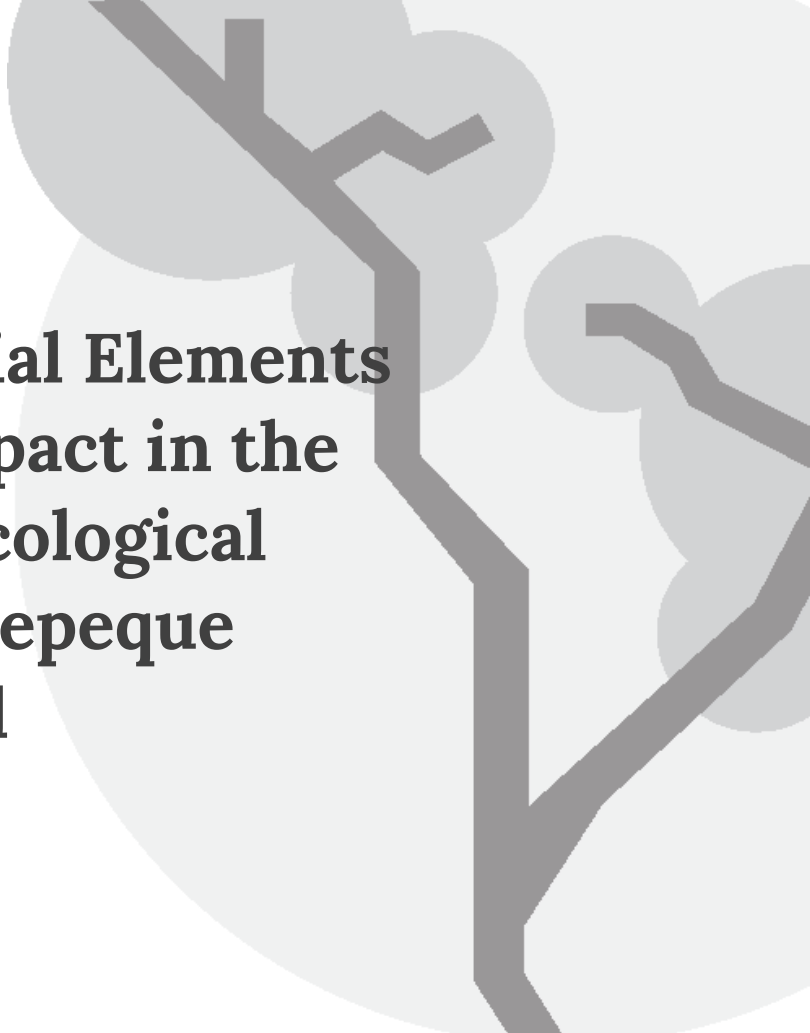


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Assessment of Social Elements with Ecological Impact in the Historical Socio-Ecological Systems in the Jaltepeque Estuary Watershed

Ariel Alexander Quintanilla Magaña¹

ABSTRACT

The mangrove ecosystem-based management is not a simple task. It poses a challenge for nations, municipalities, and stakeholders that look to protect their livelihoods. The integration of watersheds provides a scope that includes freshwater and soil pollution in the upper basin. The Socio-ecological system framework offers a new vision for understanding how the social elements interact with the ecological cycles in an area without being limited by political boundaries. As well as the configuration of spatial patterns that discover indicators to establish action keys for ecosystems and livelihoods. However, understanding the present is insufficient to get the data needed to cover crucial thresholds impacting human beings and the ecological cycles in the mangrove forests and estuaries. Through a historical revision of 105 documents from the early 1900s to 2014, as well as 24 interviews were performed to delimit the configuration of two Socio-Ecological Systems in the Jaltepeque estuary watershed. First, which almost covers an 80-year period, has a primary factor: the no-limiting of cotton crops implies the replacement of the wetland area for more production. The second SES was started by the civil war in El Salvador and reconfigured to small subsistence production.

Keywords: environmental history; ecosystem services evaluation; watershed management; mangrove forest.

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The Jaltepeque Estuary Watershed, located in the central zone of El Salvador, extends 965.2 km² between La Paz and San Vicente Provinces (figure 1), where the Lempa River flows into the Pacific Ocean². At the base of this estuary, is located the second mangrove forest of importance in the country, covering 7,559 hectares. In 2011, it was declared the sixth Ramsar Site in El Salvador, covering 49,954 hectares between the core area and its buffer.³

The principal characteristic of this ecosystem is a forest that converges among seawater and freshwater and a phreatic land layer up to 5 meters in depth ⁴. Mangrove is a crucial ecosystem for inhabitants in the area, especially around the estuary, to catch crabs, shrimp, and fish. In addition, mangrove wood is still used as a building material for houses. These benefits are called ecosystem services, in which the mangrove forest provides essential services of provisioning, regulation, support, and cultural heritage to inhabitants⁵.

However, increasing human activities in the area have threatened these ecosystem services. In El Salvador, the use of agrochemicals in crops has been a concern for the government and environmental specialists who have evaluated the area of the lower Lempa River. ⁶. Through the years, the implications of this impact have been taken without considering the context of the production or other variables, such as the support given to the salvadorian government in the expansion of monoculture crops, as well as other social implications of the inhabitants and the structure configured in the area.

Historically, the Jaltepeque Estuary Watershed was an area where large landowners produced cotton and sugarcane. Since the 20th century, those “haciendas” have increased their cover, put more pressure on the mangrove forest, and configured

² Ministerio de Medio Ambiente, ‘Plan de Manejo Región Hidrográfica Del Estero de Jaltepeque’, 2013.

³ Ministerio de Medio Ambiente y Recursos Naturales, ‘Plan de Manejo Humedal Complejo Jaltepeque’ (San Salvador, 2016); Ministerio de Medio Ambiente, ‘Plan de Manejo Del Humedal Complejo Jaltepeque 2018-2023’ (San Salvador, 2018), <http://www.marn.gob.sv/sitio-ramsar-complejo->

⁴ Secretaría de la Convención Ramsar, *Manual de La Convención Ramsar*, 6th ed. (Gland: Secretaría de la Convención de Ramsar, 2013).

⁵ Edward B. Barbier, ‘Progress and Challenges in Valuing Coastal and Marine Ecosystem Services’, *Review of Environmental Economics and Policy* 6, no. 1 (1 January 2012): 1–19, <https://doi.org/10.1093/reep/rer017>.

⁶ Rafael Eduardo Rubio Fabián, ‘Informa Del Estado Del Medio Ambiente Marino En El Área Pacífico de El Salvador’ (San Salvador, April 1994); Consejo Nacional de Planificación y Coordinación Económica (CONAPLAN), ‘El Salvador. Zonificación Agrícola-Fase I’, 1974, <http://www.oas.org/usde/publications/Unit/oea34s/begin.htm>.

social aspects through the absence of land access to the population, poverty, and pollution of drinking water.

The scenario has been changed through the constitution of communitarian organizations around the region. After the Civil War, new communities were founded in the former hacienda headquarters, and their land was accessible. In addition, the conservation of nature has been a priority in defending the livelihoods and species that live in the mangrove forests and the estuary.

The socio-ecological system approach provides an understanding of the different strategies used by the population for ecosystem management from the early 20th century to the present. This research has a starting point on the question: How have the different perspectives of the use and management of Jaltepeque Estuary affected both the mangrove biome and the population? Using a social-ecological view, the historical reconstruction allows social implications and ecological pressures to be stratified by the range of stakeholder actions over the years. This study covers 120 years (1900-2020), defining relationships between agricultural exploitation processes and rebuilding communities towards small-scale and subsistence production.

The use of an environmental history framework establishes an appropriate approach to identify patterns and processes in the area of study, especially in the economic, institutional, technological, and social changes, to define which area is vital to conserve or have a different use⁷. According to Castro Herrera⁸, environmental history is developed among the biophysical means where human activities are located; how those relations (as shapes and purposes) reorganize the space, and how it is assimilated by humans as culture, values, and expressions.

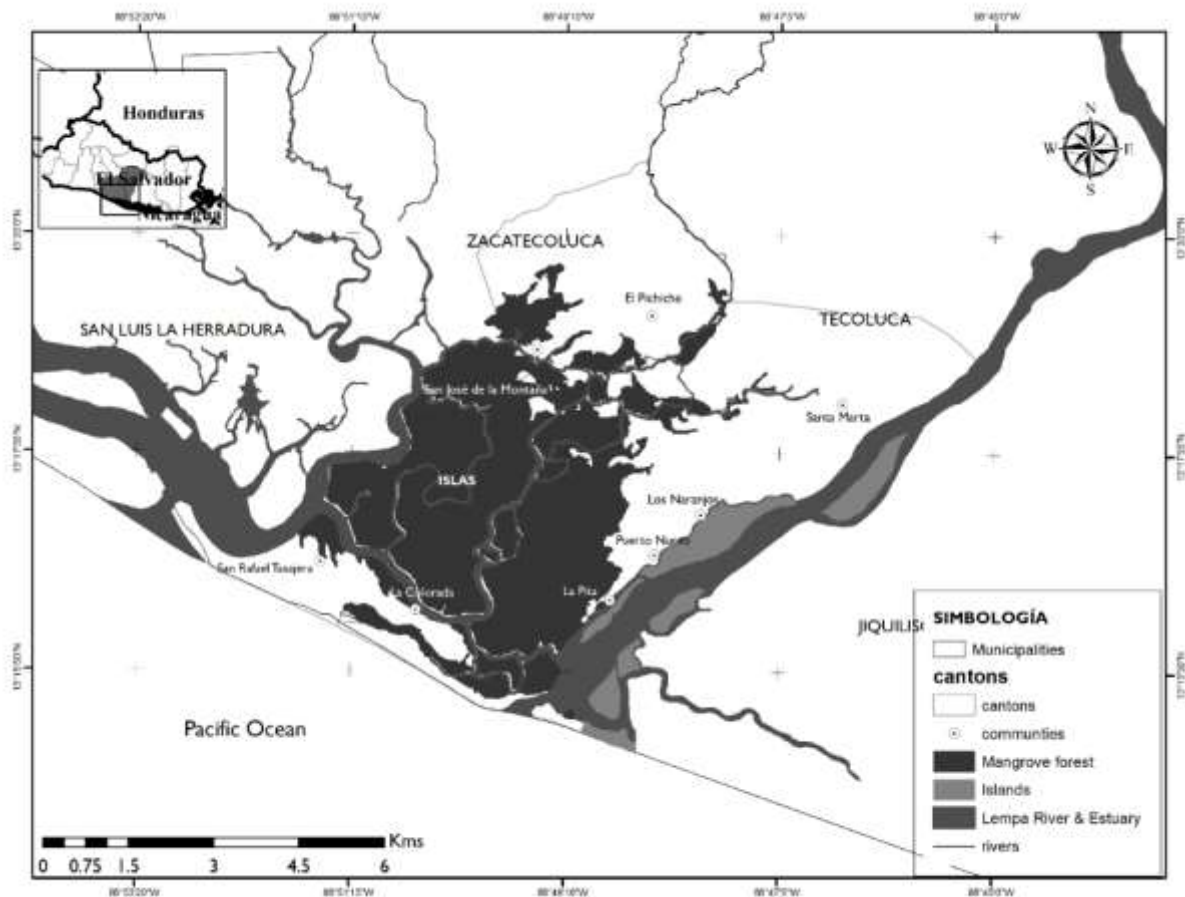
The use of the watershed as the “boundary” in this socio-ecological system implies recognizing of the natural spaces (delimited by all the rivers to discharge in the Jaltepeque estuary) in the crops settlements in the period selected (1900-2020), as well

