

## Looking from above the Seven Crater Lakes, Arrangement, and Limitation of Aquaculture Structure

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The Seven Crater Lakes—Sampaloc Lake, Bunot Lake, Palakpakin Lake, Pandin Lake, Yambo Lake, Mohicap Lake, and Calibato Lake—are work-in-progress to address and conclude the aquaculture structure impediments. This paper examines the aquaculture structure's configuration of the maar lakes by looking into the fish cage zone's arrangement and limitation attributes. This academic work embraces a subjective-qualitative approach and takes from the above perspective. The inferences are: [1] Pandin Lake, Yambo Lake, Mohicap Lake, and Sampaloc Lake have attained the fish cage structures' restriction, *i.e.* Sampaloc Lake has accomplished, whereas Pandin Lake, Yambo Lake, and Mohicap Lake have to be satisfied the fish cage structures' dimension, alignment, and distance; [2] Palakpakin Lake has confirmed the fish cage structures' reduction, as well as the fish cage structures' dimension, alignment, and distance, *i.e.* Palakpakin Lake shows that the aquaculture structure's configuration has not been strictly observed and, hence, this requires stringent implementation; and [3] Bunot Lake and Calibato Lake have not yet conformed to the fish cage structures' reduction, as well as the fish cage structures' dimension, alignment, and distance. Bunot Lake and Calibato Lake are still behind the rest and, thus, these necessitate responding urgently. Overall, these central features are rudimentary but essential requirements in the crater lakes—whether complementing, reciprocating, or augmenting from conservation-development connection to the aquaculture-tourism nexus.

Keywords: aquaculture structure, arrangement, limitation, maar lakes, satellite imagery, Seven Crater Lakes

### INTRODUCTION

#### The Seven Crater Lake's Aquaculture Structure Rationale

The Seven Crater Lakes are notable for aquaculture structure and tourism pursuits, yet counterbalancing their conservation and development is still ongoing. Sampaloc Lake, Bunot Lake, Palakpakin Lake, Pandin Lake, Yambo Lake, Mohicap Lake, and Calibato Lake

are the freshwater maar lakes of San Pablo City, Laguna Province, the Philippines. These small lakes have long ago been recognized for tilapia floating cages and sightseeing excursions, whereas their preservation *vis-à-vis* advancement situation still lingers. From the lackadaisical decades (*i.e.* the 1980s–1990s), the maar lakes have been threatened by water conditions and contended by uneven progress. The seven small lakes experienced water quality deterioration due to accelerated eutrophication, elevated nutrients, and escalated pollution, whereas the economic quandary induced underdevelopment in tourism flow and

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overdevelopment in aquaculture constructions [e.g. Brillo (2017a, b), Brillo *et al.* (2019), Mendoza *et al.* (2019), and Ballares *et al.* 2020)]. In the present day, the Seven Crater Lakes' circumstances have ameliorated noticeably. The water quality standards have been retained (*i.e.* Pandin Lake and Yambo Lake) and improved (*i.e.* Mohicap Lake and Sampaloc Lake), the tourism development has been initiated (*i.e.* Mohicap Lake and Yambo Lake) and expanded (*i.e.* Pandin Lake and Sampaloc Lake), and the aquaculture structures have been sustained (*i.e.* Pandin Lake and Yambo Lake) and trimmed (*i.e.* Sampaloc Lake and Mohicap Lake) [e.g. Brillo (2020), Brillo and Simondac-Peria (2021), Paller *et al.* (2021), Brillo (2022a), and BFAR (2022)]. Despite these, the small maar lakes still have issues—especially Bunot Lake, Palakpakin Lake, and Calibato Lake—which have unresolved matters such as the aquaculture over-expansion and tourism establishment's predicament [see Brillo (2015a, 2016a, 2016b, 2022b)]. Overall, the Seven Crater Lakes have markedly regained, but they still continuously face current obstacles.

