuation of each site of geological and industrial interest. In this case, three experts who were geological and mining engineers valuated each site. First, the method includes the scientific value, the academic value and the tourist value. In a second section, the environmental degradation is assessed. The third part includes considerations of environmental protection. Tables 1 and 2 illustrate the methodology and rating values.

The three experts made the evaluation of the places of interest, as follows: i) with a score from 0 to 4, each of the parameters given in Tables 1 and 2 are evaluated. This valuation is given by the experience and knowledge of the experts after visiting these places; ii) this rating is multiplied by the weight that has been determined in Tables 1 and 2. With this, the experts obtained a total value for the interest and the degrees of vulnerability, fragility and susceptibility. This susceptibility is determined by the degrees of vulnerability and fragility, as proposed [19]. And, finally, iii) once the experts obtained the interest ratings and susceptibility, they calculated the protection priority according to eqns 1–4 described below:

$$Pp\ (Sc.)\ =\ (Sc^2) * SD * (1/400^2), \tag{1}$$

$$Pp\ (Ac.)\ =\ (Ac^2) * SD * (1/400^2), \tag{2}$$

$$Pp\ (To.)\ =\ (To^2) * SD * (1/400^2), \tag{3}$$

$$Pp.=\ [(Sc + Ac + To)/3]^2 * SD * (1/400^2). \tag{4}$$

Both in Tables 1 and 2, we obtained an assessment that allows us to know if a site is of interest or susceptible to deterioration and the degree of protection of these. For a better interpretation, classification ranges have been proposed for the given ratings:

- Interest: from 400 to 270 (very high grade), from 269 to 140 (high grade), from 139 to 55 (middle grade) and lower than 55 (low grade).
- Susceptibility (Ds.): From 400 to 225 (very high degree), from 224 to 100 (high grade), from 99 to 50 (medium grade) and less than 50 (low grade).
- Protection priority (Pp.): From 400 to 120 (very high grade), from 119 to 30 (high grade), from 29 to 5 (middle grade) and lower than 5 (low grade).

3.3 SWOT and TOWS analysis

Based on the results obtained in stage I and II, a SWOT and TOWS analysis was carried out in the context and approach towards geotourism in this area. As a result of this analysis, we proposed geotouristic development strategies, in accordance with the criteria of society and the potential of the valued sites, leading to the sustainable development of the study area.

Table 1: Interest ratings (Sc., Ac. and To.) with ranges from minimum 0 to maximum 400. *(Source: Adapted from [19].)*

Parameters	**Interest**		
	Scientific (Sc.)	Academic (Ac.)	Tourism (To.)
	Weight	Weight	Weight
Representative	30	5	0
Standard or reference site	10	5	0
Knowledge of the site	15	5	0
conservation status	10	5	0
Conditions of observation	10	5	5
Scarcity, rarity	15	10	0
Geological diversity	10	20	0
Educational values	0	15	0
Logistics infrastructure	0	5	5
Population density	0	15	5
Possibilities for public outreach (accessibility)	0	0	10
Size of site	0	5	15
Association with other natural elements	0	5	5
Beauty	0	0	20
Informative value	0	0	15
Possibility of recreational activities	0	0	5
Proximity to other places of interest	0	0	5
Socio-economic situation	0	0	10

Table 2: Assessment procedure of Fr., Vul, SD of a site, with ranges of minimum 0 to maximum 400. *(Source: Adapted from [19].)*

Degradation Susceptibility			
Parameters	Fragility (Fr.)	Parameters	Vulnerability (Vu.)
	Weight		Weight
Site size	40	Proximity to infraestructures	20
Vulnerability to looting	30	Mining exploitation interest	15
Natural hazards	30	Protected area designation	15
		Indirect protection	15
		Accesibility	15
		Ownership status	10
		Population density	5
		Proximity to recreational areas	5

4 RESULTS

4.1 List of places of interest

Through field visits and results with local participation in communities, we made a list of 45 places, 37 sites are of geological interest and 8 are of industrial interest. In the classification of places of geological interest, we entered places like mountains, geologic structures, natural springs, rivers and aquifers; while in places of industrial interest, we included places related to the oil industry, museums and salt industry. In Table 3, we can see the complete list of the 45 places.

Table 3: List of the 45 places of geological and industrial interest.