⁷ Gabriel Garnero, 'Ambiente y Sustentabilidad: Aportes Desde La Historia Ambiental', *Estudios Rurales. Publicación Del Centro de Estudios de La Argentina Rural* 13, no. 27 (January 2023), <http://portal.amelica.org/ameli/journal/181/1813954017/>.

⁸ Guillermo Castro Herrera, 'De Civilización y Naturaleza. Notas Para El Debate Sobre Historia Ambiental Latinoamericana', *Revista Ecuatoriana de Historia*, no. 20 (2004): 99-113.

as the patterns through the human settlements and the protection of primary forests in the watershed by the present-day communities.

Figure. 1. Jaltepeque estuary location map



Source: Author's elaboration using ArcMap 10.3, based on mangrove forest coverage data from the Ministry of Environmental and Natural Resources of El Salvador (2018) and the municipalities' boundaries from the National Registry Center of El Salvador (2019).

METHODS

During the last 120 years, the Salvadorian coast has changed depending on the different economic models involved in the world economy. Thus, the Jaltepeque Estuary watershed has suffered several impacts from the growth of new crop areas. That has affected the inhabitants and the mangrove forest, the second wetland most important in extension in El Salvador. In this manner, this research aims to describe the different processes, management forms, and various uses developed across the

twentieth century and their affectations in the Jaltepeque Estuary Watershed to understand the current socio-ecological system model.

The socio-ecological system is understood as the complex relationship between society and nature, mediated by the system feedback provided by spatial patterns (vegetation distribution, flows, type of soil, biodiversity) and social reorganization caused by ecological perturbative scenarios (such as droughts, floods, hurricanes, earthquakes) or conflicts among stakeholders (governance system, empowerment of process, Common Pool Resources conflict)⁹.

It is essential to explain some concepts to gain insights into defining the socio-ecological system. Spatial Resilience is the equilibrium point where the ecosystem maintains its life cycles without being perturbed by human actions; moreover, social system behaviour quickly responds to any perturbation¹⁰. The thresholds are a no-return point at which the system cannot respond to perturbations; it is necessary to redefine each element of social organization that might be a counter-producer for the ecological variables¹¹.

This research used the Environmental History Methodology¹² to delineate the study area. In that direction, environmental history focuses in the different relational patterns between society and nature, but since mid-twentieth century the use of natural borders or ecosystems as study field into the human geography and historical studies¹³. In this case, it was defined through the watershed boundaries. In the same way, this methodology provided a framework to include different temporal scales, which were defined for this work in the last part of the nineteenth century until the 1990s. The techniques used to collect data were reviewing statistics, economic data, maps, land cover change data, and interviews with stakeholders in the Jaltepeque Estuary.

⁹ Rathe and Laura, 'La Sustentabilidad En Los Sistemas Socio-Ecológicos', *Utopía y Praxis Latinoamericana* 22, no. 78 (July 2017): 65–78, <http://www.redalyc.org/articulo.oa?id=27952381006>.

¹⁰ Graeme S Cumming, 'Spatial Resilience in Social-Ecological Systems', 2011.

¹¹ Ricardo Castro-Díaz, 'IMPLICANCIAS DE LA RESILIENCIA ESPACIAL EN LA PRESTACIÓN DE SERVICIOS AMBIENTALES EN CUENCAS NORANDINAS', *Contribuciones Científicas GAEA* 25 (2013): 71–87.

¹² Michael Williams, 'The Relations of Environmental History and Historical Geography', *Journal of Historical Geography* 1, no. 20 (1994): 3–21.

¹³ Hortensia Castro, 'La Cuestión Ambiental En Geografía Histórica e Historia Ambiental: Tradición, Renovación y Diálogos', *Revista de Geografía Norte Grande*, no. 54 (2013): 109–28.

The scope of this process was to identify changes in land use, geomorphological changes, laws and regulations in the soils of mangrove forests, and conservation policies. From January to March 2020, 105 documents were reviewed, divided as follows: 22 newspapers, ten laws, one governmental code, five ordinances, four policies, 17 reports, six environmental plans, two opinion articles, two scientific articles, eight NGO studies, four books, one government report, 12 maps, two dictionaries, four censuses, five theses. It conducted 24 interviews in the study area and four focus groups to establish spatial-temporal changes in the mangrove forest and the exploitation of soil via cotton farms.

All the documents have been systematized by the impact factor of change in the Jaltepeque Estuary, divided into six categories: legislation, Political Ecology Conflicts, Weather Events, Production, Management, and Communitarian uses. Those categories have been separated to incorporate a spatial resilience context when the thresholds were presented and the impact and response for ecological and social elements.

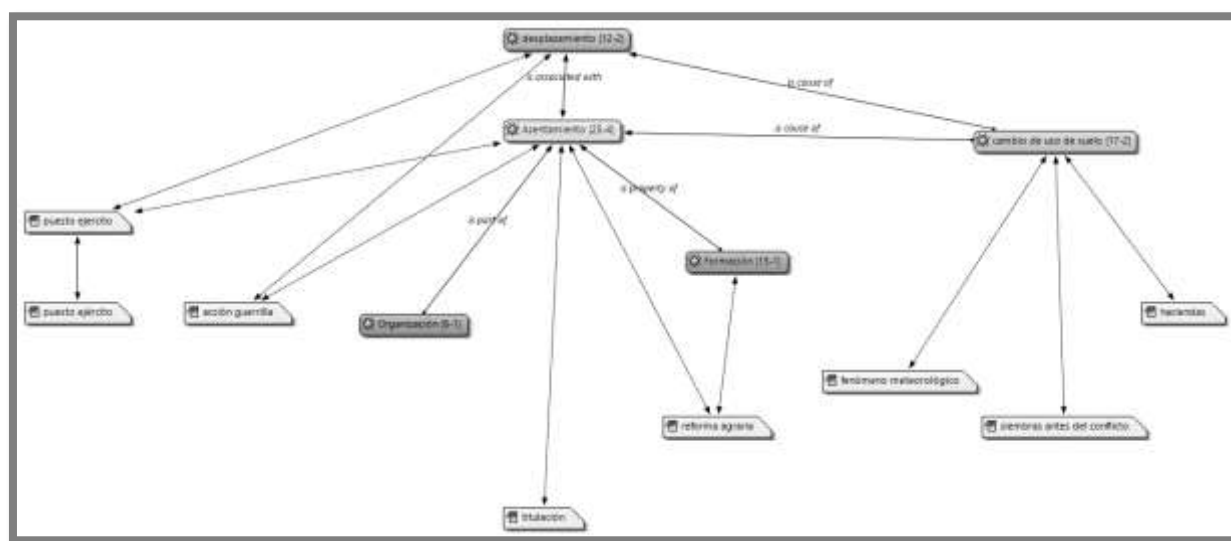
Table 1. Document Systematization in Categories

Documents	Legislation	Political Ecology Conflicts	Weather Events	Production	Management	Communitarian uses	Total
Newspapers	1	7	5	3		6	22
Laws	10						10
Governmental codes	1						1
Ordinances	4				1		5
Policies	4						4
Reports		1	4	12			17
Environmental plans					6		6
Opinion articles		1					2
Scientific papers		1		1			2
NGO Studies		6		1		1	8
Journals							0
Books			4				4
Memories		1					1
Maps			2	6			12
Dictionary						2	2
Census				1		3	4
Thesis	2	2	1				5
Total	22	19	16	24	7	12	105

Source: Author's own elaboration

The interview was analyzed throughout the Atlas.Ti program generates a semantic network that includes quotes from the community members with the data bibliographic review. In the same direction, the analysis process consists of an associative grid crossing the categories of social factors: settlement, change of land uses, displacements, and social organization. The results were analyzed in contrast with different periods where thresholds were identified and achieved to define a new organization model from stakeholders.