The Seven Crater Lakes scholarships gradually increased in the latter 2000s. The social science literature on the Philippine's small lakes has slowly become conspicuous in the mid-2010s [e.g. Brillo (2015b, 2016c, 2017a), Quintal *et al.* (2018), Brillo *et al.* (2019), Paller *et al.* (2021), Brillo (2022c)]. Although the natural science literature, particularly biological and physical sciences, are spearheaded and considerable, the social sciences work in the Seven Crater Lakes—albeit lesser substantial—has also increased steadily. The academic outputs are led by Sampaloc Lake and Pandin Lake studies, mainly about lake governance and tourism development in the seven small lakes [see Google Scholar (2022a, 2022b); e.g. Brillo and Boncocan (2016) and Brillo (2016d, 2022d)]. Presently, social science studies need more to fill up the seven maar lakes' enduring issues and build up the other academic disciplines. The social science works are necessary to be steady and stable; in the former, the small lake and its populace hurdles are dynamic, and in the latter, the natural science research complements and supplements each other. More so, social science studies are required to address the rudimentary barrier in the Seven Crater Lakes—the long-lasting conservation and development impediments from political, social, financial, and environmental concerns. The foremost among them is the aquaculture structures, as they directly and inevitably affect the small lake's preservation and advancement equilibrium.

The aquaculture structures, particularly tilapia floating cages, have long been dominant in the Seven Crater Lakes, past to the present. Tilapia culture and production are viewed as most suitable for freshwater maar lakes.

Since 1976 when tilapia cage farming was introduced in Bunot Lake, the seven small lakes eventually escalated, especially in Sampaloc Lake, Bunot Lake, Palakpakin Lake, Calibato Lake, and Mohicap Lake [e.g. City Government of San Pablo (2015a, 2016a, 2016c) and LLDA (2019)]. The aquaculture structures subsequently became entrenched, transforming an integral feature of the maar lakes. Inversely, the Seven Crater Lakes are consequently congested, risking water degradation, thus creating ramifications for the tourism economy. Currently, compared to the aquaculture development, the tourism development of the seven maar lakes is disproportionate: Bunot Lake, Palakpakin Lake, Yambo Lake, Mohicap Lake, and Calibato Lake have been initiated, but generally, their tourism enterprises and activities are sluggish; while only Sampaloc Lake and Pandin Lake are more established and operationally active [e.g. LLDA (2014), City Government of San Pablo (2015b), and Brillo (2017a, 2022a, b)]. All of the small lakes are regarded as excellent for tourism development since they are connected to each other, have proximate access roads, and are close to the city proper and adjacent to the surrounding municipalities (*i.e.* Rizal, Nagcarlan, Calauan, and Alaminos of Laguna, and Dolores and Tiaong of Quezon); yet, except for Sampaloc Lake and Pandin Lake, the remaining crater lakes have less traction in constructing the essential tourism infrastructure and facilities. Thus, if tourism progresses, aquaculture structures demand to look into their significance and ramifications; both are strongly associated with enhancing the conservation and development of the maar lakes. Inevitably, aquaculture development and tourism development are not averse, being interlinked and necessary, but the fish cage structures' exorbitance has to be filtered and curbed to flourish the tourism drive and poise the inland's water conditions.

With those mentioned above—the Seven Crater Lakes must continue confronting and dealing with their hindrances. The aquaculture structures' issue is the preeminent among them, as it impacts forthrightly on the maar lakes, from environmental protection to economic development. The fish farming organization-regulation *vis-à-vis* water management and tourism extension is indispensable and crucial to grasp the small lakes' encumbrance. Since tilapia cage farming is prominent, yet the issue is prevailing, this reality research gap requires assessing the aquaculture structure contemporarily. Thus, this paper explores the aquaculture structure's pivotal stipulation—the arrangement and limitation taking the view prospect to advance the conservation and development of the seven maar lakes. The arrangement and limitation are fundamental requirements for addressing and tackling the complications of the enduring small lakes. The view prospect is about looking from above *via* a web map, as it

allows a recent vantage point in authenticating the crater lakes' big picture. Besides, this academic work aligns with the social science scholarship to substantially improve the maar lakes resources, augment the local economy, and supplement their communities. *Ergo*, this article covers the following: [a] the Seven Crater Lake's Aquaculture Structure Rationale; [b] Methodology, Methods, and Criteria for Analysis; [c] Results and Discussion: the Seven Maar Lakes, the Government Agency, and Local Government, and the Two Essential Features: Arrangement and Limitation; and [d] Concluding Remarks.

## METHODOLOGY, METHODS, AND CRITERIA FOR ANALYSIS

This academic work embraces a subjective and qualitative approach to examine the two rudimentary requisites—arrangement and limitation—and to understand their unsettled impediments to the Seven Crater Lakes. Simply, a subjective and qualitative approach typifies a research viewpoint to explain using an interpretative manner and understand the circumstances systematically. Openly, this research espouses the relativism (or constructivism) position, which employs a distinctive grasp in concluding reality [see Baghrmian (2004), Summer and Tribe (2008), Crotty (2015), Brillo and Simondac-Peria 2021, and Brillo (2022a)]. On the whole, the study's reason is to comprehend two essential requirements' consequences *vis-à-vis* the seven maar lakes' situation.

