

REVIEW

Pollution of Lake San Roque: a silenced threat

Contaminación del lago San Roque: una amenaza silenciada

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ABSTRACT

Sustainable development was introduced in the 1987 Brundtland Report, which established the importance of meeting current needs without compromising future ones. Within this framework, the concept of sustainable tourism emerged, promoted by the UNWTO, which emphasised the need to consider the environmental, social and economic impact of this activity. However, in practice, many tourist destinations such as Lake San Roque in Córdoba faced a very different reality. Various studies revealed that this body of water suffered severe pollution due to the discharge of untreated wastewater from hotels and restaurants. Persistent enteric viruses and toxin-producing cyanobacteria were detected, posing a serious risk to public health. Scientific research confirmed that up to 62 % of the lake was covered by these algae in 2021, a direct consequence of the discharge of approximately 9 000 tonnes of sewage per year. Despite existing environmental laws, such as General Environment Law No. 25.675 and the Organic Law of the Water and Sanitation Directorate of Córdoba, the authorities did not ensure compliance. In addition, greenwashing by some tourism sectors contributed to disguising the magnitude of the problem. The case of Lake San Roque highlighted the disconnect between sustainability rhetoric and actual tourism management, causing profound environmental damage that demanded urgent and effective measures.

Keywords: Cyanobacteria; Pollution; Sustainability; Health; Tourism.

RESUMEN

El desarrollo sostenible fue introducido en el Informe Brundtland de 1987, el cual estableció la importancia de satisfacer las necesidades actuales sin comprometer las futuras. En este marco, surgió el concepto de turismo sustentable, promovido por la OMT, que subrayó la necesidad de considerar el impacto ambiental, social y económico de esta actividad. Sin embargo, en la práctica, muchos destinos turísticos como el lago San Roque en Córdoba enfrentaron una realidad muy distinta. Diversos estudios revelaron que este cuerpo de agua sufrió una contaminación severa debido al vertido de aguas residuales sin tratamiento por parte de hoteles y restaurantes. Se detectaron virus entéricos persistentes y cianobacterias productoras de toxinas, lo que representó un riesgo grave para la salud pública. Investigaciones científicas confirmaron que hasta el 62 % del lago estuvo cubierto por estas algas en 2021, consecuencia directa del vertido de aproximadamente 9 mil toneladas anuales de fluidos cloacales. A pesar de las leyes ambientales existentes, como la Ley General del Ambiente N° 25.675 y la Ley Orgánica de la Dirección de Agua y Saneamiento de Córdoba, las autoridades no garantizaron su cumplimiento. Además, la práctica del greenwashing por parte de algunos sectores turísticos contribuyó a disfrazar la magnitud del problema. El caso del lago San Roque evidenció la desconexión entre el discurso de sostenibilidad y la gestión real del turismo, generando un daño ambiental profundo que demandó medidas urgentes y efectivas.

Palabras clave: Cianobacterias; Contaminación; Sostenibilidad; Salud; Turismo.

INTRODUCTION

Sustainable development has become a key principle for addressing the environmental, social, and economic challenges of the 21st century. This concept was first defined in 1987 in the Brundtland Report, prepared by the UN World Commission on Environment and Development, as that which meets the needs of the present without compromising the ability of future generations to meet their own needs. In this context, sustainable tourism emerges as a response to the need to balance economic activity with the protection of natural resources. However, reality shows that in many regions, such as Lake San Roque in the province of Córdoba, Argentina, these sustainable practices are more of an aspiration than a reality. Poorly managed tourism, inadequate infrastructure, and weak enforcement of environmental laws have created a critical pollution situation with serious consequences for public health and the ecological balance of the area.

DEVELOPMENT

Brundtland Report

In 1983, former Norwegian Prime Minister Gro Harlem Brundtland headed the newly created Commission on Environment and Development, commissioned by the United Nations to draft a comprehensive report on these issues. Four years later, “Our Common Future,” also known as the Brundtland Report, was published, outlining for the first time the concept of sustainable development, defined as: “It is within the power of humanity to ensure that development is sustainable, that is, to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Hand in hand with the concept of sustainable development comes that of sustainable tourism, defined by the World Tourism Organization (UNWTO) as: “Tourism that takes full account of the current and future economic, social, and environmental impacts to meet the needs of visitors, the industry, the environment, and host communities”.⁽¹⁾

According to the UNWTO, tourism is responsible for more than 5 % of global carbon dioxide (CO₂) emissions. Of this percentage, hotels account for 20 % through the energy consumption of air conditioning, heating, and refrigeration in bars and restaurants.⁽²⁾