Figure. 2. Semantic Network to Community Settlements



Source: Author's own elaboration using Atlas.Ti 7.0

Table 2. Cross-analysis of social variables for new Socio-Ecological System Threshold

Categories	Settlement	Land uses change	Displacement	Social organisation	Total
Land uses change	5	0	2	2	9
displacement	1	2	0	1	4
Social organisation	2	2	1	0	5
Settlement	1	0	1	2	4
Total	9	4	4	5	

Source: Author's own elaboration using Atlas.TI 7.0

RESULTS

The presentation of the results has been divided into four sections. The first section explained the geomorphological structure of the Jaltepeque Estuary and the movements promoted by climate phenomena, such as hurricanes, and the streams and rivers that flow into the estuary. The second section established the former agricultural activities in the area and how the crop settlement defined spatial patterns by the Haciendas, which became in the current communities near the estuary and mangrove forest. A third section looked to understand the former conservation point of view developed by the Salvadorian State to conserve (or regulate) the deforestation process of the mangrove forest. The last section analyzed the salvadorian civil war as a threshold between the former agricultural exploitation to the communitarian uses and protection of the Jaltepeque estuary, explaining the social elements that modified the society-nature relationship in the area of study.

GEOMORPHOLOGIC EVOLUTION OF THE JALTEPEQUE ESTUARY IN THE TWENTIETH CENTURY

The Jaltepeque Estuary has been changing due to the sediment flows from the Lempa River; in the past, the Jiboa River had its river mouth in the estuary. According to Gierloff-Emden¹⁴. Until 1900, the estuary mouth was on the western side, next to the current San Marcelino Beach (13°20'59.92" N, 89°1'27.25" W). It was closed on the eastern side.

The Lempa River's importance in the evolution of the Salvadorian Coastal Plan is essential for the Jaltepeque Estuary and Jiquilisco Bay (the eastern side of the river). Eleven thousand years ago, the coastal line was in the current San Nicolas Lempa village. Still, in that period, sedimentation from Lempa formed the present La Paz and San Vicente provinces¹⁵. On this hand, the area determined the evolution in three factors: changes in the Lempa River Delta, the creation of a peninsula, and weather (by hurricanes)¹⁶.

¹⁴ H.G. Gierloff-Emden, *La Costa de El Salvador. Monografía Morfológica-Oceanográfica*, ed. Dirección de Publicaciones del Ministerio de Educación, 1st ed., vol. 1 (San Salvador: Ministerio de Educación, 1975), <http://books.google.com>.

¹⁵ Ibid.

¹⁶ Haydeé Beltrán, 'Evolución Del Sistema Estuarino de Jaltepeque' (San Salvador, 2014).

This evolution has been registered since the first maps elaborated on the area (figure 3). The first representation recorded is in the work of bishop Pedro Cortez y Larraz in the XVII century, where the estuary presented its mouth on the western side. In the same way, the British cartographer in 1804 represented the same characteristic, but his map recreated the peninsula as an island. On the first official map of El Salvador in 1859, created by Maximilian Von Sonnestern, the area was not an island but a peninsula with its mouth on the western.

However, in the twentieth century, three hurricanes changed the estuary, creating a new mouth in the middle of the peninsula and sedimenting the former western mouth. In 1911, the first tropical storm sedimented the channels into the estuary. In 1934, another hurricane generated the following events: the rupture of the mouth for the formation of Tasajera Island, El Cordoncillo Island, and the tongue of land of the Costa del Sol; while in 1998, with Hurricane Mitch, the mouth of the Lempa River was deviated, modifying Los Negritos beach¹⁷.

Older people on the islands still remember that event. In a personal communication with them, a person expressed: “that ‘llenona’(flood) was in 1944... and closed the coastal bar, from the coastal bar inland to there, where “tortugueros” (people that caught sea turtles) passed¹⁸”.

Another factor in the evolution of the Jaltepeque Estuary is the amount of seawater introduced into the system to facilitate mangrove growth, especially of the *Rhizophora* mangle (red mangrove), which is up to islands close to the inland. In addition, it needs to recognize the amount of freshwater from other rivers, such as Jalponga, Acomunca, and Guayabo¹⁹.

Considering that the Jaltepeque estuary is a slightly stratified estuarine system, that is, the amount of tide is higher than the freshwater discharge, the formation of new land is not ruled out, to the point of unifying the old bars, as happened in Tasajera Island

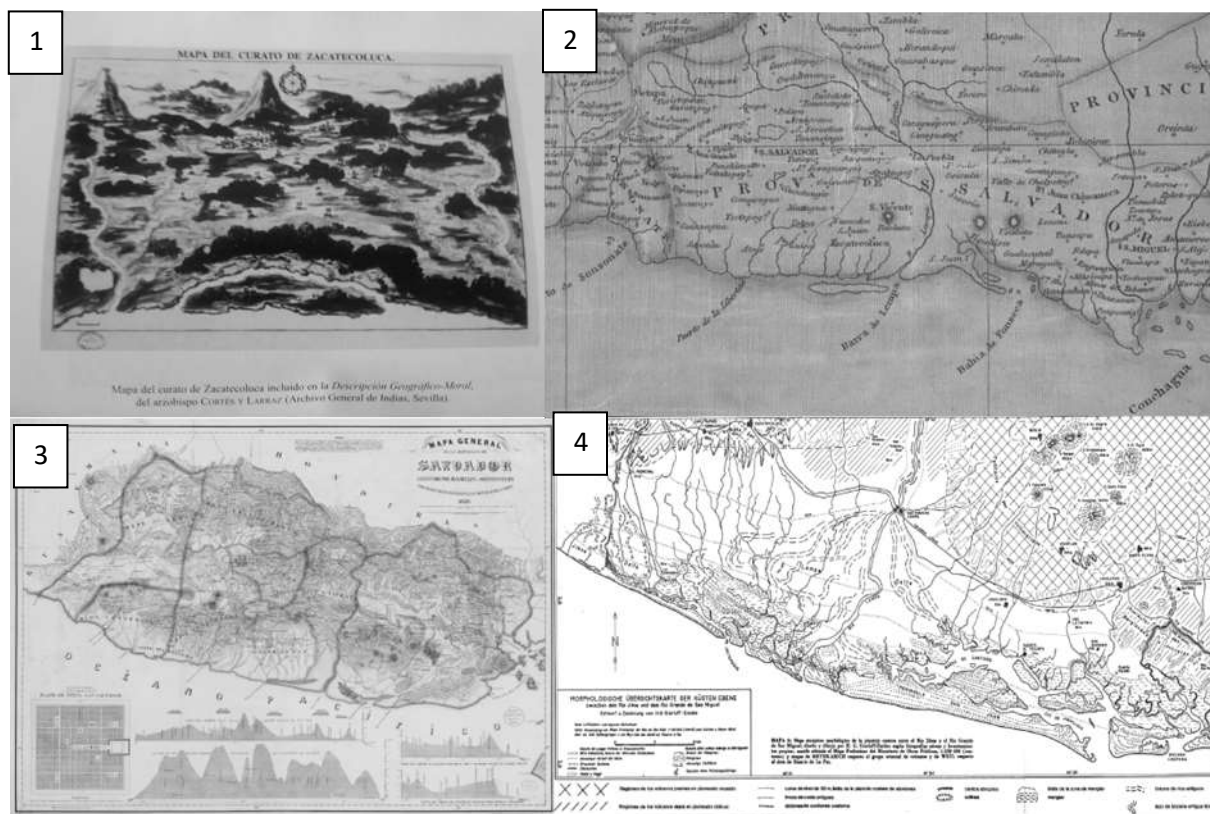
¹⁷ Ibid.

¹⁸ ‘Oral Interview in San Rafael Tasajera with the Author’ (San Luis La Herradura, La Paz, 13 October 2019).

¹⁹ Gierloff-Emden, *La Costa de El Salvador. Monografía Morfológica-Oceanográfica*.

²⁰This context is crucial since it has a significant implication for saltwater mangroves in the inland mangroves and the difficulties in consolidating other agricultural exploitation activities in the Jaltepeque estuary basin.

Figure 3. Register of geomorphological change in the Jaltepeque estuary from the 18th century to the middle of the 20th century"



Source: Author's collage elaboration. Map 1 Cortez y Larraz, P. (1958) Descripción Geográfico-Moral de la Diócesis de Guatemala II. Vol XX. Academia de Geografía e Historia de Guatemala (AGHG). Map 2. Arrowsmith, A. (1826) Map of Guatemala : reduced from the survey in the archives of that country, 1826. Map 3. Sonnestern, M. (1859) Mapa general del Salvador. Map 4. Gierloff-Emdem, H. (1976) a costa de El Salvador. Monografía morfológica-oceanográfica. Dirección de Publicaciones. San Salvador.

AGRICULTURE EXPLOITATION IN THE TWENTIETH CENTURY

In the 19th century, El Salvador transitioned its agricultural structure from indigo crops –great cultivation in the tropical and coastal areas – to coffee. In the Spanish colonial era, indigos generated landlords in Zacatecoluca, San Vicente, Usulután, and San Miguel; most were beneficiated during the independence process.

²⁰ Cristina Galván Arbeiza, 'Clasificación de estuarios a diferentes escalas espaciales mediante la integración de modelos físicos y biológicos' (Doctoral Dissertation, Universidad de Cantabria, 2014).

Indigo crops dropped due to the industrial production of chemical substitutions in the middle of the century, being marginalized in the first decade of the 20th century²¹.

This period was the configuration of the former socio-ecological system in the Jaltepeque watershed zone through the land use change and introduction of a new global market using cotton production. This spatial pattern changes in the coastal area, especially in the Jaltepeque watershed, put further pressure on the mangrove forests and the first inhabitants of this area.

On this hand, two agricultural products that affected the configuration of the Jaltepeque Estuary watershed were identified. Cotton was a significant activity from the 1930s to the 1980s, and sugar cane from the 1960s until now.

Cotton

The introduction of cotton cultivation on the coast, considered the last place to colonize, was necessary for the government of El Salvador ²². However, it is necessary to clarify that it is expressed in the transformation of the land through global commercial and capitalist dynamics sustained by cotton and that it was deployed in the central and eastern zones of El Salvador.

Cotton was a product that was introduced on a large scale during the 1940s. Cotton production was consolidated through family or single-person farms. By 1940, a producers' cooperative was formed by 120 members (farm owners) who produced 70% of all the cotton in El Salvador²³.

