

Analysis of the Conservation Model of Territorial Forest and Vegetation Protection in Azuay, Ecuador

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Abstract

In Ecuador, the changes in vegetation coverage seem to be directly influenced by the deforestation rates, and by the change in use of soil with forestation capabilities to farming soils, causing the loss of native forests, as well as the goods and services they help provide to the local communities. The objective of this article is to get a preliminary diagnostic of the management of the Forest and Protecting Vegetation Areas (ABVP) in the towns of the province of Azuay, through the review of: Development and Territorial Management Plans (PDYOT) available in the city level governments; statistics of town areas as given by the Ecuadorian National Institute of Statistics and Census (INEC), Maps of ABVP's emitted by the Ministry of Environment, and the Department of National Forests, which are available at the National Department of Information (SNI). Getting to the conclusion that more than 60% of the ABVP in the entire province are centralized in the cities of Cuenca (42%) and Pucara (19%), and also existing in a town which has not reported the existence of ABVP called Guachalapa; The most frequent anthropogenic activity in the towns that pushes the ABVP's is the expansion of the farming areas (8 towns), followed by the cattle farming activities (6 towns); the reforestation is one of the most frequently proposed projects to achieve the recovery and conservation of the ABVPs, followed by updating activities for the ABVP Forest Management Plans.

Keywords

Territorial planning, Development, Forest areas, Protecting Vegetation, Anthropogenic activities

1. Introduction

Interactions between forests and forest soils help maintain environmental conditions to ensure a productive food system, improved rural livelihoods and a healthy environment in the face of global, national and local changes, fulfilling a fundamental role in sustainable development [1, 2, 3, 4].

Desertification is considered a problem on a global scale because it affects approximately one sixth of the world's population and one quarter of the total land area of the world [5]. In Ecuador between 1982 and 2003, 34,686.3 km² of land was degraded, approximately 14.2% of the national territory. Of this total, 25.9% corresponds to the mountains, 30% to the coast and

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44.1% to the east. In the mountains, the provinces of Pichincha, Loja and Azuay account for 13% of the total [6].

Poor land management, intensive crops, deforestation, and wildfires are some of the factors related to desertification. According to the Ministry of Environment, Ecuador has an annual deforestation rate of 95000 hectares, one of the highest in South America.

The interest in environmental conservation in Ecuador has increased in recent years, becoming embodied in the most recent Ecuadorian Constitution (2008), which through Article 405 incorporates the protected areas of local governments as one of the four subsystems that are part of the National System of Protected Areas (SNAP) to guarantee the conservation of biodiversity and the maintenance of ecological functions.

The Territorial Planning applied to the ABVP conservation categories, is an important planning instrument, which seeks the preservation of biological and cultural wealth, through clear rules of conservation and recovery of resources, being the obligation of each local government the preparation and approval of development plans and territorial planning, said competences are regulated by the Constitution and the Organic Code of Territorial Organization, Autonomy and Decentralization COOTAD [7].

The SNAP contemplates seven categories of protected areas: national parks, ecological reserves, wildlife refuges, biological reserves, national recreation areas, wildlife production reserves, and hunting and fishing areas. The Areas of Forests and Protective Vegetation (ABVP) constitute another category of conservation, the main differences with the seven of the SNAP are that forests can be privately owned, in addition, certain survival activities are allowed. SNAP areas and forests are included in a general management plan, in addition to this each ABVP has a specific management plan.

1.1. General Data and Geographical Location of the Province of Azuay

The province of Azuay is a diverse geographical space for its territory, climate, population, economic production and other elements that identify and distinguish it from the other regions of Ecuador.

According to Father Julio Maria Matovelle, the word ‘Azuay’ means liquor or “heaven’s rain;” it is a term of cañari origin formed by the word “azu”, which means “liquor,” and the suffix “ay” which means from the heavens.

It has approximately 8,492.76 km² of surface, and a height that oscillates between 37 m above sea level in the coastal area of Camilo Ponce Enriquez and 4,482 m above sea levels in the national park El Cajas. The province of Azuay is concluding several limits definition processes, which once the corresponding procedures are completed will redefine the city areas and the total area of the province.

As of 2010, according to the Population and Housing Census, a population of 712,127 inhabitants is registered in Azuay, which represents 4.92% of the national population, of which 380,445 belong to the urban area and 331,682 to the rural area. According to the projection of the estimated population, with the data of the last inter-census period, by 2020 the population would increase to 881,394 inhabitants [8].