No.	Geosites	Characteristic
GS1	Cerro Azúcar	Mountain
GS2	Estructuras sedimentarias San Rafael	Sedimentary structure
GS3	Terrazas Marinas Fm. Tablazo	Marine Terrace
GS4	Fracturas secundarias rellenas de yeso	Filled fractures
GS5	Acantilado Anconcito	Mountain Cliff
GS6	Aguas Termales San Vicente	Natural Spring
GS7	Bad Lands Anconcito	Badlands
GS8	La chocolatera	Geological formation
GS9	Playa de Bolsillo Ayangue	Beach
GS10	Acantilados Ayangue	Mountain Cliff
GS11	Playa Rosada	Beach
GS12	Acuífero Manglaralto	Aquifer
GS13	Cueva de Aguas Profundas El Pelado	Cave
GS14	Islote el Pelado	Islet
GS15	Acantilado Olón	Mountain Cliff
GS16	Vetillas de yeso Puerto Anconcito	Gypsum vents
GS17	Afloramiento Lutitas Chocolate	Basset
GS18	Afloramiento Lutitas Diatomáceas	Basset
GS19	Concreción Calcárea	Concretion
GS20	Cordillera Chongón-Colonche	Mountain Chain
GS21	Afloramiento Areniscas Rojizas	Basset
GS22	Estructuras Sedimentarias Ballenita	Sedimentary structure
GS23	Plataforma abrasión Ballenita	Bench
GS24	Acantilados Ballenita	Mountain Cliff
GS25	Cascada Dos Mangas	Waterfall
GS26	Cordillera Costera Chanduy-Playas	Mountain Chain
GS27	Fuente termal Borbollones	Natural Spring
GS28	Mirador Cerro Capay	Viewer
GS29	Marisma en Santa Paula	Swamp
GS30	Torre El Suspiro	Tower
GS31	Albarradas de Zapotal	Dyke
GS32	Mirador de Montañita	Viewer
GS33	Pozos de agua Manglaralto	Water well
GS34	Tapes en Olón	Dyke
GS35	Acuifero Olón	Aquifer
GS36	Acuifero Valdivia	Aquifer
GS37	Acuifero Río Chico	Aquifer
No.	**Industrial Sites**	**Characteristic**
IS1	Pozos Artesanales Atahualpa	Water well
IS2	Primer Pozo Petrolero	Oil well
IS3	Mina San Rafael	Mine
IS4	Exudaciones Bituminosas La Libertad	Bituminous exudation
IS5	Exudaciones Bituminosas Anconcito	Bituminous exudation
IS6	Exudaciones bituminosas Santa Paula	Bituminous exudation
IS7	Salinas de San Pablo	Saline Company
IS8	Museo Megaterio	Museum

4.2 Evaluation and classification of geological and industrial sites

In this stage II, we proceeded with the evaluation of each of the sites of interest given in Table 3, regarding the methodology previously described.

According to the parameters and weights of Table 1, plus the valuation of each one of the experts regarding the interest, as the range of values explained above, the following results are obtained:

- Seven places are classified as very high grade, representing 16% of the total. Divided into 6 geological and 1 industrial.
- Thirty-four places are classified as high grade, representing 75% of the total. Divided into 27 geological and 7 industrial.
- Four places are classified as middle grade, representing 9% of the total. All of them are classified as geological.

In addition, we evaluated the 45 sites of interest for their susceptibility to degradation, as proposed in Table 2. According to the qualification of the experts and the range of values, explained in the methodology, the results are:

- One place is classified as very high Ds., representing 3% of the total. This is classified as geological.
- Twenty-one places are classified as high Ds., representing 47% of the total. Divided into 17 geological and 4 industrial.
- Seventeen places are classified as middle Ds., representing 38% of the total. Divided into 13 geological and 4 industrial.
- Six places are classified as low Ds., representing 12% of the total. All of them are classified as geological.

Finally, we have the protection priority evaluation, calculated with eqns 1–4 of the methodology. According to the classification range for Pp., the results are:

- Twenty places are classified with a high degree, representing 44% of the total. Divided into 16 geological and 4 industrial.
- Twenty-three places are classified with medium grade, representing 52% of the total. Divided into 20 geological and 3 industrials.
- Two places are classified with low grade, representing 4% of the total. Divided into 1 geological and 1 industrial.

In Table 4, we observed the evaluation and results of each of the geological and industrial sites according to their interest, susceptibility and protection priority.

4.3 SWOT and TOWS analysis

With the registration and assessment of the geological sites and industrial sites, a SWOT analysis was carried out (Table 5) in order to determine the strengths, opportunities, weaknesses and threats presented in the study area. We considered the local development approach through the places of interest in the context of Geotourism. With previous analysis, we developed strategies using a TOWS matrix (Table 6).