By 1942, cotton cultivation had spread to 14,014.74 manzanas (Manzana is a former measure unit of land. 1 Manzana is equal to 7000 square meters) with 568 producers, rising to a total extension of 28,218.64 Mz. and 1903 producers by 1951²⁴. The rise of cotton during almost 30 years is demonstrated by the production capacity of

²¹ Darío González, *Datos Sobre La República de El Salvador y Catálogo de Los Productos Enviados Por Esta República a La Exposición Panamericana de Buffalo, N.Y.*, vol. I (San Salvador: Tipografía La Luz, 1901).

²² David Browning, *El Salvador, La Tierra y El Hombre*, ed. Dirección de Publicaciones e Impresos, Cuarta Edición (San Salvador: CONCULTURA, 1975).

²³ Ibid.

²⁴ Ibid.

this product per manzana, as well as its weight in the participation of the Gross Domestic Product of El Salvador. In 1960, cotton was positioned as the country's second export product, yielding revenues of ₡37 million colons (Colons were the Salvadoran currency from 1892 to 2001 when it was substituted by the US Dollar. The currency in 1962 was \$1.00, which is equal to ₡2.50)²⁵ The economic profit of cotton production extended around the coastal zone and increased to 1000% from the 1950s to 1963 (Table 3), displacing other subsistence crops (such as maize, beans, or rice) and cattle areas. In the same period, the land cover increased by 43% in La Paz, San Vicente, and Usulután (Table 4).

Despite El Salvador's small territory, crop optimization practices were not a priority; instead, the priority was the expansion of the crop. In the 1950s, the construction of the Shoreline Highway (which would connect the country from end to end in its coastal zone) allowed the expansion of cotton to the entire coastline²⁶. This brought about the growth of “haciendas” (large farmers), which established “cascos” (headquarters) for those temporary workers who were used as shelters and later became hamlets with the agrarian reform during the 1980s. The extension of the cotton hacienda had social implications, but its most significant impact was ecological due to the use of Dichlorodiphenyltrichloroethane (DDT) as an insecticide on the crops²⁷.

Table 3. Cotton production and other production in the salvadorian coast area

Harvest	Production (metric tons)		Percentage of change
	1950	1963	
Cottonseed	9321	119768	1184%
Cotton	5565	71441	1183%
Sugar	39015	63134	62%
Rice	9453	11941	26%
Maize	130307	153246	18%
Beans	16471	14475	-12%

Source : Browning, D. (1975) El Salvador, la tierra y el hombre. San Salvador

²⁵ Ministerio de Agricultura y Ganadería, 'Situación Del Mercado de Los Principales Productivos Agropecuarios. Enero – Marzo de 1978' (San Salvador, 1978).

²⁶ Consejo Nacional de Planificación y Coordinación Económica (CONAPLAN), 'El Salvador. Zonificación Agrícola-Fase I'.

²⁷ Rubio Fabián, 'Informa Del Estado Del Medio Ambiente Marino En El Área Pacífico de El Salvador'.

Table 4. Variations in cotton land use in 1950-1961.

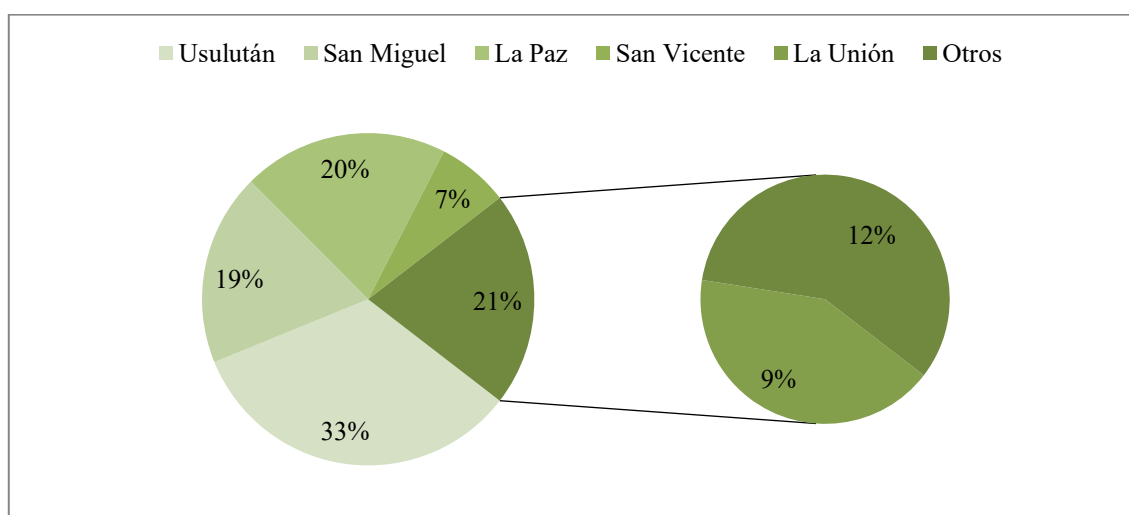
Department	Cropland		Percentage of change
	1950	1961	
La Paz	26614.55	39161.02	47.1%
Usulután	40133.48	50743.13	26.4%
San Miguel	39953.8	62728.7	57%
Total	106701.83	152632.85	43%

Source: Browning, D. (1975) El Salvador, la tierra y el hombre. San Salvador

San Vicente and La Paz (where the study area is located) produced 27% of El Salvador's total cotton in the 1960s (Figure 4), second only to the department of Usulután. In total, both departments had 347,421 quintals. Something that should be considered is that the figures for the extension of cotton cultivation may be higher due to the limited cartographic information available at the time.

It is also essential to take into consideration data provided by the former Council for Economic Planning and Coordination (CONAPLAN) and the Organization of American States (OAS), which stated that by 1969, 65% of national production was concentrated in the provinces of San Vicente, La Paz, and Cabañas, with a yield of 23.5 Qt/Mz²⁸.

Figure 3. Distribution of cotton production by department (1961-62).



Source: General Directory of Statistics and Census of El Salvador (1962). Statistical Yearbook 1961–1962.

²⁸ Consejo Nacional de Planificación y Coordinación Económica (CONAPLAN), 'El Salvador. Zonificación Agrícola-Fase I'.

Despite the social and ecological impact of cotton cultivation, the economic benefit it left during the 20th century to the landlords' owners is indisputable. In general, the production was destined for four countries, with Japan having more participation since the 1960s when exports to that country amounted to ₡43,295,276 Salvadoran colons (table 5), being \$17,318,110 of the time²⁹.

Ministry of Agriculture and Livestock (1978) Market situation of the leading agricultural products. San Salvador.

In the 1980s, and with the beginning of the civil war and hacienda attacks, cotton production was down. The Ministry of Agriculture and Livestock mentioned that the 1983-84 harvest period was approved to seed 54,523 Mz, but only 52,000 Mz was seeded³⁰. In 1985, cotton production was down up to 1995 (three years after the civil war finished) that only 2575 Mz was seeded³¹.

Table 5. El Salvador: Cotton exportation from January to March 1978.

Country	Quintal (1Q = 220 pounds)	Colons (former currency)	₡/Quintal	Dollars	\$/Quintal
Japan	150,451	₡21,451,208.00	₡142.58	\$8,580,483.20	\$57.03
Germany	42,320	₡6,879,611.00	₡162.56	\$2,751,844.40	\$65.02
Spain	51,462	₡8,318,358.00	₡161.64	\$3,327,343.20	\$64.66
Formosa (Taiwan)	1,243	₡183,125.00	₡147.33	\$73,250.00	\$58.93
Total	245,476	₡36,832,302.00	₡150.04	\$14,732,920.80	\$60.02

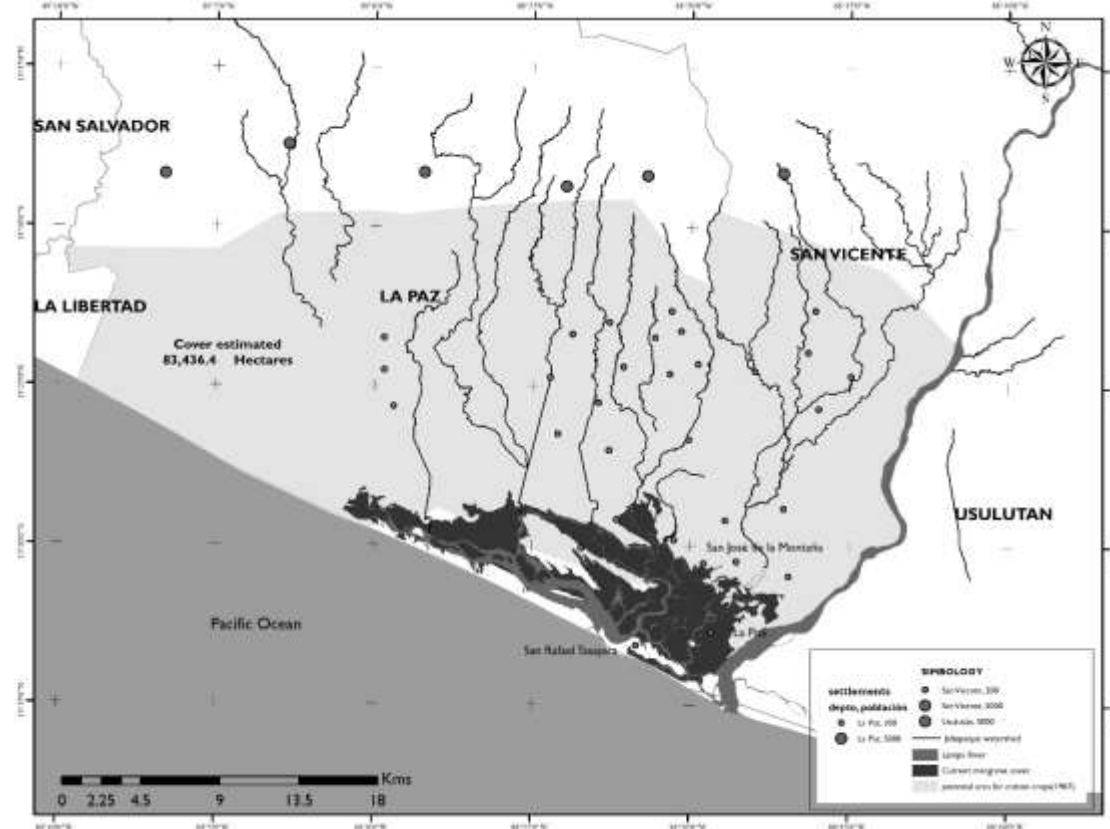
Source: Ministry of Agriculture and Livestock of El Salvador (1978) Market Status of the primary agricultural commodities. San Salvador

²⁹ Ministerio de Agricultura y Ganadería and Dirección General de Economía Agropecuaria, 'Situación Del Mercado de Los Principales Productos Agropecuarios' (San Salvador, September 1961).