Pollution in Lake San Roque

A study carried out by the Dr. J.M. Vanella Institute of Virology, part of the Faculty of Medical Sciences at the UNC, detected a combination of enteric viruses (Astrovirus, Enterovirus, Polyomavirus, Rotavirus, Norovirus, and Picobirnavirus) in the waters of Lake San Roque, one of the main sources of fresh water in the province of Córdoba. The team of scientists confirmed the persistence of these agents throughout 2016. These types of pathogens, which mainly cause acute gastroenteritis, enter the body through the mouth and are eliminated in feces.^(3,4) According to experts, there are two ways in which these viruses can reach the environment: one is through the discharge of untreated domestic effluents into the lake or its tributaries; the other is through rain “washing” the latrines of nearby homes and carrying the waste away. In tourist areas such as Villa Carlos Paz, where water is used for recreational purposes as well as for consumption, it is believed that only one to ten viral particles are needed to start an infection, and a single drop of water can contain up to ten billion of them.⁽⁵⁾

Enteric viruses are very resistant. They can withstand purification processes with hypochlorite and ultraviolet light and can pass through the digestive tract without being affected by stomach acids. In addition, thanks to their variability, a person never becomes fully immune because the strains constantly mutate.

The study concluded that the detection of these pathogens could be indicators of contamination by human fecal matter discharged into the water throughout the year.

Hotels and restaurants dump waste into Lake San Roque

In January 2018, CIRSA, one of the research centers of the National Water Institute, warned that “the situation of the San Roque reservoir-lake is critical,” as it is experiencing a bloom of cyanobacteria as a result of pollution. It therefore recommended taking precautions in water treatment and avoiding recreational use of the water, which is becoming increasingly greenish in color.

These levels of contamination are largely attributed to hotels and restaurants that discharge their sewage into the lake without any direct treatment. For this reason, Prosecutor Marchetti was asked to collect samples from the drains of several establishments for the National Institute of Environmental Studies to confirm the type of bacteria present, as well as reports drawn up by the Environmental Police confirming the poor management by local business owners.

Since 2013, the Environmental Police of the Province of Córdoba has issued 60 citations for violations by commercial establishments engaged in restaurant and hotel activities for discharging sewage directly into the lake or its tributaries for at least five years. All of the establishments were located in the towns of Carlos Paz, San Antonio de Arredondo, Mayu Sumaj, Tanti, La Falda, Big House, Beautiful Valley, and Cabalango.^(6,7)

Current regulations allow for the presence of up to 5 000 total coliform bacteria per 100 milliliters and 1 000 fecal coliform bacteria per 100 milliliters. It is estimated that Lake San Roque maintains levels well above these figures throughout the year.

A report in the newspaper *Perfil Córdoba* details the study carried out by researchers Valeria Amé, Anabella Ferral, and Velia Solís, in which they found the presence of cyanotoxins in Lake San Roque. These bacteria can cause liver damage and skin irritation. “Although acute poisoning in humans is a rare event, there is evidence that long-term exposure to low levels of toxins could promote the development of cancer,” the publication warns. Concentrations of microcystins, a type of toxin, were also found to far exceed the acceptable levels suggested by the World Health Organization (WHO).

To remedy this, the researchers suggest “reducing the inflow of nutrients into the lake” by insisting on the installation of sewage treatment plants in nearby towns to remove phosphates.

LUCADESA Foundation

In 2020, Carlos Matheu, president of the Foundation for the Fight Against Environmental Pollution in Defense of Health (LUCADESA), told University of Córdoba Radio AM 580 that the various municipalities that make up the San Roque lake basin clandestinely dump untreated fecal matter into the water, causing the growth of algae with cyanobacteria that are very dangerous to health. Hotels and restaurants in the areas near the lake and its tributaries are largely blamed for the high levels of pollution, since a study carried out by the Environmental Bioremediation Laboratory concluded that around 8 000 tons of fecal matter are dumped into the lake, which Matheu considers to be “an open sewer”.^(8,9)

In April 2022, scientist and professor Exequiel Di Tofino presented on social media the results of a five-year study in which he measured the level of toxins generated by algae accumulated in Lake San Roque. The result was 1,92 micrograms of microcystins per liter of water, when the maximum acceptable level set by the WHO is 1 microgram per liter. Emilio Losa, a public health doctor and researcher who currently collaborates with the Institute of Virology at the National University of Córdoba, has been studying the problem of pollution in Lake San Roque, which supplies water to 70 % of the population of the city of Córdoba. He joined Di Tofino to raise awareness of the problem and demand solutions. The doctor describes the phenomenon as very progressive, saturating the water and filling it with dangerous algae and a permanent rotten smell.⁽⁴⁾

According to the Municipality of Carlos Paz, around 9 000 tons of sewage are dumped into the San Roque reservoir every year. This is because of the 300 000 people who live permanently around the lake, only 30 % are connected to the sewage system. But the biggest problem comes in the summer, when nearly a million tourists visit the city and stay in hotels that do not treat their greywater, causing the lake to have high levels of eutrophication, or an inability to absorb nitrogen and phosphorus, which leads to the blooming of highly dangerous cyanobacteria.