The Province of Azuay borders North with the province of Cañar, to the South with the Province of Loja, to the East with the Amazonian provinces of Morona Santiago and Zamora

Table 1
Area of the Azuay Province [8]

TOWN	AREA (ha)	PERCENT
Cuenca	375.443,11	41,75
Pucara	84.800,00	9,43
Santa Isabel	77.141,00	8,58
Sigsig	67.453,00	7,50
Nabon	66.820,00	7,43
Gualaceo	37.000,00	4,11
Giron	35.010,00	3,89
Sevilla de Oro	31.100,00	3,46
Oña	28.976,00	3,22
Paute	26.990,00	3,00
Camilo Ponce		
Enriquez	26.700,00	2,97
San Fernando	14.051,00	1,56
El Pan	13.278,87	1,48
Chordeleg	10.470,00	1,16
Guachapala	3.966,94	0,44

Chinchiipe, to the West, its geographical location allows it to share borders with two coastal provinces, El Oro and Guayas.

The capital of the province is the city of Cuenca, and the province is composed of 15 towns (Figure 1): Camilo Ponce Enríquez, Chordeleg, Cuenca, El Pan, Girón, Guachapala, Gualaceo, Nabón, Oña, Paute, Pucará, San Fernando, Santa Isabel, Sevilla de Oro, Sígsig, located in the Paute river basin and the Jubones river basin. The surface values of each town are detailed in Table 1.

1. Methodology

The methodology applied is of mixed qualitative and quantitative type. The former begins with the elaboration of an institutional and legal framework based on the Kelsen Pyramid, through the bibliographic review of the regulations in force, in the Official Registry, applicable to the PDYOT of the cantons of the Province of Azuay.

The PDYOT is compiled from the 15 towns of the Province of Azuay (Table 1), taking as a source the websites of each local government and / or the National Information System, SNI (Table 2).

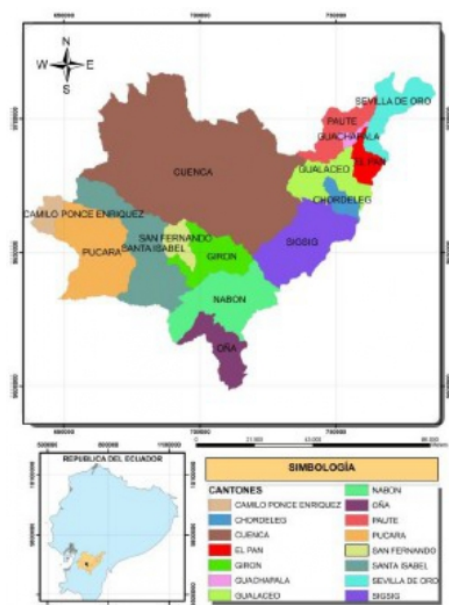


Figure 1: Localization

Table 2: Periods of validity of PDYOT of Azuay Province

TOWN	START YEAR	UPGRADE	END	REFERENCE
CAMILO PONCE ENRIQUEZ	2012		2026	[9]
CHORDELEG	2012	2015	2019	[10]
CUENCA	2014	2015	2019	[11]
EL PAN	2012		2027	[12]
GIRON	2014		2019	[13]
GUACHAPALA	2014		2017	[14]
GUALACEO	2012		2032	[15]
NABON	2014		2019	[16]
OÑA	2014		2019	[17]
PAUTE	2014	2015	2025	[18]
PUCARA	2014		2019	[19]
SAN FERNANDO	2014		2025	[20]
SANTA ISABEL	2014		2025	[21]

SEVILLA DE ORO	2012	2014	2027	[22]
SIGSIG	2015		2027	[23]

The town PDYOTs are reviewed under the structural reference of the Methodological Guide for the Development of Territorial Management Plans [24] and extract the information related to the biophysical component - subcomponent Fragile ecosystems and conservation priorities – ABVP

With each town’s information collected from ABVP and the anthropogenic activities that exert pressure on them belonging to the Diagnostic and Information Phase of Projects or Programs contained in the Proposal phase, a quantitative analysis is carried out [25].

2. Results and discussion

2.1. Institutional and legal aspects

Table 3 details the norms applicable to the ABVP, under the Ecuadorian legal margins.