³⁰ Ministerio de Agricultura y Ganadería, 'Revista de Economía Agropecuaria' (San Salvador, 1984).

³¹ Ministerio de Agricultura y Ganadería, 'Anuario de Estadísticas Agropecuarias 1996/1997' (San Salvador, 1997).

Figure. 4. Map of cotton cover estimated and farm headquarters used where peasants lived throughout the cotton harvest season. Most of these farms were conferred in the agrarian reform in El Salvador (1980-1992).



Source: Author's elaboration using ArcMap 10.3 based on Browning D. (1975) *El Salvador, la tierra y el hombre*, San Salvador. And mangrove forest coverage data from the Ministry of Environmental and Natural Resources of El Salvador (2018).

SUGARCANE

Introduced by the Spanish in the 16th century, sugarcane is a product that has been present in the daily activities of the population of El Salvador to produce sweets and alcohol³². By the 18th century, this crop was widely spread in the current national territory, especially in Zacatecoluca, San Vicente, and Usulután³³. In the 19th century, with the change in the agricultural property regime, sugarcane cultivation increased to produce alcohol³⁴.

³² Browning, *El Salvador. La Tierra y El Hombre*.

³³ María Inés Dávila Medina, 'Dinámica de La Producción de Caña de Azúcar En El Salvador' (San Salvador, March 2019).

³⁴ Rafael. Menjivar L., *Acumulación Originaria y Desarrollo Del Capitalismo En El Salvador* (Editorial Universitaria Centroamérica, 1980).

In the 20th century, sugarcane was considered El Salvador's third most important export product; by 1961, more than 26 million kilograms of sugar were exported, with the United States being the leading market with a share of almost 84% of income³⁵. However, most sugarcane processing into refined sugar was done in small mills until the 1970s, when large mills were established throughout the country³⁶. Cultivation in the departments of San Vicente and La Paz was significant in the mid-1970s, representing 29% of the country's total. These crops were in the upper basin of the Jaltepeque estuary.

Dávila³⁷ has established that the transition from cotton to sugarcane in the coastal zone began in 1965. Still, when observing production statistics, this change in agricultural use occurred at the beginning of the Civil War in the departments of La Paz and San Vicente. The MAG records show that as of 1985, sugarcane displaced cotton in terms of crop extension by more than 20,000 Mz (Figure 6).

Sugarcane, already concentrated since the 1960s and 1970s for industrial production in only six sugar mills with the capacity to supply the market, began to accumulate large amounts of land in the paracentral zone of the country, especially in the departments of La Paz and San Vicente, which by 2002 had become one of the areas with the most significant monoculture extension, exceeding by 2214% the area in 1971³⁸.

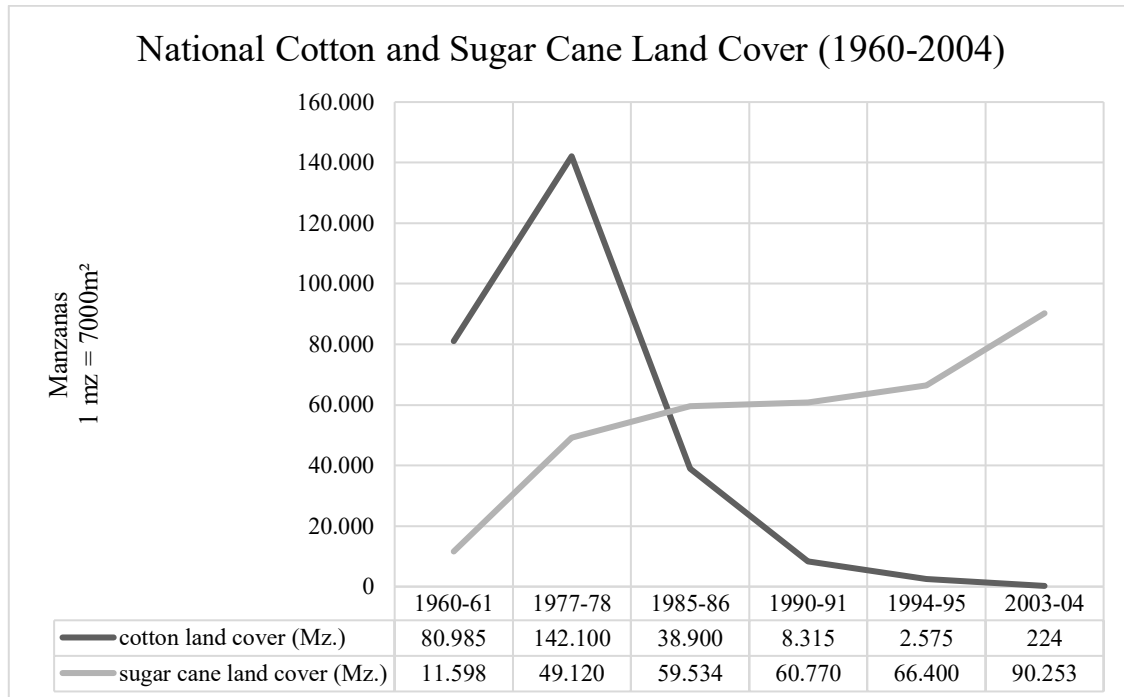
³⁵ Ministerio de Agricultura y Ganadería and Dirección General de Economía Agropecuaria, 'Situación Del Mercado de Los Principales Productos Agropecuarios'.

³⁶ Consejo Nacional de Planificación y Coordinación Económica (CONAPLAN), 'El Salvador. Zonificación Agrícola-Fase I'.

³⁷ Dávila Medina, 'Dinámica de La Producción de Caña de Azúcar En El Salvador'.

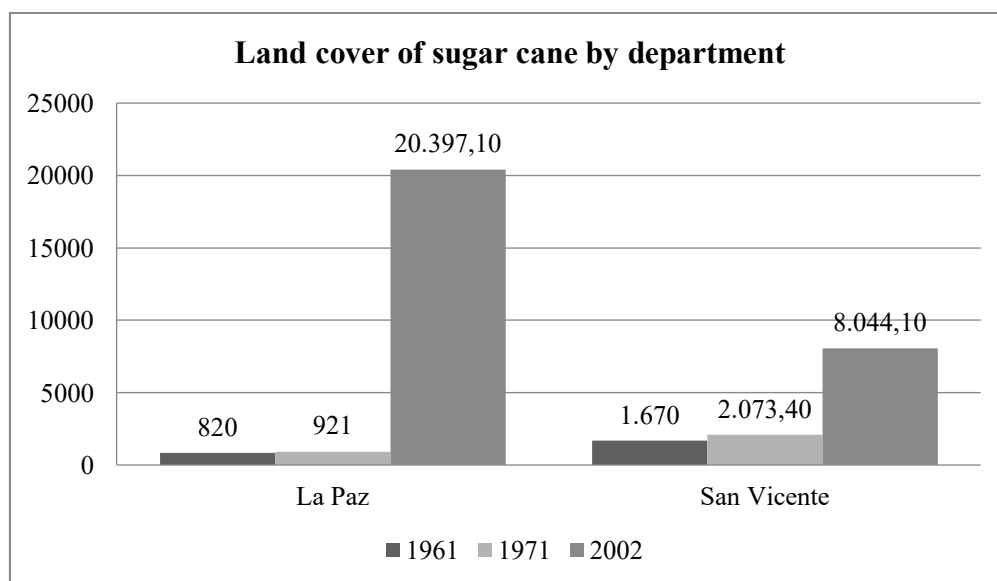
³⁸ Ministerio de Medio Ambiente y Recursos Naturales, 'Análisis De La Producción Azucarera En El Salvador Y Sus Vinculos Con Procesos De Cambio Del Uso Del Suelo, La Deforestación Y Degradación De Ecosistemas Forestales. Informe Final' (San Salvador, 14 June 2012).

Figure. 6. National Cotton and Sugar Cane Land Cover. Source: Ministry of Agriculture and Livestock (various dates)



Source: Author's elaboration based on data from the Ministry of Agriculture and Livestock of El Salvador (1961, 1978, 1986, 1991, 1994, 2004), Statistical Agricultural Yearbook.

Figure. 7. Land cover of sugar cane by department, source: Ministry of Agriculture and Livestock (various dates).



Source: Author's elaboration based on data from the Ministry of Agriculture and Livestock of El Salvador (1961, 1971, 2002), Statistical Agricultural Yearbook.

CONSERVATION MANAGEMENT FOR THE RATIONAL USE OF MANGROVE FORESTS IN THE TWENTIETH CENTURY

Although agricultural production had a significant impact on land use change in the country, it is notable that conservation efforts predated the declaration of the country's first forestry laws. In the case of the Jaltepeque estuary, a legal regulation on timber extraction was obtained. Decree 115 of April 1949 is an explicit conservation effort by El Salvador's Revolutionary Commission Government that was found to stop deliberate exploitation by granting licenses ³⁹. Thus, the Jaltepeque estuary mangrove forest is considered the first national mangrove forest ⁴⁰. However, since 1954, the declaration was limited to those lands that were not claimed according to the recently decreed civil code⁴¹.

