Article **ECORFAN Journal-Ecuador**
December 2023, Vol.10 No.19 1-8

Natural treasure of Acapulco: preserving the magic of Roqueta Island

Tesoro natural de Acapulco: preservando la magia de la Isla Roqueta

NIÑO-GUTIÉRREZ, Naú Silverio*†, NIÑO-CASTILLO, Jacob Elías and NIÑO-CASTILLO, Isaías Naú

Universidad Autónoma de Guerrero, Mexico

ID 1st Author: *Naú Silverio, Niño-Gutiérrez* / **ORC ID**: 0000-0001-9250-0798, **CVU CONAHCYT ID:** 121259

ID 1st Co-author: *Jacob Elías, Niño-Castillo* / **ORC ID**: 0000-0002-0575-5336

ID 2nd Co-autohr: *Isaías Naú, Niño-Castillo* / **ORC ID:** 0000-0003-0728-3798

DOI: 10.35429/EJE.2023.19.10.1.8 Received July 10, 2023; Accepted December 30, 2023

Abstract

In the context of the climate crisis, community resilience is vital in addressing environmental challenges. This study examines climate change resilience on Roqueta Island, Acapulco, Mexico. The objective was to assess Roqueta Island's resilience strategies in the face of climate threats, hypothesizing that these measures encounter challenges due to climate threats and tourism. Justification: Acapulco bay faces tropical storms, and Roqueta Island is crucial; understanding how resilience and tourism impact sustainability is essential. Methodology: We conducted comprehensive documentary research on climate change, resilience, and island tourism. Six field trips with participant observation took place from January to July 2023. Results: Acapulco bay faces constant climate threats. Roqueta Island, vital to Acapulco, is impacted by intensive tourism. Local conservation efforts, sometimes with tourist concessionaires, aid preservation but face challenges. Conclusions: Extreme weather increasingly affects the Mexican tropics. Despite resilience measures, they're deemed insufficient to address climate change and tourism. Robust strategies are urgently needed to safeguard Roqueta Island's environment.

Environmental, Resilience, Sustainability

Resumen

En el contexto de la crisis climática, la resiliencia comunitaria es fundamental para abordar los desafíos medioambientales. Este estudio examina la resiliencia al cambio climático en la Isla Roqueta, Acapulco, México. El objetivo fue evaluar las estrategias de resiliencia de la Isla Roqueta frente a las amenazas climáticas, con la hipótesis de que estas medidas enfrentan desafíos debido a las amenazas climáticas y al turismo. Justificación: La bahía de Acapulco sufre tormentas tropicales, y en la Isla Roqueta es crucial; comprender cómo la resiliencia y el turismo afectan la sostenibilidad local. Metodología: Realizamos una investigación documental exhaustiva sobre cambio climático, resiliencia y turismo en la isla. Se llevaron a cabo seis viajes de campo con observación participante de enero a julio de 2023. Resultados: La bahía de Acapulco enfrenta constantes amenazas climáticas. La Isla Roqueta, vital para Acapulco, se ve afectada por un turismo intensivo. Los esfuerzos locales de conservación, a veces en colaboración con concesionarios turísticos, ayudan a preservar el entorno, pero enfrentan desafíos. Conclusiones: El clima extremo afecta cada vez más los trópicos mexicanos. A pesar de las medidas de resiliencia, se considera que son insuficientes para abordar el cambio climático y el turismo. Se necesitan con urgencia estrategias sólidas para proteger el entorno de la Isla Roqueta.

Ambiental, Resiliencia, Sustentabilidad

Citation: NIÑO-GUTIÉRREZ, Naú Silverio, NIÑO-CASTILLO, Jacob Elías and NIÑO-CASTILLO, Isaías Naú. Natural treasure of Acapulco: preserving the magic of Roqueta Island. ECORFAN Journal-Ecuador. 2023. 10-19:1-8.

* Author's Correspondence (E-mail: nsninog@uagro.mx)
† Researcher contributing as first author.