Table 3: Institutional regulations

RULE	ARTÍCLES / DETAIL OF THE REGULATIONS	REFERENCE
Constitution of the Republic	Arts: 3, 14, 57, 66, 71, 72, 73, 74, 83, 261, 262, 263, 264, 267, 275, 276, 277, 282, 284, 313, 317, 376, 395, 396, 397, 398, 399, 400, 404, 405, 406, 407, 408, 411, 414, 415, 424, 425	[26]

International treaties and conventions	Programa Hombre y Biosfera MAB de la UNESCO, Convención RAMSAR, Convención española sobre el Comercio Internacional de Especies Amenazadas de Flora y Fauna Silvestres CITES, Convención Marco de las Naciones Unidas sobre el Cambio Climático, Convención Marco sobre la Diversidad Biológica, Convenio sobre la Diversidad Biológica, Declaración de Río sobre Medio Ambiente y Desarrollo, Protocolo de Kioto sobre Cambio Climático, Foro Intergubernamental de Bosques, Convenio Internacional de Lucha contra la desertificación.	
Supreme Laws Código Orgánico de Organización Territorial, Autonomía y Descentralización COOTAD	Arts: 2, 4, 6, 10, 11, 12, 28, 29, 41, 54, 55, 64, 65, 72, 100, 114, 115, 136, 139, 274, 395, 431, 516	[7]
Código Orgánico de Planificación y Finanzas Públicas COOPLAFIP	Arts: 1, 2, 34, 77, 79, 81, 96, 97, 98, 104, 115, 178	[27]
Ley Orgánica de Recursos Hídricos, Usos y Aprovechamiento del Agua	Arts: 1, 3, 4, 8, 9, 10, 12, 13, 14, 15, 16, 25, 28, 30, 33, 34, 37, 42, 57, 58, 59, 60, 64, 65, 66, 71, 72, 73, 76, 78, 79	[28]
Ley Orgánica de Empresas Públicas LOEP	Arts: 3, 4.	[29]
Ordinary Laws Ley Forestal y de Conservación de Áreas Naturales y Vida Silvestre	Arts: 1, 5, 13, 44, 48, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 94, 106	[28]
Ley de Gestión Ambiental	Arts: 1, 2, 3, 4, 5, 6, 9, 10, 13, 15, 16, 20, 33, 34, 35, 39, 41, 43, 44, 46	[29]
Ley de Prevención y Control de la Contaminación Ambiental	Arts: 6, 10, 12	[29]

Regulations	De las políticas básicas ambientales Arts: 1 Libro I: Arts: 1, 2, 3, 4	
Texto Unificado de Legislación Secundaria TULAS	Estatuto de gestión organizacional: Arts: 1, 2, 3,7 Libro II: Arts: 1, 2, 3, 6. Libro III: Arts: 155, 156, 158, 168, 169, 170, 171,172, 173, 174, 175, 176, 177, 178, 179, 180, 192, 193, 194, 195, 200, 201, 220 Libro IV: Arts: 1, 2, 3, 4, 5, 6, 72, 94, 114, 165,166, 167, 168, 169, 170, 171, 172,173, 174, 175, 176, 179 Libro VI: Arts: 1, 2, 9, 15, 26, 203, 255.	[29]
Agreements		
Las Normas para el Manejo Forestal Sostenible de los Bosques	Acuerdo Ministerial del Ambiente, 2015	[30]

2.2. Value of the ABVP and related anthropogenic activities

Table 4 shows the values reported in the PDYOTs of the ABVPs and the anthropogenic activities that affect them in each town in the Province of Azuay.

Table 4: Description of ABVP (Biophysical Component) / anthropogenic activities

DIAGNOSIS			
CANTÓN	ABVP	ABVP (ha)	PROBLEMS / ANTHROPOGÉNIC ACTIVITIES
CAMILO PONCE ENRIQUEZ	Hacienda Cigasa Molleturo - Mollepongo Uzchurrumi, La Cadena, Penas Doradas, Brasil, Balao	38252,97	Logging Improper use of technologies.
CHORDELEG	Collay	2274,00	Overgrazing, Incinerate Agricultural frontier extension Wood extraction

CUENCA	Cuenca del Río Paute Tourism Sun Sun Yanasacha Molleturo Mollepungo Mazán Quinoa Miguir Subcuenca del Río Dudahuaycu Totorillas	186219,78	Agricultural activities Tourism Overgrazing
EL PAN	Collay	4647,60	Agricultural activities Agricultural frontier extension
GIRON	El Chorro	4807,00	Agricultural frontier extension, Incinerate, Tree fell.
GUACHAPALA	-	-	-
GUALACEO	Aguarongo Collay Río Zhío - Santa Bárbara	24131,00	Agricultural frontier extension, Piece of ground Tree fell Overgrazing Mining activity Incinerate Temporary crops
NABON	Subcuenca Alta del Río León y Microcuencas de los Ríos San Felipe de Oña y Shincata	18492,65	Pasture Agricultural activities New read work Dwelling
OÑA	Subcuenca Alta del Río León y Microcuencas de los Ríos San Felipe de Oña y Shincata	15936,80	Agricultural frontier extension Overgrazing
PAUTE	Pichahuaicu Rumicruz Collay	3132,23	Deforestation, Incinerate.