Table 4: Evaluation of geological and industrial sites, according to their interest, susceptibility and protection priority.

	Interest					Degradation				Protection			
	Sc.	**Ac.**	**To.**	**Av.**		**Fr.**	**Vul.**	**Ds**		**Pp. (Sc.)**	**Pp. (Ac.)**	**Pp. (To.)**	**Total Pp.**
GS3	305	300	310	**305**	GS2	320	310	**248**	GS12	102	83	89	**91**
GS5	330	265	315	**303**	IS7	260	320	**208**	IS5	83	43	110	**76**
GS12	320	290	300	**303**	IS5	280	290	**203**	GS5	90	58	82	**76**
GS7	305	300	300	**302**	GS21	280	250	**175**	GS3	76	73	78	**76**
GS23	320	240	280	**280**	GS10	290	240	**174**	GS21	80	63	74	**72**
IS8	280	300	256	**279**	GS4	260	255	**166**	GS16	95	69	44	**68**
GS16	330	280	225	**278**	GS12	270	235	**159**	GS8	61	63	79	**68**
GS8	250	255	285	**263**	GS8	260	240	**156**	GS7	62	60	60	**61**
GS22	285	210	280	**258**	IS1	260	220	**143**	GS2	86	53	47	**61**
GS21	270	240	260	**257**	GS16	200	280	**140**	GS23	75	42	57	**57**
GS24	270	205	295	**257**	GS5	170	310	**132**	IS7	42	49	69	**53**
GS6	260	255	250	**255**	GS32	200	260	**130**	GS24	56	32	67	**51**
GS17	270	200	280	**250**	GS3	260	200	**130**	GS6	52	50	48	**50**
GS34	264	236	236	**245**	GS15	190	270	**128**	IS1	38	47	56	**47**
IS5	255	185	295	**245**	GS31	200	250	**125**	GS4	57	35	41	**44**
GS14	215	225	290	**243**	GS6	220	225	**124**	GS17	51	28	55	**44**
IS2	290	205	230	**242**	GS24	190	260	**124**	IS2	62	31	39	**43**
GS20	265	230	225	**240**	IS2	160	295	**118**	GS15	26	34	72	**42**
GS26	256	224	240	**240**	GS23	170	275	**117**	GS22	43	23	41	**35**
GS13	285	240	190	**238**	GS17	140	320	**112**	GS10	23	28	46	**31**
GS18	220	255	235	**237**	GS33	200	215	**108**	GS27	33	25	29	**29**
IS1	205	230	250	**228**	GS7	260	165	**107**	IS4	34	26	27	**29**
GS15	180	205	300	**228**	IS4	230	170	**98**	GS20	34	26	25	**28**
GS11	220	205	250	**225**	GS34	200	195	**98**	GS29	29	22	22	**25**
IS4	235	205	210	**217**	GS35	200	195	**98**	GS32	35	22	18	**24**
GS9	220	175	245	**213**	GS29	170	220	**94**	GS31	42	20	14	**24**
GS33	224	204	204	**211**	IS3	100	350	**88**	GS28	27	23	23	**24**
GS4	235	185	200	**207**	GS28	170	205	**87**	GS18	20	26	22	**23**
GS35	224	196	196	**205**	GS22	130	260	**85**	GS25	22	25	18	**22**
IS7	180	195	230	**202**	IS6	170	195	**83**	IS3	21	20	24	**22**
GS1	240	165	195	**200**	GS27	260	125	**81**	GS9	21	13	26	**20**
GS2	235	185	175	**198**	GS36	160	195	**78**	GS33	33	16	14	**20**
IS3	195	190	210	**198**	GS37	160	195	**78**	GS13	24	17	11	**17**
GS25	200	172	188	**187**	GS20	230	135	**78**	GS14	12	13	22	**16**
IS6	232	160	136	**176**	GS19	100	295	**74**	GS34	22	11	16	**16**
GS31	208	164	148	**173**	GS9	100	280	**70**	GS11	14	12	18	**14**
GS27	220	152	144	**172**	GS18	100	260	**65**	GS26	16	13	13	**14**
GS10	145	160	205	**170**	IS8	220	115	**63**	GS30	15	11	14	**13**
GS19	115	160	210	**162**	GS30	190	130	**62**	GS35	8	12	17	**12**
GS36	188	132	160	**160**	GS13	110	170	**47**	GS19	6	12	20	**12**
GS32	116	140	168	**141**	GS11	130	140	**46**	GS36	8	10	9	**9**
GS29	132	144	136	**137**	GS25	170	105	**45**	GS37	10	7	9	**9**
GS37	140	124	136	**133**	GS14	200	85	**43**	IS6	8	7	11	**9**
GS28	124	120	144	**129**	GS26	120	125	**38**	IS8	4	4	4	**4**
GS30	104	100	100	**101**	GS1	60	40	**6**	GS1	2	1	1	**2**

Table 5: Study area SWOT analysis.