Introduction

The tourism industry is a fundamental pillar of the Mexican economy, and Acapulco Bay has long been an iconic destination in the country. However, in an increasingly climate-challenged and environmentally degraded world, sustainable tourism has become an urgent necessity (Carvajal-Oses et al., 2023). At the state level, the central issue of environmental education in Guerrero is related to a lack of socio-territorial reflection in the face of environmental deterioration under conditions of climate change. Therefore, the indirect causes are: *a)* minimal environmental training and education; *b)* weak public policy on environmental education; *c)* disjointed environmental dissemination, outreach, and communication; *d)* a lack of systematization of assessment tools for environmental education processes, and *e)* limited research cases in environmental education in the context of climate change that can provide a clear understanding of the current situation (Niño-Castillo & Niño-Gutiérrez, 2023).

At the local level, the research problem is as follows: How can an effective environmental education program be designed and implemented on Roqueta Island to comprehensively address the challenges of climate change, including resistance, recovery, and adaptation actions, in order to promote environmental resilience and sustainability in this island community?

The problem lies in the absence of an on-site environmental education program, causing local stakeholders to undertake various actions with limited planning (Niño-Gutiérrez et. al., 2021). This, in turn, results in landscape alterations in the nearly flat portion of the island, 0-20 meters above sea level, which is the area influenced by the land-sea interface where activities such as "free diving (snorkeling) and scuba diving (with oxygen tanks)" take place (Niño, 2014).

Research question: How can an effective environmental education program be designed for Roqueta Island that incorporates climate change resilience, recovery, and adaptation actions to promote environmental resilience and sustainability within the community?

To address this question: The main objective is to synthesize effective climate change resilience, recovery, and adaptation actions on Roqueta Island in Acapulco, Guerrero, Mexico.

In this regard, designing and implementing a comprehensive environmental education program that addresses the challenges of climate change on Roqueta Island is justified for several fundamental reasons:

A. Vulnerability to climate change; on Roqueta Island, this includes rising sea levels, extreme weather events, and ocean acidification. These changes pose a significant threat to the community and its natural environment.

B. Need for awareness and action: The business community on Roqueta Island needs to comprehend the effects of climate change and be prepared to take concrete measures to mitigate and adapt to these impacts. Environmental education is a key tool to increase awareness and capacity for action.

C. Conservation and sustainability: The island boasts unique and valuable marine and terrestrial ecosystems. The conservation of these ecosystems and the promotion of sustainable practices are essential to preserve biodiversity and long-term well-being for all (Niño-Gutiérrez, 2022a).

D. Local empowerment: A well-designed environmental education program will not only inform tourists but also empower residents to actively engage in climate change mitigation and adaptation, thereby strengthening Roqueta Island's resilience.

E. Contribution to science and practice: The implementation of this program can serve as a valuable case study for other island communities facing similar challenges. The knowledge and experiences gained on Roqueta Island can contribute to the development of effective strategies in other parts of the world.

ISSN-On line: 1390-9959

Methodology

Desk work was conducted, encompassing the search, reading, and analysis of printed and digital documents regarding Roqueta Island, as well as exhaustive analysis of printed and digital documents related to the topics of climate change, resilience, and island tourism. During this phase, the identification of the island landscape was carried out within the period of January-February 2023. This desk work was complemented by field research consisting of six visits between January and July 2023, during which information was collected through participant observation.

Through counts conducted during the island visits, a total of 900 individuals were tallied who visit this site during the day, categorized as follows: domestic tourists 60%, residents 30%, vulnerable groups 5%, and international tourists 5%. These data were recorded in the field logbook, and photographic documentation was taken to illustrate the maritime-terrestrial conditions. Additionally, through participant observation, the use of island tourism was observed. Finally, the manuscript was drafted.