PUCARA	Uzhurrumi, La Cadena, Penas Doradas, Brasil	84652,87	Incinerate Tree fell
SAN FERNANDO	ABVP Molleturo Mollepongo n° 5/6/7 Cuenca del Río Paute	2638,59	Agricultural frontier extension Livestock activities
SANTA ISABEL	Jeco Molleturo y Mollepongo No.4/5/6	16636,36	Short cycle crops Cattle raising, Agricultural frontier extension (Pasture)
SEVILLA DE ORO	Jeco Allcuquiro	11785,00	Agricultural frontier extension
SIGSIG	Collay Subcuenca Alta del Río León y Microcuencas de los Ríos San Felipe de Oña y Shincata Cuenca del Río Paute	25170,00	Agricultural frontier extension (Pasture)

The Province of Azuay has an area of 438776.85 hectares, with the city of Cuenca having the largest ABVP with 186219.78 ha, which represents 42.4% with respect to the Provincial ABVP, followed by Pucará with 84652.87 ha (19.3% of the provincial), while Chordeleg owns 2274 ha of ABVP (0.5% of the provincial). In the town of Guachapala it is reported that there are no ABVP.

The sum of the ABVP of five towns represents more than 80% of the Provincial ABVP, as follows: Cuenca with 186219.78 ha (42.4%), Pucará with 84652.87 ha (19.3%), Camilo Ponce Enríquez (8, 7%), Sigsig (5.7%) and Gualaceo (5.5%) as detailed in Figure 2.

Based on the information compiled in Table 4, it is visualized in Figure 3 that the anthropogenic activities that affect the ABVP more frequently in the cities of Azuay are: extension of the agricultural frontier present in 8 towns, agriculture in 6 towns, and in 4 towns overgrazing, burning and logging.

2.3. Management and Process indicators used by the City PDYOT projects and programs in the province of Azuay

The territorial planning, shows the goals proposed for the local town's PDYOT projects.

The projects should support the accomplishment of national strategic objectives, which for Ecuador should be the National Development Plan's objectives [22]