Strengths	**Opportunities**
1. The population of Ancon-Santa Elena are considered guardians of their territory. 2. The sites of Geological and Industrial interest are accessible and with disclosure. 3. Great natural, cultural and historical wealth. 4. Conducting joint projects with the community for its strength and development. 5. Stands out for its history, being the place where the first oil well was drilled in Ecuador. 6. Ancestral knowledge for community growth and preservation of resources. 7. Ancon-Santa Elena has marine and coastal ecosystems that are home to biodiversity of fauna and flora.	a) Development of sustainability projects with use of ancestral knowledge. b) Improvement of tourism. c) Public and private use initiatives. d) Protection of suitable areas for field studies, projects and thesis. e) Base projects as Ancon-Santa Elena Geopark. f) Through the Geopark project, employment sources are created. g) Projects of government agencies for reforestation, soil recovery and improve environmental system. h) The archaeological resources in the area linking the community with its history.
Weaknesses	**Threats**
1. Little cohesion between intergovernmental entities. 2. Lack of links with universities to develop projects with communities with lack of support. 3. Scarce economic support from government entities 4. The population of Ancon-Santa Elena has a high level of poverty, and there is a shortage of water. 5. In some communities are losing traditions and ancestral knowledge.	a) Lack of protection of assets against destroyers of these. b) Pollution and damage to these places due to poor care and poor treatment by the community and tourists. c) Lack of attention by regional authorities. d) Non-conformity of social groups due to the inability to solve dairy problems. e) Problems due to natural threats. f) High level of vulnerability due to geodynamic risks.

Table 6: Development of the TOWS Matrix.

Strategies: strengths and opportunities	**Strategies: weaknesses and opportunities**
1.a. Development of the area through the promotion and promulgation of knowledge and ancestral knowledge. 5.a.b. Development of tourist routes including proposed places of interest. 7.c.e. Promulgation and disclosure for the acceptance of the Ancon-Santa Elena Geopark.	2.a.d. Linkage with universities and the productive sector for joint projects with society. 4.b.e. Creation of committees / associations, with multi-institutional participation for the declaration as Cultural Heritage / Geopark. 5.a.h. Recovery of ancestral knowledge by communes and communities.
Strategies: strengths and threats	**Strategies: weaknesses and threats**
4.a.c.e. Dissemination of projects with university-community links through scientific knowledge and ancestral knowledge. 5.b.e.f. Create focus groups, between the community and public authorities, through multiple participation for the management of these interest places.	1.a.c. Plans for the conservation of the heritage of the Ancon-Santa Elena sector, to be an icon of national and international tourist interest. 4.d.g. Promotion of projects by government entities with cooperation from the community to strengthen ties and socialize them.

The SWOT analysis and the TOWS matrix generated a series of strategies to address appropriate actions for the preservation, restoration and dissemination of these areas. Finally, we established the basis for recognition of the Ancon-Santa Elena Geopark.

As a result, from the data obtained in Tables 5 and 6, we obtained the strategies for the development of the existing geodiversity in this area of study:

1. Raise awareness and promote geotourism routes as a basis for a tourist alternative. The stakeholders responsible for its development and application should be local public bodies, educational centers (colleges) and private companies linked to tourism promotion.
2. Propose projects and research with active participation of the community through knowledge and ancestral knowledge. The projects aim is the protection and conservation of the resources of the study area and prevention of risks due to natural threats and geodynamic factors.
3. Guarantee the conservation and defense of geoheritage and geodiversity through the incorporation of land management plans. The elaboration of local norms of behavior of the natural space in general and of the geological-industrial resources in particular is fundamental.

4.4 Geotourism route proposal

We proposed a geotouristic route (Fig. 3) as part of the context of one of the strategies outlined above. This *georoute* integrates some of the places chosen from Table 3. The following criteria were: i) accessibility to each of the geological sites and industrial sites selected by motorized vehicle; ii) the distance between the places of interest is short, pleasant and attractive circuit and iii) the chosen places are currently preserved by the same community or by a governmental entity. These factors will guarantee a great geodiversity all around.