Framework: Historical, legal, and theoretical-methodological, the international precedents are related to the following: Agenda 2030 for Sustainable Development (September 2015); Incheon Declaration 2015 (May 2015); Convention on Biological Diversity (September 1988); Vienna Convention for the Protection of the Ozone Layer (September 1988); Paris Agreement (November 2016); Decade of Sustainable Consumption and Production Program Framework (2015); and the Sendai Framework for Disaster Risk Reduction 2015-2023 (March 2015) (Naciones Unidas, 2015).

Regarding environmental education programs worldwide, notable examples include: *i)* Environmental education program in Pacific Islands, where several pacific countries, such as the Maldives and Fiji, have implemented environmental education programs focused on climate change adaptation and sustainable natural resource management; *ii)* Caribbean Islands conservation project, which has conducted conservation projects on islands to protect marine ecosystems, including coral reefs and seagrass meadows.

These projects have engaged local communities in restoring these ecosystems damaged by climate change and human activity; and *iii)* Resilience initiatives in Indian Ocean Islands, where countries like Seychelles and Mauritius have established marine reserves and promoted sustainable fishing practices as part of their climate resilience strategies. These efforts aim to protect marine biodiversity and ensure food security for island communities.

Theoretical-Methodological Framework, the theory of ecological resilience represents a fundamental cornerstone in the research and understanding of the relationship between natural systems and climate change. This theory focuses on the capacity of ecosystems to withstand disturbances, recover from adverse impacts, and adapt to changing conditions over time. In essence, ecological resilience posits that natural systems are not static but dynamic and adaptable. These systems can face significant challenges, such as rising temperatures, biodiversity loss, and habitat degradation, yet still maintain their integrity and essential functions (Holling, 1973).

Research based on the theory of ecological resilience not only helps us better understand how ecosystems operate in a changing world but also provides valuable insights for informed decision-making. This theory demonstrates how people can intervene in nature to address the challenges of climate change, protect our natural resources, and build a more sustainable future for future generations. It is, in essence, an essential foundation for the conservation and resilience of our planet in the context of ongoing climate change (Holling, 1986).

The theoretical approach followed is grounded in: *a)* C. S. Holling, one of the founders of resilience theory, has played a pivotal role in conceptualizing and developing this theory. His pioneering work has contributed to understanding ecosystem dynamics, promoting the theory, and its application in natural resource management and conservation (Holling et al., 1998), and *b)* Lance H. Gunderson, another prominent expert in resilience theory. He has focused his research on applying resilience in ecosystem management and environmental decision-making (Chaffin & Gunderson, 2016).

ISSN-On line: 1390-9959

As for the study area, from the 1940s to the present, Mexico's governmental policy has focused on protecting the country's natural and cultural heritage. This approach has led to the designation of 185 Federal Protected Natural Areas (Áreas Naturales Protegidas or ANPs), in addition to other areas with protection status at the state, municipal, and community levels (Comisión Nacional de Áreas Naturales Protegidas, 2022).

These protected natural areas play a vital role in global conservation efforts. They not only significantly contribute to improving the quality of the environment by promoting air oxygenation and preserving biodiversity but also serve an essential function as spaces for spiritual well-being, hiking activities, and other forms of recreation and tourism.

In terms of the local historical context, it dates back to 1982 when La Roqueta Island was declared a Marine National Park by then-President of the Republic, Lic. José López Portillo (Diario Oficial de la Federación, 1982). However, in 1998, the Coordination of Protected Natural Areas of the National Institute of Ecology of Mexico recommended to the Government of Guerrero "that custody of the Environmental Management Unit (UMA) La Roqueta be transferred to the Secretary of the Navy and the administration of this area to the municipality of Acapulco through the municipal offices of Tourism and Ecology" (Niño Gutiérrez, 2012, p.13).

Environmental education is the process of sensitizing individuals and the community at large to the state of the environment and its close relationships with socio-economic and cultural aspects (Niño Gutiérrez, 2014), promoting awareness of the environment and its resources, instilling values, imparting knowledge, developing skills, experiences, and the will to solve specific problems in daily life and adopting a sense of solidarity with fellow humans, the environment, and oneself (Santamaría and Guevara, 2017, Table 1).