In 1969, El Salvador decreed its Regulations for the exploitation of mangrove forests⁴², two years before the signing of the convention for conserving wetlands in Ramsar, Iran. This fact was established in the Salvadoran Forestry Law, which was enacted in 1973.

The regulation for the exploitation of mangroves defines six mangrove species that will be within this regulation: Red Mangrove, called locally as *Colorado* (*Rhizophora mangle*), Bicolor Mangrove, *Madresal* (*Avecennia bicolor*), White Mangrove, *Sincahuite* (*Laguncularia racemosa*), according to Hernández⁴³, *Sincahuite* originates from the native language of the Nahua population, Nawat. The original word is *Shikwawit* and refers to all the mangrove trees., Button Mangrove, *Botoncillo* (*Conocarpus erectus*), and Black Mangrove, *Istaten* (*Avecennia nitida*) which refers to the conjugation of the tree's bud, *tzun*, and salt: *stat*. So, *Istatzun* is the “tree of salt.” ⁴⁴. Among the main

³⁹ Consejo de Gobierno Revolucionario, 'Decreto N° 115 - Disposiciones Acerca de La Corta de Madera En Los Bosque Nacionales Del Estero de Jaltepeque', Pub. L. No. 115, Diario Oficial 1407 (1949).

⁴⁰ Ada Hernández, María Miranda, and Cecy Portillo, 'Eficacia de La Legislación Nacional y de Los Tratados Internacionales En La Protección y Conservación de Los Manglares de La Barra de Santiago.' (Universidad de El Salvador, 2000).

⁴¹ Poder Legislativo, 'Decreto N° 1363 - Adicionase Inciso al Art. 1 Del Decreto N° 115 Del Consejo de Gobierno Revolucionario', Pub. L. No. 1363, Diario Oficial 1026 (1954).

⁴² Ministerio de Agricultura y Ganadería, 'Decreto N° 53 - Reglamento Para La Explotación de Bosques Salados', Pub. L. No. 53, Diario Oficial 6218 (1969).

⁴³ Werner Hernández González, *NAWAT MUJMUSTA*, vol. 1 (San Salvador, 2016).

⁴⁴ Ibid.

provisions of this regulation are the prohibition of cultivation and the regulation of rustic dwellings within the mangroves.

However, the law provisions made in El Salvador over twenty years ago were linked to optimizing the use of mangrove wood for industrial purposes. In 1972 (one year before the promulgation of the Forestry Law), the Rational Plan for the Management and Use of Mangroves was presented as part of the regulations of Executive Decree 56 of 1969 ⁴⁵.

This plan aimed to avoid the destruction of the mangroves that had been occurring in El Salvador since the beginning of the century, as well as the first delimitation of the Jaltepeque estuary within the use zone 2. This demarcation contemplated the estuary and the mouth of the Lempa River and the island of Montecristo in the department of Usulután. It was calculated to cover an area of 6,600 hectares. However, it did not include a proposal to avoid contamination caused by cotton farms and the use of DDT.

The 1998 Environmental Law, which superseded the 1973 forestry law, ushered in a new era in the legal landscape by shifting the focus from rational resource management to sustainable management and environmental restoration in line with the Brundtland report. The law recognizes the vulnerability of mangroves as delicate ecosystems and underscores the importance of their conservation, considering the ecosystem services they provide. Notably, legislation is needed for reparations related to the use of pesticides on large estates.

THE CIVIL WAR AS A THRESHOLD OF SOCIO-ECOLOGICAL SYSTEM CHANGE

Beginning in the 1970s, with the arrival of guerrilla unit organizations in the lower Lempa area, the politicization of the population living in the hacienda colonies produced a scenario of territorial division based on the radius of action that members of the five guerrilla organizations that formed the FMLN were able to establish in the municipality of Tecoluca, especially in communities such as La Sabana, El Pacún, San

⁴⁵ Ministerio de Agricultura y Ganadería, 'Lan de Ordenación y Aprovechamiento Racional En Los Manglares' (San Salvador, August 1972).

Marcos Lempa and the city of Jiquilisco⁴⁶. It was in 1978 when the Armed Forces began the burning of the old haciendas and the forced displacement of the communities from La Pita to Pacún. For the San Rafael Tasajera, La Colorada, and San José de la Montaña communities, they mention that the guerrillas established a restriction to break down the population so that they would leave the area⁴⁷.

To understand the process of displacement, it is necessary to delve into the memory of the inhabitants and the construction of community stories about their origins. Knowing well about the geomorphological evolution, the configuration of the land in haciendas destined for export, and the legal regulations, the qualitative tools provided the guidelines to describe this process. The displacement of the communities of the Jaltepeque estuary is a process that began in 1980, when the FMLN guerrillas and the Army took over bases around strategic zones (figure) in search of control of the mouth of the Lempa River⁴⁸.

The differences between army and guerrilla control emerge when listening to accounts of the displacement and resettlement dynamics experienced during the 1980s. An inhabitant of the Los Naranjos community explains:

But this was fought by a group that we already know, called the FPL, the popular group of the FMLN, which rose from the beginning to see what the rich were doing. The poor were treated as colonists. They did what they wanted with the poorest, and they did not have any value before. That is why the FMLN group rose, to see if they could fight for it, and they succeeded; that is how each one of us was able to get the pieces of land. But it did cost to get to see all this.⁴⁹

However, the positions of the San Rafael Tasajera and San José de la Montaña disagree due to the political formation that the inhabitants of Tecoluca developed towards the conquest of lands. This can also be reflected by the titling processes that advanced rapidly in the Lempa River sector over those closer to the mouth of the estuary (which was also complicated by the provisions of the law since 1949).

⁴⁶ Andrew Cummings, 'Diagnóstico Socio-Económico Del Sur de Tecoluca, San Vicente (Informe Completo)' (San Salvador, August 1996).

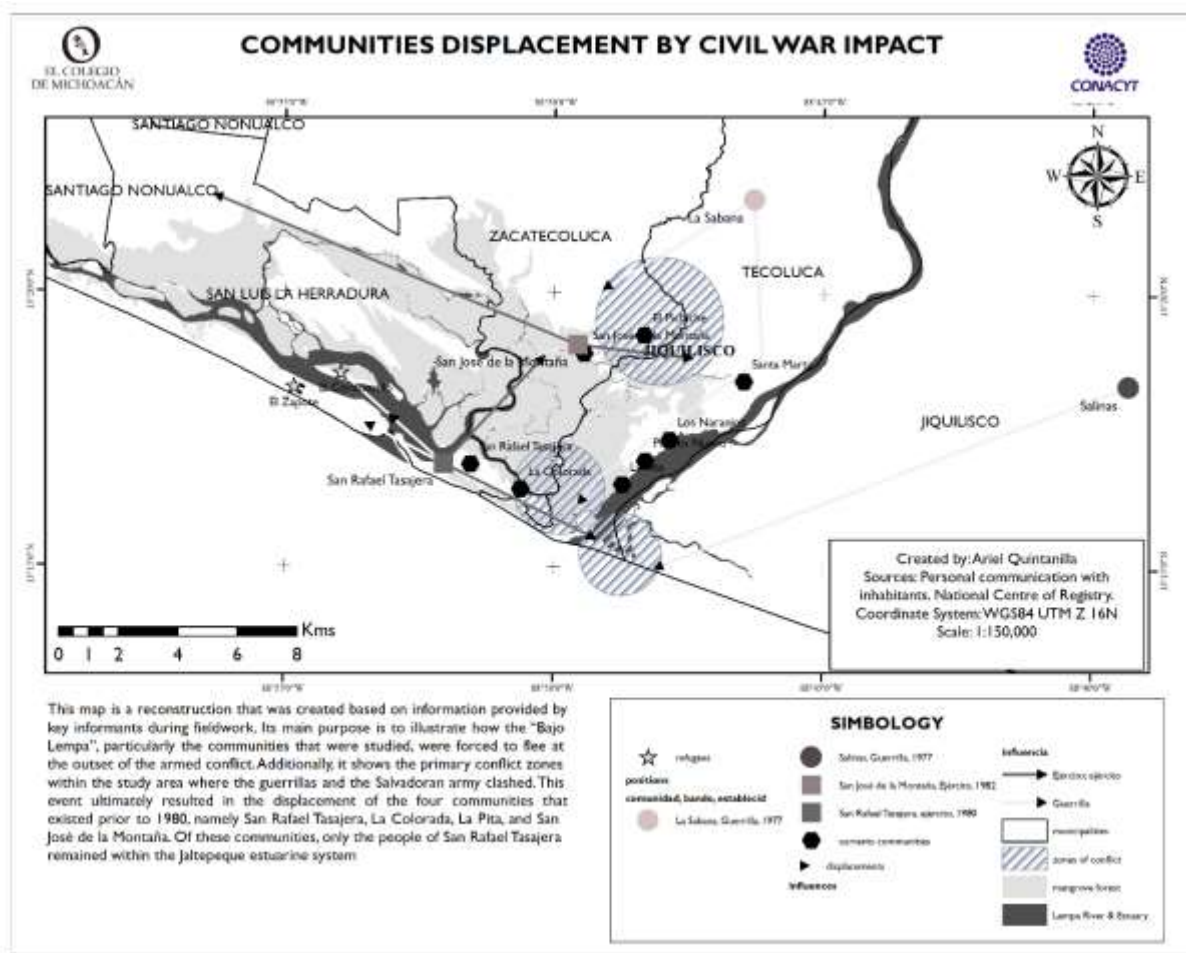
⁴⁷ 'Oral Interview in San José de La Montaña with the Author' (Zacatecoluca, La Paz, 27 February 2020).

⁴⁸ 'Oral Interview in San Rafael Tasajera with the Author' (San Luis La Herradura, La Paz, 7 February 2020).

⁴⁹ 'Oral Interview in Los Naranjos with the Author' (Tecoluca, San Vicente, 9 November 2019).

Nevertheless, the placement of a military detachment in both communities was well received, and several of their members enlisted and could return to their former homes: "The displacement of the war was because we, not being leftists, had to leave because if we did not die, whether one side or the other always died, so we had to leave for two years. We left in '80 and returned in '82"⁵⁰.