On *modus operandi*, the research information is collected primarily by web maps—specifically, Zoom Earth, Google Earth, and Apple Maps—and underpinned by on-site observation/ocular inspection, authoritative websites, archival documents (*i.e.* official papers, records, reports), and academic journal articles. The aerial view of Zoom Earth, Google Earth, and Apple Maps uses satellite imageries that allow a more definitive description as well as a more amenable to verify and grasp the small lake's big picture. Although the satellite images are not instantaneous, these virtual sources are sufficient to provide pertinent information and study purposes—as the goal is to capture and depict the overall trajectory of the aquaculture circumstances of Seven Crater Lakes. Also, the satellite images are buttressed by visiting and directly checking the small lakes. The empirical data are systematically analyzed through content analysis and ordered using the two underlying features of the seven maar lakes. This study inclines to recognize and understand the ongoing small lakes' issues and implications. Incidentally, the small lake, maar lake, and crater lake's terminologies are designated as similar or interchangeable in this paper. Eventually, this academic

work espouses conviction by broadening the country's social science scholarship of small lakes.

Sampaloc Lake, Bunot Lake, Palakpakin Lake, Pandin Lake, Yambo Lake, Mohicap Lake, and Calibato Lake explore the two critical stipulations of the aquaculture structures. Broadly, the aquaculture structure refers to the configuration of the fish cage areas, explicitly the arrangement and limitation on the fishing zone of the maar lakes. The arrangement refers to the systematic layout and order of the fish cage belt in the crater lake's surface area. The limitation refers to the standardized constraint of the fish cage allocation in the small lake's surface area. The two main criteria are integral and pivotal in conserving and developing the Seven Crater Lakes, especially in undertaking the implementations and dealing with the complications of the aquaculture structures. Thus, these essential features are the concentration of study—the *crux* of the aquaculture-tourism development in the small lakes.

## RESULTS AND DISCUSSION

### The Seven Maar Lakes

As mentioned, Sampaloc Lake, Bunot Lake, Palakpakin Lake, Pandin Lake, Yambo Lake, Mohicap Lake, and Calibato Lake are acknowledged as the Seven Crater Lakes of San Pablo City [see Figure 1 and Apple Maps (2022a)]. These seven small lakes are described as tropical-freshwater and dished-shaped maar lakes. A maar lake is referred to as a volcanic crater that forms when magma contacts groundwater sparking an explosion that generates a water-filled bowl [*e.g.* USGS (2015) and Geology.com (2022)]. The seven maar lakes are also within the ambit of San Pablo Volcanic Field (or Laguna Volcanic Field), which is located among Laguna de Bay (*i.e.* the largest lake in the Philippines), Mount Banahaw–San Cristobal Protected Landscape, and Mount Malepunyo Range [see Global Volcanism Program (2013) and Google Maps (2022)]. In trophic conditions, the seven small lakes are commonly regarded continuum between mesotrophic (*i.e.* intermediate level of biological productivity) and eutrophic (*i.e.* high level of biological productivity), whereas in water quality classification, the seven maar lakes are normally considered Class C, the intended beneficial use for fishery and recreational water [see DENR (2016), LLDA (2018), Mendoza *et al.* (2019), Paller *et al.* (2021), de Leon *et al.* (2022), and Brillo (2022a)]. Thus, the Seven Crater Lakes' trophic and water quality state are satisfactorily suitable for aquaculture and tourism development.

Sampaloc Lake is situated within San Pablo City's proper—comprising *Barangay IV-A*, *Barangay V-A*,





**Figure 1.** The Seven Crater Lakes of San Pablo City: Sampaloc Lake, Bunot Lake, Palakpakin Lake, Pandin Lake, Yambo Lake, Mohicap Lake, and Calibato Lake (Apple Maps 2022a).

*Barangay* San Lucas 1, and *Barangay* Concepcion—and about 1 km from the San Pablo City Plaza. This small lake is the largest in size among the Seven Crater Lakes and is regarded as the “*primus inter pares*” among them. In maar dimensions, Sampaloc Lake has a surface area of 104 ha, a water depth of 27.6 m, and an elevation of more or less 106 m (LLDA 2008; City Government of San Pablo 2015a; Brillo 2016c).