Education axis	Environmental education
Priority	Environmental sustainability and resilience
Objective	1.1 Development of resiliencie activities
	1.2 Fostering recovery and adaptation to climate change
Estrategies	Establishing a commitment to island conservation and responsable use of *water, soil, and vegetation*
	1.2.1 Strengthening resilience-focused actions for climate change *resistance, recovery, and adaptation*
Action	1.1.1.2 Promoting non-formal environmental education and citizen participation in the conservation of the island landscape
	1.2.1.1 Promoting island resilience in print media, radio, televisión, and scientific articles

Table 1 Proposal for a non-formal and inclusive environmental education program on Roqueta Island in Acapulco
Source: Author's own work

Roqueta Island serves as a green lung for the residents of the city and port of Acapulco, Guerrero (Figure 1). It holds significant social relevance as it was the site of the first amphibious battle with simultaneous action at sea and on land in the struggle for Mexico's Independence on June 13, 1813 (Secretaría de Marina, 2022).

Figure 1 Civic engagement on Roqueta Island
Source: Self-captured

The island covers an area of 1.16 km^2, with a tropical climate featuring summer rains (Aw), 286 sunny days per year. It serves as a nesting and refuge site for marine birds, mammals, and reptiles (Aguirre et al., 2010). However, it is currently vulnerable due to the absence of a management program.

ISSN-On line: 1390-9959

Its environmental significance lies in being a natural refuge for fauna such as raccoons (*Procyon lotor*), green iguanas (*Iguana iguana*), black iguanas (*Ctenosaura pectinata*), white-faced magpies (*Calocitta formosa*), ospreys (*Pandion haliaetus*), orange-fronted parakeets (*Eupsittula canicularis*), peregrine falcons (*Falco peregrinus*), Cooper's hawks (*Accipiter cooperii*), masked woodpeckers (*Melanerpes chrysogenys*), yellow-crowned night herons (*Nyctanassa violácea*), and white-tailed hawks (*Butteo albonotatus*). Additionally, it features low deciduous forest vegetation, including amate (*Ficus insípida*) and ceiba (*Ceiba pentandra*) trees that grow to heights exceeding 20 meters (Ochoa, 2021).

Results

Since 1948, tourist activities have been developed in a chaotic manner. Hence, the purpose of this study is to contribute to the proposal of a non-formal environmental education program on Roqueta Island in Acapulco, Guerrero, Mexico (Niño et al., 2021). The aim is to provide residents, domestic tourists, and foreign visitors with environmental knowledge about the importance of conserving this natural space (Figure 2).

Figure 2 Promotion of local environmental education
Source: self-captured

The results revealed that: *a)* Acapulco Bay is constantly impacted by tropical storms and high waves; *b)* La Roqueta Island serves as a green lung in Acapulco, Guerrero, Mexico, but its land-sea interface is altered due to the activities of intensive tourism (Gobierno de México, 2022a); and *c)* local environmental management, including conservation (resistance) and restoration (recovery and adaptation) actions carried out by the local population as positive intervention measures, sometimes with the cooperation of tourism concessionaires, have contributed to extending the possibility of an environmental collapse over time (Niño-Gutiérrez, 2023, Table 1).
Environmental education contributes to balance in the affective, value, cognitive, or behavioral aspects of global citizens, with significance in the personal learning process (Placensia et al., 2021). Therefore, it is suggested that educational activities on the island include environmental education, ecology workshops, and thematic tours. Additionally, conservation activities should be undertaken, including reforestation campaigns, garbage collection, and awareness-raising about caring for the environment in the fragile island ecosystem. These actions help reduce the negative impacts of urban solid waste, improper freshwater management, and the alteration of the low deciduous forest, among other issues (Arroyo & Lechuga, 2021).

Hence, the importance of proposing the program: "Environmental resilience in Roqueta: Our path to a sustainable future," whose overall objective will be: To promote resilience and sustainability on the island through environmental education, by training tourism service providers, residents, and visitors to address the challenges of climate change (Niño-Gutiérrez, 2022b). An example of content could be: Module 1: Strengthening Resilience.