Figure 8. Map of communities displacement by the Salvadorian Civil War (1980-1992)



Source: Author's elaboration using ArcMap 10.3 based on personal communication with inhabitants (2019, 2020), and the municipalities' boundaries from the National Registry Center of El Salvador (2019).

The people interviewed mentioned some landowners who owned these lands and whose exploitation revolved around cotton and fruit trees. Among the main ones

⁵⁰ 'Oral Interview in San José de La Montaña with the Author' (Zacatecoluca, La Paz, 6 November 2019).

are Antonio Aguilar and Tony Closa in Isla Tasajera⁵¹; Señor Aguirre in El Pichiche⁵²; General Torres and Chacón in Los Naranjos⁵³, as well as Justino Núñez owned the Santa Marta hacienda, dedicated to cattle and cotton⁵⁴.

As mentioned above, transformations in the socio-ecological system are present due to both the evolution of the estuary itself and social and political activities. Despite this, the civil war brought the deconfiguration of the hacienda system, agricultural exploitation of small subsistence rural property, and a more significant opportunity to take advantage of the mangrove.

DISCUSSION

THE AGRICULTURAL EXPORTATION MODEL AS A FLUX SYSTEM IN A SOCIO-ECOLOGICAL APPROACH

It is impossible to hide the enormous weight in the configuration of the coastal plain's rural environment and the Jaltepeque estuary. The formation of cotton haciendas was expanding by leasing small land or land for livestock. The production of space for cotton production conditioned the building of the communities under study because of the benefits they received during the agrarian reform and in constructing these old hacienda huts in coastal communities.

Thus, the leasing regime, cotton production, and the construction of the hacienda farmhouses must be considered for the current socio-ecological system, which is conditioned by the current resident population's participation in cotton harvesting during the 1960s and 1970s. The latter will be addressed in the last section of this chapter, and the following one will detail the settlement of the current population as a community formation using a socio-ecological approach.

The cultivation of sugarcane and cotton followed a pattern of expansion of the agricultural frontier but did not optimize the yield per manzana. The Agricultural

⁵¹ 'Oral Interview in San Rafael Tasajera with the Author', 13 October 2019.

⁵² 'Oral Interview in El Pichiche with the Author' (Zacatecoluca, La Paz, 20 November 2019). 'Oral Interview in El Pichiche with the Author' (Zacatecoluca, La Paz, 20 November 2019).

⁵³ 'Oral Interview in Los Naranjos with the Author'.

⁵⁴ 'Oral Interview in Santa Marta with the Author' (Tecaluca, San Vicente, 9 November 2019); Cummings, 'Diagnóstico Socio-Económico Del Sur de Tecoluca, San Vicente (Informe Completo)'.

Zoning Plan 1974 showed the need to optimize each part of the territory, mainly for the flat lands found in the lower Lempa.

VISION FOR MANGROVE CONSERVATION FROM WATERSHED APPROACH

The legal frameworks that were established in the Jaltepeque estuary, as well as in the country's mangrove forests, were designed to allow this area to enter the global market dynamics. The older population of the communities under study, especially those not settled in cotton plantations, remember how the forestry police acted in the territory: "Back then, if the forestry police existed, it was quiet, nobody cut a stick because they respected the place where it was because of the laws they put in place for that reason⁵⁵".

Punitive measures were remembered as efficient before the Civil War, even though they were aimed at preventing the local population from using them for potential industrial exploitation. In this way, it is necessary to understand the configuration of the socio-ecological system within the construction of private property and the restriction of activities for rational industrial utilization.

The agrarian reform law approved by the Revolutionary Government Junta in January 1980 provided the opportunity for access to land through the takeover of farms more prominent than 245 hectares⁵⁶. This turning point is the cornerstone of the socio-ecological system's current configuration in the community context. The land tenure of the former cotton haciendas adjacent to the Jaltepeque estuary, as well as the new legal provisions for the protection and use of ecosystem goods, were established through this process of reconfiguration not only in the social and economic aspects but also in the ecological restoration of the mangrove swamp, as explained above.

THE CIVIL WAR THRESHOLD

The social and political configurations during this stage of the communities underwent a series of changes concerning the society-ecosystem relationship. This

⁵⁵ 'Oral Interview in La Pita with the Author', November 2019.

⁵⁶ Margarita Flores, 'El Salvador: Trayectoria de La Reforma Agraria, 1980-1998', *Revista Mexicana de Sociología* 60, no. 4 (1980): 125-51.

was achieved by decomposing the old land ownership regimes of the former cotton haciendas.

Considering this network not in a hierarchical manner but as a horizontal spatial-temporal process is not a deliberate decision. The deterritorialization and reterritorialization it generates by itself methods of agency (from the Jaltepeque Estuary inhabitants) through the loss point⁵⁷. This loss point can be understood by the abrupt departure from 1978 to 1982 and its return in the mid-1980s or early 1990s. This event caused the inhabitants to organize, whether they were supported by the guerrilla as in the case of Tecoluca⁵⁸, or by the army as in San Rafael Tasajera and San José de la Montaña⁵⁹.

The "exit" from the territory of the estuary, which could extend from periods of six days (for the primary helpers of both sides) or until the completion of the twelve years of war, is the immediate process in the construction of the community component that the socio-ecological system demands because it establishes the parameters of identification, organization, and training for the protection of the community and its ecosystems services, same that generates horizontal ties of transmission of local ecological knowledge. It is important what is mentioned by a key informant describing the situation of the inhabitants at the time of return: "In the first place, the settlers who lived before, the former lords came back to the community, they started to make like a directive, not legal, but they started to make a directive, and they always started to protect what was the area of resources for themselves⁶⁰".

From this point on, it is crucial to know how the elements of the community socio-ecological system, divided into environmental, socioeconomic, political, and cultural, are integrated for the community management of the natural assets of the Jaltepeque estuary.

⁵⁷ Rogério Haesbaert, *EL MITO DE LA DESTERRITORIALIZACION DEL 'FIN DE LOS TERRITORIOS' A LA MULTITERRITORIALIDAD*, ed. Siglo XXI Editora Iberoamericana (Ciudad de México: Siglo XXI Editora Iberoamericana, 2011).

⁵⁸ 'Oral Interview in Santa Marta with the Author'; 'Oral Interview in Los Naranjos with the Author'.

⁵⁹ 'Oral Interview in El Pichiche with the Author'; 'Oral Interview in San José de La Montaña with the Author', 27 February 2020.

⁶⁰ 'Oral Interview in La Pita with the Author' (Tecoluca, San Vicente, 27 January 2020).

THE CURRENT FLUX SYSTEM BY THE PROTECTION OF MANGROVE ECOSYSTEM SERVICES IN THE SOCIO-ECOLOGICAL APPROACH

As the extensive landowner property regime changed and the communities around the Jaltepeque estuary began to settle, forest protection was initiated, as well as the provision of fresh water from the Lempa, Guayabo, and Jalponga rivers. They were integrating various community protection mechanisms. This protection has an environmental sense and goes hand in hand with the care of their livelihoods for fishing, planting, and social life.

This involves integrating mechanisms for mangrove species to maintain a balance between freshwater and saltwater input, especially in the island areas, to prevent sedimentation of the channels where water passes at high tide and low tide. The main mangrove species found in Jaltepeque are *Rhizophora mangle* (red mangrove), *Avecennia bicolor* (Madresal), *Avecennia nitida* (Istaten), and *Laguncunaria racemosa* (Sincahuite), as well as other species in transition zones that these communities protect⁶¹.

The ecosystem services the mangrove provides to the local population can be governed by the goods and services that become fundamental for the functioning of community practices. The primary services are provisioning, supporting, regulating, and cultural, which are the key to understanding the socio-ecological system of the coastal communities under study. The following table shows the primary goods that the mangrove ecosystem and the estuarine system generate for the communities:

Table 6. Ecosystem services provided to communities for Jaltepeque Estuary.

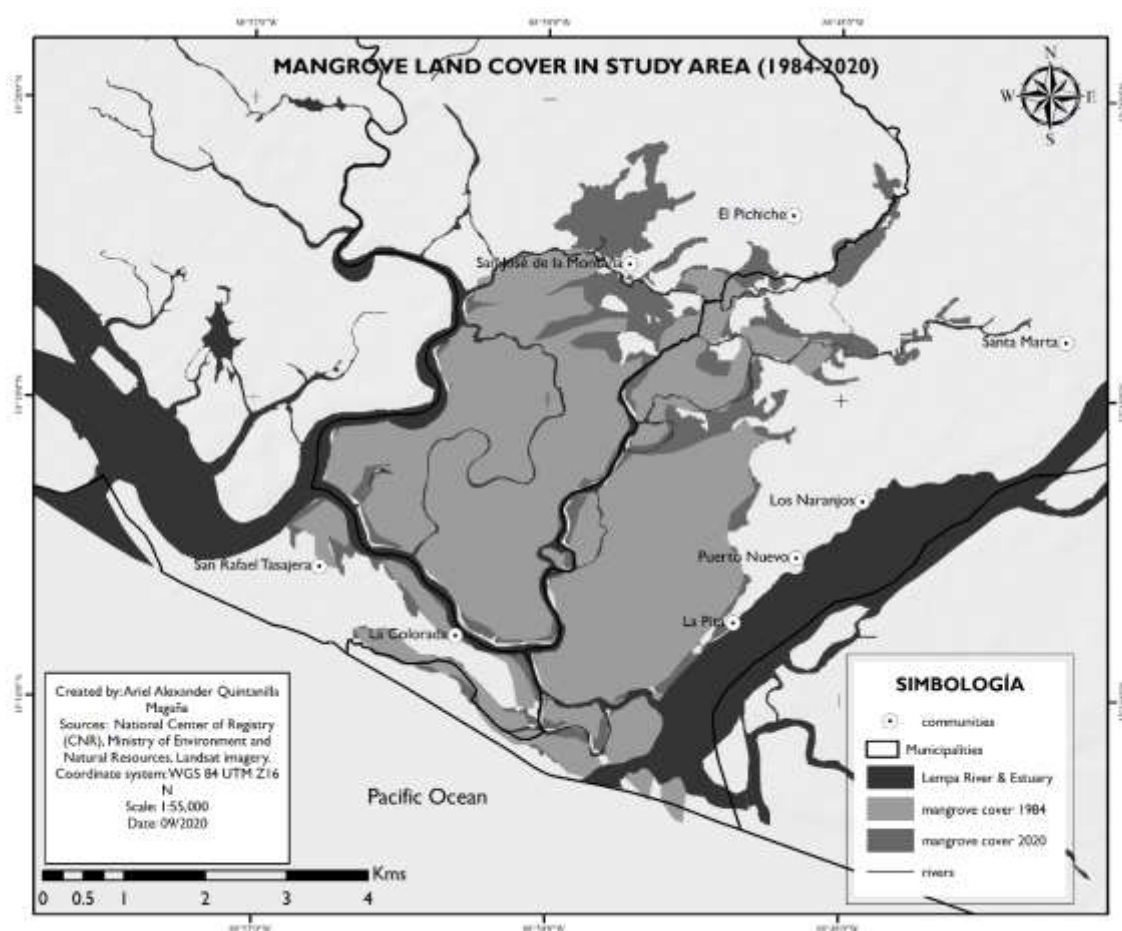
Ecosystem Service	Description	Used by
Provisioning	Feed Freshwater Fuel Wood and wood	Communities
Support	Tides and hydrological services Mangrove life cycle Nursery areas	Communities and other village in the provinces
Regulation	Climate regulation The natural barrier for hurricanes and floods	Communities and other village in the provinces