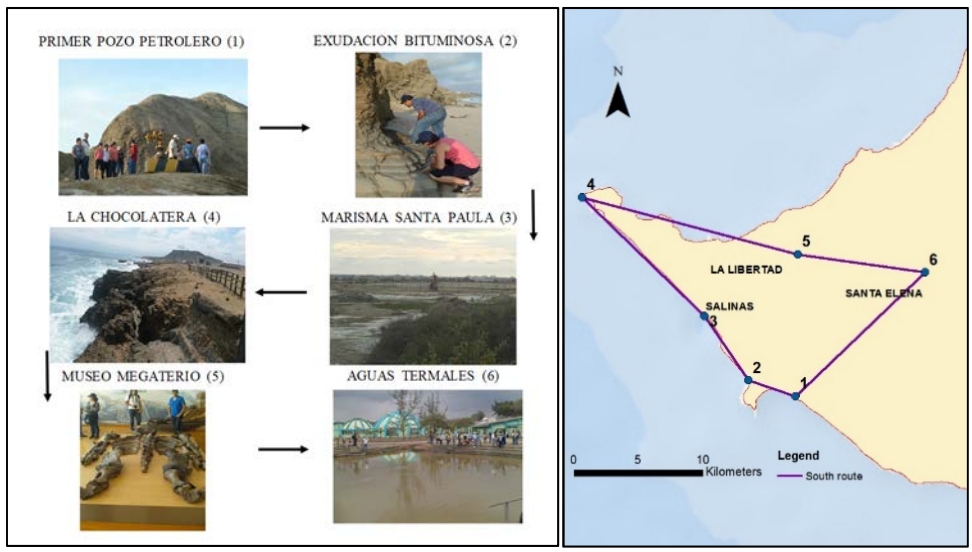

Figure 3: Suggested itinerary, selecting several geological sites and industrial sites.

5 DISCUSSION

From the methodological point of view, the inventory and valuation of applied geosites and industrial sites [19] allowed to assign a semi-quantitative value to the resources and possibilities of the Santa Elena Peninsula, within the context of the Ancon-Santa Elena Geopark. In particular, this process allowed identifying and ordering the areas of interest from three aspects: Interest, Susceptibility and Protection. For the assessment of the industrial sites, we used the same geological places sequence taking into consideration that the areas of industrial interest are a consequence of the use of geological resources.

The valuation of these places facilitated the practical adoption of the inventory by the potential users. The purpose of the evaluation was: i) to guide non-experts on the relative value of a place compared to others that are part of the inventory in the region under consideration. Thus, it allowed prioritizing further use or conservation actions and ii) to highlight a distinguishable set of places with very high and high values.

The SWOT analysis applied allowed relating the potential use of the zones of interest for geotourism. In addition, the application of the TOWS matrix provided important information on the viability of the geotouristic development and the awareness of the full potential of the study area.

Therefore, the assessment of the geological sites and industrial sites show: i) the relevance of the places and ii) the proximity among the areas. An alternative to take advantage of the existence and importance of geological sites and industrial sites may be the recognition of the Ancon-Santa Elena Geopark. Another alternative is the creation of a Geotourism Route that connects the evaluated areas.

6 CONCLUSIONS

This research shows the existence of various geosites and industrial interest places in the Santa Elena Peninsula, within the context of the Geopark Ancon-Santa Elena project, which has a potential for exploitation as a geotourism option. From the list of places of interest, we defined 37 geological sites and 8 industrial sites based on the methodology [19], already tested in other studies. The methodology considers three aspects: interest, degradation and conservation or protection. It ensures the development of education, tourism and geoconservation around these sites. The experts evaluated the sites with the specific criteria described in the analysis. In addition, we established the SWOT matrix that provides a comprehensive analysis for the local development considerations of these places.

The inventory and evaluation of the areas of interest in the study area are the basis for an economic initiative and future protection. Moreover, this is the first step to propose development alternatives based on geological and industrial wealth. The creation of a Geotouristic Route, the acceptance of the Ancon-Santa Elena Geopark or type of recognition based on the existing places would favor the geodiversity and the community of the area. Furthermore, the assessment added value to the zone. Consequently, it is possible to take adequate measures for the protection and disclosure of the different resources. Finally, the proposed strategies intend to encourage tourists to visit the area and recommend exclusive programs for children, young people, adults and people with special abilities. Social media and main national media could be in charge of the advertisement of these geosites.

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