Resistance action: Restoration of marine ecosystems: Lesson 1: Introduction to marine ecosystems and their importance; Lesson 2: Impacts of climate change on coral reefs; Lesson 3: Restoration projects and their impact on marine biodiversity; and practical activity: Participation of various actors in restoration activities (Periódico Oficial del Gobierno del Estado de Guerrero, 2009).

ISSN-On line: 1390-9959

Specific objective: Upon completing the program, participants will be equipped to identify the impacts of climate change on their island communities and take concrete steps to enhance their resilience, restore their environment, and adapt to climate change. Methodology: The program will be conducted in the form of interactive workshops, practical field activities, and community projects. Certification is not necessary as it is non-formal education. This educational program will help visitors, tourism service providers, and island residents understand and effectively address the challenges of climate change, promoting resilience and sustainability in their unique environment (Kabir et al., 2018).

In this context, the theory of ecological resilience stands as a fundamental pillar for understanding how ecosystems can face and recover from natural and anthropogenic disturbances related to climate change (Groch & Cogliati, 2022). It is important to emphasize that resilience, especially in islands and coastal communities like Roqueta Island, plays a crucial role (Niño Gutiérrez, 2012). In this case, the discussion focuses on how resistance, recovery, and adaptation actions are essential to strengthen the island's resilience (Table 2).

Resistance activities	Recovery activities	Adaptation activities
Collection of food and urban waste	Cleaning of the marine and terrestrial bottom	Collaborating with various stakeholders to disseminate information about natural disaster preparedness measures
Safeguarding biodiversity	Cigarette butt collection	Monitoring and protecting endemic species of parakeets, green iguanas, and black iguanas to ensure their survival
Preserving unique habitats on the island	Generating scientific knowledge to support informed decision-making regarding biodiversity and climate change.	Involving entrepreneurs in decision-making and planning for a sustainable future
Strengthening effective communication on environmental issues and climate change adaptation	Empowering students from Elementary to undergraduate levels to become advocates for local environmental conservation	
Documenting and understanding species diversity on Roqueta island		

Table 2 Climate change adaptation activities on Roqueta Island in Acapulco, Guerrero
Source: Author's own work

Conclusions

A) The expansion of an inclusive environmental education program on the island is an indispensable priority. This program not only has the potential to promote the sustainable use of the abundant natural resources on the island but can also foster a deeper connection with the values and scenic charms of the environment. Of particular relevance is the ability to involve children and youth in the stewardship and preservation of the environment; *B)* It is essential to disseminate and obtain the consensus of authorities related to the tourism and ecological sectors, as well as non-governmental organizations, regarding the incorporation of actions from the inclusive environmental education program into local environmental protection strategies and policies. This synergy can generate tangible benefits, such as a noticeable improvement in the island's environmental surroundings and *C)* Despite the fact that the population of La Roqueta has implemented resistance, recovery, and adaptation measures in the right direction, they are still considered insufficient compared to the magnitude of the challenges they face. Continued collaboration and the expansion of these measures are crucial to successfully address ongoing climate and environmental challenges. These conclusions summarize the main findings and recommendations derived from the study regarding Roqueta Island and its environment (Gobierno de México, 2022b).

ISSN-On line: 1390-9959

References

Aguirre, A., Bezaury, J. N., De la Cueva, H., March, I. J., Peters, E., Rojas, S. y Santos, K. (2010). En A. Aguirre, J. N. Bezaury, H. De la Cueva, I. J. March, E. Peters, S. Rojas y K. Santos. (Comps.). *Islas de México, un recurso estratégico* (pp. 7-17). Instituto Nacional de Ecología (INE), The Nature Conservancy (TNC), Grupo de Ecología y Conservación de Islas A. C. (GECI) y Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE). https://bit.ly/3R6SBwz