⁶¹ Ministerio de Medio Ambiente, 'Plan de Manejo Del Humedal Complejo Jaltepeque 2018-2023'; Ministerio de Medio Ambiente y Recursos Naturales (MARN), 'Inventario Nacional de Humedales. El Salvador' (San Salvador, August 2018), www.facebook.com/marn.gob.sv.

	Fresh air	
Cultural heritage	Local Ecological Knowledge Crab party (Tecoluca) Recreational and leisure areas	Communities

Source: Author's elaboration based on the data collected and crossing based on the works: Larios, N. (2017). The role of mangrove ecosystem services in generating local livelihoods in the Jaltepeque estuary, Bajo Lempa, El Salvador. And Sanjurjo Rivera, E., Welsh Casas, S. (2005). A description of the value of the environmental goods and services provided by mangrove forests.

Figure 9. Mangrove forest land cover change from 1984 to 2020.



Source: Author's elaboration using ArcMap 10.3. Canton's boundaries are from the National Registry Center of El Salvador (2019). Mangrove forest coverage provided by Landsat Imagery (1984, 2020). Water bodies are from the Ministry of Environmental and Natural Resources of El Salvador (2018).

It is important then to consider the mangrove above other ecosystems that converge the population, mainly when considering that the ecosystem increased concerning the years of transition to a small property, showing a growth of the mangrove that benefited the communities and species that come to nest in the estuary

(see Figure 9). At this point, it is necessary to re-understand the Jaltepeque estuary within a socio-ecological system in which the use of goods is prioritized to sustain community life over a market logic based on the exploitation of monocultures.

THE USE OF SOCIO-ECOLOGICAL APPROACHES IN THE LATIN AMERICAN ENVIRONMENTAL HISTORY STUDIES

The assessment of the social elements in the Jaltepeque Estuary Watershed socio-ecological system has brought an essential debate to Latin American studies about the interdisciplinary approach to understanding the socio-spatial patterns promoted by regulation, technological access, and human settlements over the last 120 years in an area defined by its watershed boundary. According to Sánchez-Calderón⁶², Latin American historiography has been divided into two areas. The first is more closely related to the “declensionist” interpretation, which is pinned to political boundaries. The second corresponds to a new movement to study the relationships between conservation and urban nature. However, it would be unfair if it did not recognize the cornerstone of historical geography, namely the agrarian studies that support much of the rural and environmentalist studies, especially in topics related to landscape changes and crop colonization in Latin American countries⁶³.

Leff explained that this environmental complexity must not be conceived as an organizational principle, because it only configures a vision where the environmental history studies the production means and social formations in any space or country⁶⁴. In this direction, environmental history presents an opportunity to understand cultural rationality through the social construction of the “environment” concept within society or human groups.

Thus, the production of this interdisciplinary exchange between history, geography, sociology and ecology derived concepts and frameworks as a response to

⁶² Vladimir Sánchez-Calderón and Jacob Blanc, 'Latin American Environmental History: Change and Continuity in a Growing Field', *Historia Crítica* 2019, no. 74 (2019): 3–18, <https://doi.org/10.7440/histcrit74.2019.01>.

⁶³ Hortensia Castro, 'La Cuestión Ambiental En Geografía Histórica e Historia Ambiental: Tradición, Renovación y Diálogos', *Revista de Geografía Norte Grande*, no. 54 (2013): 109–28.

⁶⁴ Enrique Leff, 'Vetas y Vertientes de La Historia Ambiental Latinoamericana. Una Nota Metodológica y Epistemológica', *Varia Historia* 33 (2005): 17–32.

the mismanagement of different ecosystems, such as environmental justice⁶⁵, ecological resilience or social metabolism⁶⁶.

The Jaltepeque Estuary case established a dialogue between the former users (through statistics, maps and regulations) that modified the socio-spatial patterns around the Haciendas, towards the breaking of this socio-ecological system by the civil war, and the settlement of new users that have a different vision and social organization, determined in part, by the former Haciendas, the cotton production in the area, and the fighters headquarters as a spatial memory around the Estuary and the current uses to protect mangrove forests as a primary ecosystem in the area.

CONCLUSIONS

This study took over the changes presented in the Jaltepeque Estuary Watershed, delimited as a socio-ecological system through the last 120 years. During this period, the major affected areas were found in the mangrove forest by the cotton production in the upper and middle basin, where the haciendas used DDT to fumigate crops and put the lives of humans, animals, and vegetation at risk. From the 1930s to the 1980s, the socio-ecological framework established by the agricultural exportation model reduced the mangrove cover. However, it also generated a flux of people working in the area. Then, properties could be obtained by agrarian reform.

This last process configured the new socio-ecological framework in the Jaltepeque Estuary. The threshold started with the rise of the Civil War, the displacement of the people, and the fall of the former hacienda's vision of soil exploitation and the use of agrochemicals such as DDT. Despite the war's rawness, the communitarian organization's new social fluxes to defend the mangrove forests and their ecosystem services have provided a new model of understanding the relationship

⁶⁵ Brototi Roy and Ksenija Hanaček, 'From the Environmentalism of the Poor and the Indigenous Toward Decolonial Environmental Justice', in *The Barcelona School of Ecological Economics and Political Ecology: A Companion in Honour of Joan Martínez-Alier*, ed. Sergio Villamayor-Tomas and Roldan Muradian, Studies in Ecological Economics (Cham: Springer International Publishing, 2023), 305–15, https://doi.org/10.1007/978-3-031-22566-6_26.

⁶⁶ Victor M Toledo, 'Metabolismos Rurales: Hacia Una Teoría Económico-Ecológica de La Apropiación de La Naturaleza', *Revista Iberoamericana de Economía Ecológica*, vol. 7, 2008; Gabriel Gamero, 'Ambiente y Sustentabilidad: Aportes Desde La Historia Ambiental', *Estudios Rurales. Publicación Del Centro de Estudios de La Argentina Rural* 13, no. 27 (January 2023), <http://portal.amelica.org/amei/journal/181/1813954017/>.

between nature and society in El Salvador, creating social commissions as Local Sustainable Provisioning Plan (PLAS in Spanish acronym).

It is necessary to consider more things that could not be covered in this research, such as evaluating drinking water quality, the agrochemical soil's dependence, and the current health of mangroves in situ. These topics can be approached from the socio-ecological system's vision by assessing the communitarian organization and national or international support that have worked to overcome those conflicts since the end of the civil war and the peace agreement.

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El Covid-19 como Hiperobjeto: Una Reflexión desde la Antropología de las Epidemias

RESUMEN

La presente es una reflexión sobre la pandemia Covid 19 y sus enseñanzas. Surgió en el debate del seminario “Mirando al futuro desde las Ecologías-Mundo y los tejidos de la vida” del 2021, dentro de la Red de Estudio sobre Sociedad y Medio Ambiente (RESMA). Su estímulo viene de la lectura de la obra del filósofo inglés Timothy Morton y de la revisión de textos que nos abren al pensamiento amerindio contemporáneo y al poshumanismo. La pandemia por el virus SARS CoV-2 en tanto *hiperobjeto* es el marcador de una época caracterizada por la paradójica contracción/expansión de la malla de la vida, en la que “el fin del mundo” se constituye en el eje vertebral del compromiso ético ambiental de una conciencia hasta ahora ofuscada por la hipocresía de creerse superior y sin reconocerse participante en la debacle. La transformación en gran escala de ambientes silvestres en zonas de explotación da origen a la aparición de zoonosis letales y de consecuencias imprevisibles. Este es el trasfondo de una historia ambiental que desemboca en el Antropoceno/Capitaloceno. El miedo de salir a la intemperie es el tiempo de la lluvia ácida, del aire contaminado y de los demás terrores de la modernidad que nos obligan al confinamiento. La separación ontológica entre la naturaleza y nosotros nos provee una aparente seguridad. Creemos que la ciencia y la tecnología pueden solucionar todos los problemas que hemos causado, pero corremos urgidos por soluciones (vacunas) paliativas. En este breve ensayo la metáfora de la pandemia en tanto *hiperobjeto* es convocada para pensar en los futuros socioambientales.

Palabras clave: zoonosis, poshumanismo, futuros socioambientales, giro ontológico, hiperobjeto.

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