Bunot Lake is located in *Barangay* Concepcion and about 3 km from the San Pablo City Plaza. This small lake is closest to Sampaloc Lake and the second nearest to the city center. In maar dimensions, Bunot Lake has a surface area of 30.5 ha, a water depth of 23 m, and an elevation of more or less 110 m (LLDA 2008; City Government of San Pablo 2015a; Brillo 2015a).

Palakpakin Lake is situated in three territorial districts—*Barangay* San Lorenzo, *Barangay* San Buenaventura, and *Barangay* Dolores—and about 5.9 km from the San Pablo City Plaza. This small lake is the second largest in size and the shallowest in depth among the Seven Crater Lakes. In maar dimensions, Palakpakin Lake has a surface area of 47.98 ha, a water depth of only 7.7 m, and an elevation of more or less 100 m (LLDA 2008; City Government of San Pablo 2015a; Brillo 2016a).

Pandin Lake is located in *Barangay* Santo Angel and about 7.5 km from the San Pablo City Plaza. This small lake is the second tiniest in size, deepest in the bottom, and highest in altitude among the Seven Crater Lakes. In maar dimensions, Pandin Lake has a surface area of 24 ha, a water depth of 61.75 m, and an elevation of more or less 160 m (LLDA 2008; City Government of San Pablo 2015a; Brillo 2016e).

Yambo Lake is situated as a transboundary within three municipalities—*Barangay* San Lorenzo in San Pablo City, *Barangay* Antipolo in Rizal Municipality, and *Barangay* Sulsuguin in Nagcarlan Municipality—and about 9 km from the San Pablo City Plaza. This small lake is the second highest altitude among the Seven Crater Lakes, similar to Pandin Lake’s twin, separated only by a narrow ridge. In maar dimensions, Yambo Lake has a surface area of 30.5 ha, a water depth of 38 m, and an elevation of more or less 160 m (LLDA 2008; City Government of San Pablo 2015a; Brillo 2016d).

Mohicap Lake is located in *Barangay* San Buenaventura and about 7 km from the San Pablo City Plaza. This small lake is the smallest in size among the Seven Crater Lakes. In maar dimensions, Mohicap Lake has a surface area of 22.89 ha, a water depth of 30.4 m, and an elevation of

more or less 80 m (LLDA 2008; City Government of San Pablo 2015a; Brillo 2015c).

Calibato Lake is situated a transboundary within two municipalities—*Barangay* Santo Angel in San Pablo City and *Barangay* Antipolo–*Barangay* Tala in Rizal Municipality—and about 7.6 km from the San Pablo City Plaza. This small lake is the deepest in the bottom, highest in altitude, and largest in freshwater volume among the Seven Crater Lakes. In maar dimensions, Calibato Lake has a surface area of 43 ha, a water depth of 156 m, and an elevation of more or less 170 m (LLDA 2008; City Government of San Pablo 2015a; Brillo 2016b).

### The Government Agency and Local Government

The seven maar lakes are under the Laguna Lake Development Authority (LLDA), a government agency with exclusive jurisdiction over water rights of Laguna de Bay and other bodies of water—including Sampaloc Lake, Bunot Lake, Palakpakin Lake, Pandin Lake, Yambo Lake, Mohicap Lake, and Calibato Lake [see Republic Act No. 4850 (1966), Presidential Decree No. 813 (as amended, 1975), and Executive Order No. 927 (1983)]. The LLDA is under the administrative supervision of the Department of Environment and Natural Resources (DENR) and has prescribed special powers, functions, and duties in protecting the Laguna de Bay Basin and developing the Laguna de Bay Region [see Executive Order No. 149 (1993) and LLDA (2022)]. The Laguna de Bay is the LLDA's emphasis as the country's biggest lake, and the Seven Crater Lakes are concomitant, being small constituent lakes. Customarily, the Laguna de Bay has core precedence, while the seven maar lakes have a peripheral preference (Brillo 2017a; Brillo *et al.* 2019). Compared to the past (before the 2000s), the LLDA is more engaged contemporarily in the seven small lakes such as reducing the tilapia floating cages and removing the illegal structures (in Sampaloc Lake), as well as formulating the Development and Management Plan starting in 2014 [*e.g.* Board Resolution No. 464 (2014), LLDA (2014), Board Resolution No. 481 (2014), City Government of San Pablo (2015b), Board Resolution No. 505 (2016), Board Resolution No. 543 (2018), Board Resolution No. 544 (2018), Board Resolution No. 566 (2019), and LLDA (2019)]. Nevertheless, there are remaining challenges in the Seven Crater Lakes, primarily completing and maintaining the aquaculture structures mandate.