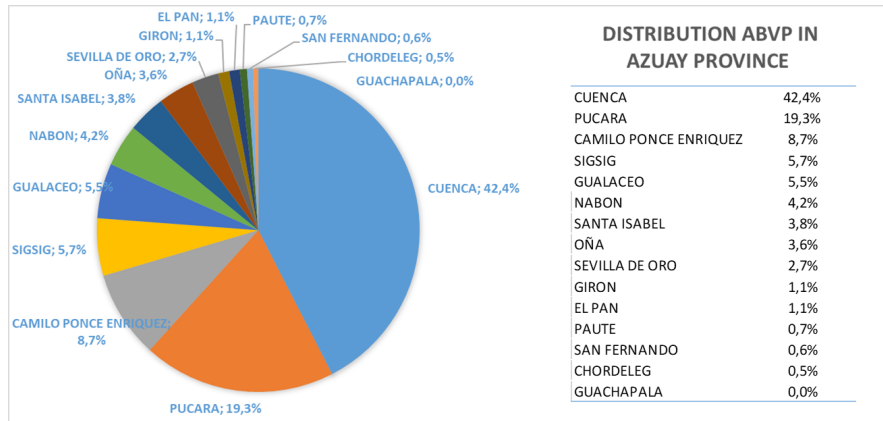


Figure 2: Distribution ABVP in the Azuay Province

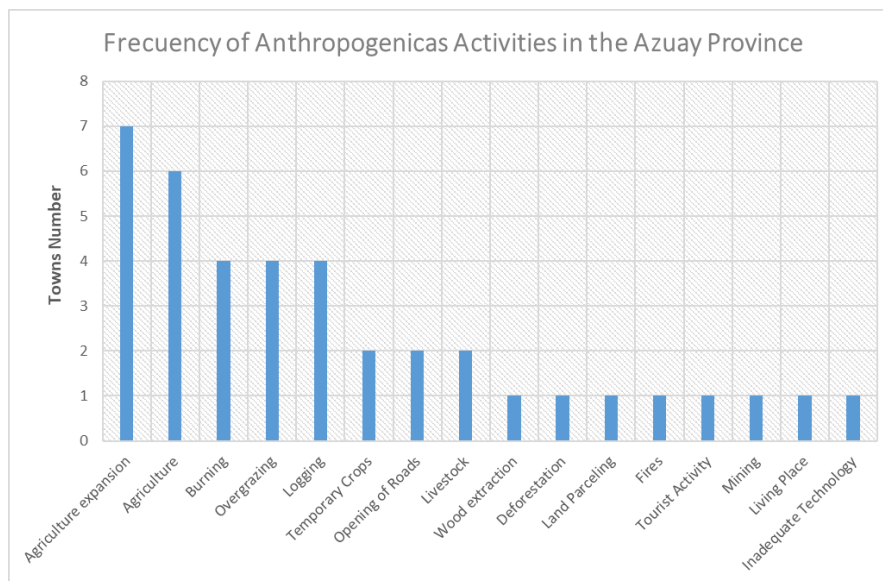


Figure 3: Frequency of Anthropogenic Activities

All town PDYOT on Azuay based their projects and programs related to ABVP with the objective number 7 of the PNBV: “To guarantee the environment’s and nature’s rights, and to promote environmental, territorial, and global sustainability.

Figure 4 shows the classification of the and details the frequencies of the goals that have been identified in the PDYOTs to achieve the recovery or conservation of the ABVP, with the projects focused on reforestation being implemented in 7 cities (Camilo Ponce Enriquez, Oña, Paute, Pucará, San Fernando, Santa Isabel, Sevilla de Oro), while 3 will work on the ABVP Management Plan Update (Chordeleg, Gualaceo, Nabón) and Compliance with the ABVP Management Plan (Cuenca, Girón, Sigsig), and finally in a Canton will be implemented the Creation of Regulation Ordinances (Gualaceo) and another in the Generation of Real Data (El Pan).

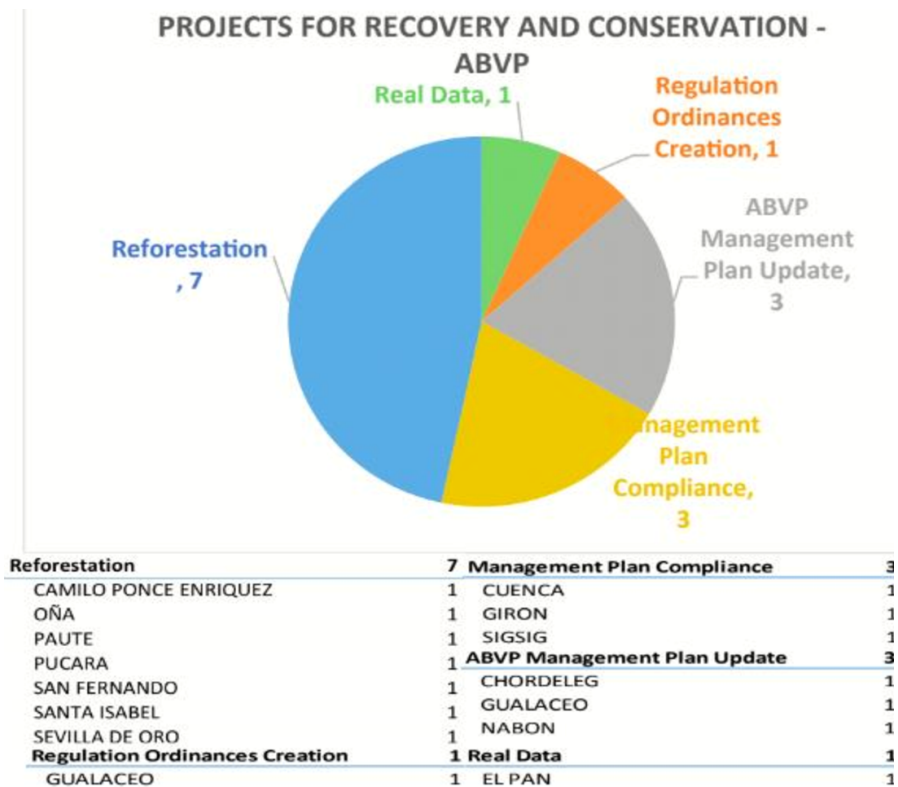


Figure 4: Projects in the PDYOT

3. Conclusion

Protective forests have the objective of conserving and protecting biodiversity and natural resources, but unfortunately it can be evidenced during the present document review that all of them are intervened (human activities), so that they cannot fulfill their function of Soil conservation and life. The application of current legislation has not been effective in preventing the degradation of these protected areas which have suffered deforestation.

Other contributing factors are:

The lack of accurate and real data on protective forests and the rate of deforestation and reforestation which hinders effective decision making.

A disarticulation between MAE and GAD regulators can be evidenced during the review of ABVP data, which differ from one institution to another.

Lack of knowledge on the effects of ABVP damage.

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