Losa indicates that the biggest problem today is water quality rather than quantity. To illustrate this, he points out that in 2021, NASA’s Landsat 8 satellite and the European Space Agency’s Sentinel 2 satellite captured images of the lake showing that 62 % of the surface is covered by cyanobacteria. This is equivalent to 900 hectares or 1 800 football fields. This is directly attributed to an extractive tourism model that looks beyond the environment, thinking only about the economic aspect and not about sustainability.

Greenwashing

According to the environmental organization Greenpeace, greenwashing is “the act of misleading consumers about a company’s environmental practices or the environmental benefits of a product or service.” In other words, it is a marketing practice or strategy used by some companies to show the public that they are responsible and committed to the environment. This practice can be carried out through various strategies, green marketing being the most common. It is the most effective way to communicate to consumers that a company’s products or services are responsible even when its practices or manufacturing processes are not.⁽¹⁰⁾

A telephone interview was conducted with renowned biologist and researcher Federico Kopta, who has worked for years to reduce pollution levels in the lakes of Córdoba, particularly in San Roque.

Regarding what is happening in Lake San Roque, Kopta says: Lake San Roque has been suffering from pollution for decades. It is a process of progressive deterioration that has been going on for more than forty years, basically involving the introduction of nutrients, which leads to the proliferation of cyanobacteria, a type of floating algae that covers the surface of the lake like a film of fluorescent green paint. Regarding the types of diseases or ailments that cyanobacteria can cause, Kopta expresses his concern, explaining that at certain times they produce dangerous toxins. Some affect the liver and others the nervous system. In both the short and long term, they can be very dangerous. In his opinion, the main culprits are largely certain restaurants and hotels in the area that have already been reported by prosecutor Matheu and the LUCADESA Foundation, but for reasons unknown to him, no action has been taken.

Full interview with Federico Kopta in the appendix

A telephone interview was conducted with Carlos Matheu, prosecutor and president of the LUCADESA Foundation. He is one of the leading advocates for the protection of Córdoba's water resources and continues his fight through his foundation.

Regarding the complaint filed by him and the LUCADESA Foundation for the pollution of San Roque, Matheu explains that the complaint was filed in 2018 following 60 reports made by the Water Resources Department through its inspectors in hotels and restaurants in the area. Unfortunately, the names of the establishments were not disclosed, but it is clear that they are all located in the immediate vicinity of the lake. He also commented that the case is currently at a standstill and there are no new developments. When asked about the apparent reasons for such an important complaint being stalled, Matheu said that, in his view, moving the case forward would highlight the lack of investment in sewage systems by the provincial authorities, which speaks to a serious lack of independence of the judiciary from politics.

As for the measures that should be taken to solve the problem, Matheu commented that citizens should demand that the competent authorities build sewage systems throughout the San Roque basin.

Full interview with Carlos Matheu in the Annex.

Regulatory Framework and Related Laws

The General Environment Law No. 25.675 establishes among its objectives in Article 1 and Article 2, Sections A, B, D, E, and F,G to ensure the preservation, conservation, recovery, and improvement of the quality of environmental resources in the performance of various human activities, as well as to prevent the harmful or dangerous effects that these activities generate on the environment in order to enable the ecological, economic, and social sustainability of development; to organize and integrate environmental information and ensure free access to it for the population, and to establish a federal system of interjurisdictional coordination for the implementation of environmental policies at the national and regional levels.⁽¹¹⁾

The Organic Law of the Water and Sanitation Directorate of Córdoba. Law 8548 states in Articles 2 and 3, Sections A, E, and F that the Water and Sanitation Directorate shall be responsible for the conservation and exploitation of water resources, the provision and control of drinking water services, the collection and treatment of sewage and wastewater, irrigation, and rural sanitation in all areas of the province. It also states that the Directorate is responsible for monitoring drinking water and controlling its supply, as well as the collection and treatment of sewage and wastewater, irrigation, and rural sanitation in all areas of the province of Córdoba. It also states that technical standards for the quality, use, and supply of drinking water, such as the discharge of effluents, shall be established.^(12,13)

CONCLUSIONS

The environmental problem of Lake San Roque is a clear example of the contradictions between the discourse of sustainable development and actual practices in tourist areas. Despite existing regulatory frameworks and multiple studies that show the serious pollution of the reservoir, the lack of political will, corporate greenwashing, and the absence of effective legal action perpetuate an alarming situation. Uncontrolled and unplanned tourism development has transformed the lake, a vital source of water, into a body of water overloaded with nutrients and toxins. Faced with this reality, it is urgent that civil society demand compliance with environmental laws, investment in health infrastructure, and the implementation of sustainable tourism policies that truly consider environmental and social well-being. Only then will it be possible to recover and preserve Lake San Roque for present and future generations.

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None.

CONFLICT OF INTEREST

None.

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