The seven maar lakes are also under the City Government, a local government with territorial jurisdiction over the municipal water of San Pablo City [see Republic Act Nos. 7160 (1991) and 8550 (1998)]. The Seven Crater Lakes are a boundary locality (*i.e.* one jurisdiction area) except Yambo Lake and Calibato Lake, which are transboundary

localities. Yambo Lake's borderline is shared—about 70% with San Pablo City, 25% with Rizal Municipality, and 5% with Nagcarlan Municipality. Calibato Lake's borderline is portioned—about 80% with San Pablo City and 20% with Rizal Municipality. Regardless of the transboundary localities, the City Government of San Pablo is the domineering municipality *vis-à-vis* the lake's portion, the community population, and the domestic economy. In economic development, the City Government has an interest in broadening tourism, especially instituting tourism enterprise in the seven maar lakes [see Republic Act No. 9593 (2009) and City Government of San Pablo (2015a)]. At present, the local government has entrenched Sampaloc Lake and Pandin Lake in tourism undertakings, explicitly commercially organized and functioning (Brillo 2020, 2022a). In contrast, the remaining crater lakes have been instigated, but typically the pursuits are less satisfactory.

The government agency, as the exclusive jurisdiction over the water rights, and the local government, as the territorial jurisdiction over the municipal waters, are interrelated and supplementary to the Seven Crater Lakes' mandate. The LLDA and the City Government are coordinated in the maar lakes; generally, the former provides a comprehensive outlook plan, and the latter contributes to the particular programs or projects in the crater lakes. Chiefly, the government agency approves or disapproves the proposals of the small lakes, and the local government heads the local legislative ordinances supporting the maar lakes' agenda. One good example is the LLDA's acceptance of the amendments for the zoning guidelines of aquaculture structures in Sampaloc Lake, whereas the City Government proposes in line with the City Tourism Master Plan and the Tourism Act of 2009 [see Board Resolution Nos. 5 (1996), 26 (1996), and 70 (1998), Memorandum Circular No. 43 (2005), Republic Act No. 9593 (2009), City Government of San Pablo 2015a, and Memorandum Circular No. 2017-03 (2017)]. Also, the LLDA issues and orders in directing and regulating the Seven Crater Lakes, whereas the City Government collaborates in enforcing and assisting through the local police and *barangay* officials. The local government has operational supervision and control over police officers and has direct administration of the *barangay* officials [see Republic Act Nos. 6975 (1990) and 7160 (1991)]. Substantially, the government agency is the principal authority, and the local government is the statutory authority of the maar lakes; thus, these pairs are inevitable in the administrative arrangement to operate coherently and cordially of the Seven Crater Lakes. When one authority is amiss, *i.e.* either the local government is disinterested or the government agency is unresponsive, then the small lakes would be undercut.



### The Two Essential Features: Arrangement and Limitation

The Aquaculture structures, as mentioned, pertain to the configuration of the fish cage areas, particularly the arrangement and limitation on the Seven Crater Lakes fishing zone. Explicitly, this refers to the alignment and the restriction of the fish floating cages and the regulation of the lake's shoreline. The aquaculture structures are entrenched and integrated from past to the present, whereas the two critical attributes are fundamental in the small lakes' water resource conservation and aquaculture-tourism development. Thus, these are crucial in understanding the ongoing complications and outlooks of the maar lakes.

The arrangement refers to the systematic layout and formation of the fish cage belt in the crater lake's surface area. This distinctly means the fish cage structures' dimension, alignment, and distance. The fish cages are standard: the dimension is measured in the maximum size of 600 m<sup>2</sup> (*i.e.* 30 m x 20 m), the alignment is uniform in the group into modules and clusters, and the distance is spaced between 5–10 m following the specific location of the maar lakes. Furthermore, aquaculture structures

are prohibited in the lake's portion, following the navigational lane for mobility around 30 or 50 m open from the shoreline (*e.g.* transporting materials and feeds), as well as the access lane for the passageway about 10 or 20 m wide from the navigational lake [*e.g.* recreational purposes; see Memorandum Circular Nos. 2017-03 (2017) for Sampaloc Lake, 2017-04 (2017) for Palakpakin Lake, 2018-04 (2018) for Mohicap Lake, 2021-04 (2021) for Yambo Lake, and 2021-05 (2021) for Pandin Lake].