Arroyo, C. & Lechuga, A. (2021). Equinodermos de la Isla La Roqueta de Acapulco, Guerrero. México. *Revista de Biología Tropical, 69*(SI), 265-271. https://doi.org/10.15517/rbt.v69iSuppl.1.46358

Carvajal-Oses, M.; Valerio-Carranza, E.; Moreira-Segura, C. & Herrera-Ulloa, A. (2023). Hacia un proceso de educación ambiental no formal y contextualizado en la comunidad de Chacarita, Puntarenas, Costa Rica. *Revista Educación, 47*(1), 1-18. https://doi.org/10.15517/revedu.v47il.49962

Chaffin, B. C. & Gunderson, L. H. (2016). Emergence, institutionalization and renewal: Rhythms of adaptative governance in complex social-ecological systems. *Journal of Environmental Management*, 165, 81-87. https://www.sciencedirect.com/science/article/abs/pii/S0301479715302553?via%3Dihu

Comisión Nacional de Áreas Naturales Protegidas (2022). *Administración de 185 Áreas Naturales Protegidas por parte de la CONANP*. https://www.gob.mx/conanp/documentos/areas-naturales-protegidas-278226

Diario Oficial de la Federación (1982, 30 de noviembre). *Decreto presidencial de la Isla La Roqueta como Parque Nacional Marino*. https://dof.gob.mx/nota_detalle.php?codigo=4783220&fecha=30/11/1982#gsc.tab=0

Gobierno de México (2022a). *Ley de Aguas Nacionales.* https://www.gob.mx/profepa/documentos/ley-de-aguas-nacionales-62956

Gobierno de México (2022b). *Trabaja Csaegro en la producción, conservación y aprovechamiento de la iguana negra*. https://www.gob.mx/agricultura/prensa/trabaja-csaegro-en-la-produccion-conservacion-y-aprovechamiento-de-la-iguana-negra?idiom=es

Groch, D. & Cogliati, M. G. (2022). Mitigation measures against floods in "La Herradura" urbanized island, Neuquén, Argentina. *Revista de Geografía Norte Grande*, 83, 221-242. https://www.scielo.cl/pdf/rgeong/n83/0718-3402-rgeong-83-221.pdf

Holling, C. S.; Berkes, F & Folke, C. (1998). Science, sustainability and resources management. En F. Berkes y C. Folkes (eds). *Linking social and ecological systems: management practices and social mechanisms for building resilience*. Cambridge: Cambridge University Press. Pp. 342-362. http://www.diva-portal.org/smash/get/diva2:830879/FULLTEXT01.pdf

Holling, C. S. (1986). The resilience of terrestrial ecosystems: local surprise and global change. En W. C. Clark y R. E. Munn (eds). *Sustainable development of the biosphere*. International Institute for Applied Systems Analysis. Cambridge University press. Pp. 292-317.http://researchlegacy.arch.tamu.edu/epsru/Course_Readings/Ldev671MARS689/LDEV671_Readings/Holling_Art3_resilienceterrestrial.pdf

Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics, 4*, 1-23. https://www.annualreviews.org/doi/pdf/10.1146/annurev.es.04.110173.000245

Kabir, M. E.; Serrao-Neumann, S.; Davey, P. Hossain, M. & Alam, T. (2018). Drivers and temporality of internal migration in the context of slow-onset natural hazards: insights from north-west rural Bangladesh. *International Journal of Disasters Risk Reduction.* https://doi.org/10.1016/j.ijdrr.2018.06.010

Naciones Unidas (2015). Marco Sendai para la Reducción de Riesgo de Desastres 2015-2023 (A/RES/69/283), resolución aprobada por la Asamblea General el 3 de junio del 2015, Sexagésimo noveno período de sesiones. https://undocs.org/A/RES/69/283

Niño-Castillo, J., & Niño-Gutiérrez, N. S. (2023). Marcos teóricos y tesoros ocultos: Un viaje multidisciplinario para impulsar la conciencia ambiental, el emprendimiento sustentable con incidencia social. *Ecocience International Journal, 5*(8): 7-16. https://www.cife.edu.mx/ecocience/index.php/ecocience/issue/view/9

Niño-Gutiérrez, N. S. (2023). Subsistemas socioecológicos en conflictos: agua marina y suelos de La Roqueta. *Utopía y Praxis Latinoamericana, 28*(102); 1-9. https://produccioncientificaluz.org

Niño-Gutiérrez, N. S. (2022a). Socioformación y sustentabilidad en tiempos de incertidumbre sanitaria. *Ecocience International Journal, 4*(6): 5-10. https://www.cife.edu.mx/ecocience/index.php/ecocience/article/view/121

Niño-Gutiérrez, N. S. (2022b). Geogra´hical synthesis of the landscape in Vista Hermosa, Acapulco. *ECORFAN Journal-Republic of Cameroon, 8*(15): 7-13. www.ecorfan.org

Niño-Gutiérrez, N. S., Luna-Nemecio, J., Niño-Castillo, I. N. y Niño-Castillo, J. E. (2021). Quality of higher education: case study Universidad Autónoma de Guerrero, Mexico. *ECORFAN-Journal México, 12(*27), 30-40. https://www.ecorfan.org/journal/v12n27/ECORFAN_Journal_Mexico_V12_N27.pdf

Niño Gutiérrez, N. S. (2014). *Parque Natural El Fondo: geografía y turismo*. Ediciones Eón-Conacyt-UAGro. https://edicioneseon.com.mx/shop/parque-natural-el-fondo-geografia-y-turismo/

Niño Gutiérrez, N. S. (2012). *Ecogeografía y sustentabilidad en la isla Roqueta de Acapulco*. México, D. F.: Editorial Praxis-UAGro. https://www.ub.edu/geocrit/b3w-1031.htm

Ochoa, O. (2021). El mundo en la piel de un árbol. Transdisciplina, complejidad y esthesis decolonial en el amate pintado del Alto Balsas, Guerrero. En N. A. Amoroso, O. F. Susunaga y A. Olvera (Coords.). *Lo estético en el arte, el diseño y la vida cotidiana* (pp. 356-375). Universidad Autónoma Metropolitana-Azcapotzalco. http://zaloamati.azc.uam.mx/handle/11191/9007

Periódico Oficial del Gobierno del Estado de Guerrero (3 de marzo del 2009). *Decreto 220 de Reformas a la Ley 593 de aprovechamiento y gestión integral de los residuos del Estado de Guerrero*. https://congresogro.gob.mx/legislacion/ordinarias/ARCHI/LEY-DEL-EQUILIBRIO-ECOLOGICO-Y-LA-PROTECCION-AL-AMBIENTE-DEL-ESTADO-DE-GUERRERO-878-2021-03-10.pdf

Placensia, A. Y., Patrón, G. C. y Sánchez, Y. V. (2021). Education based on sustainability: A life in balance. En N. S. Niño, M. del C. Valencia y M. de J. García (Coords.). *Productive Systems, Territory and Sustainability. Handbooks-TIII*. (pp. 102-116). ECORFAN. https://doi.org/10.35429/H.2021.8.102.116

Santamaría, G. A. y Guevara, F. P. (2017). Dilemas y travesías de la pedagogía ambiental en México. Guadalajara: Universidad de Guadalajara-Universidad de Ciencias y Artes de Chiapas-Universidad Michoacana de San Nicolás de Hidalgo. https://www.researchgate.net/profile/Esperanza-Amigon/publication/327172834_Dialogo_entre_educacion_ambiental_complejidad_y_pedagogia_Ambiental/links/5b7e10fd4585151fd129314d/Dialogo-entre-educacion-ambiental-complejidad-y-pedagogia-Ambiental.pdf

Secretaría de Marina (2022). *Acapulco y el padre Morelos*. https://2006-2012.semar.gob.mx/unidad-de-historia-y-cultura-naval/independencia/morelos.html.