The limitation refers to the legalized restriction of the fish cage allocation in the crater lake's surface area. This markedly means the fish cage structures' reduction and constraint, specifically the allowable ceiling of 10% of the total lake area prescribed by the Philippine Fisheries Code as amended [see Republic Act Nos. 8550 (1998) and 10654 (2015)]. In the Seven Crater Lakes, the fish cages quota at present is either 5% (*e.g.* Pandin Lake and Yambo Lake) or 10% (*e.g.* Bunot Lake, Palakpakin Lake, and Calibato Lake) of the total lake area, following LLDA [see Memorandum Circular No. 2017-04 2017, LLDA (2019), Memorandum Circular No. 2021-05 (2021), and BFAR 2022].



Figure 2. Sampaloc Lake (Apple Maps 2022b).

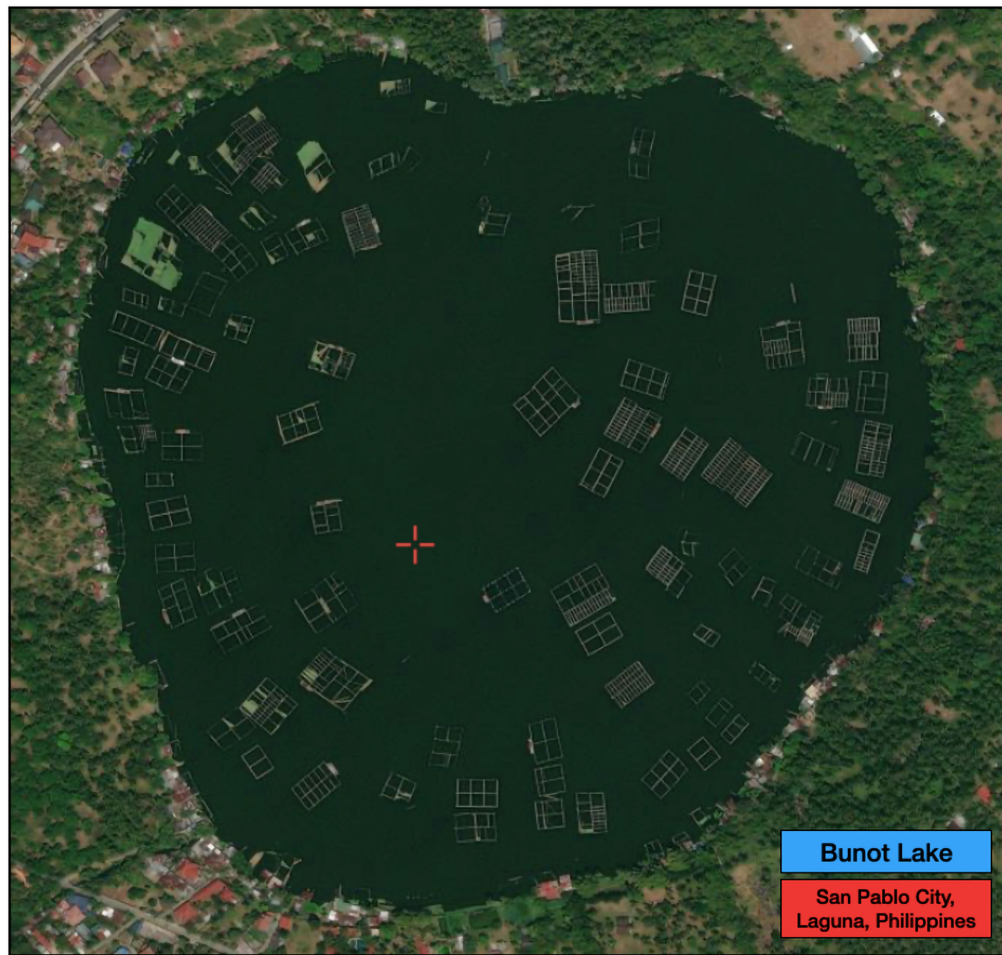


Figure 3. Bunot Lake (Apple Maps 2022c).

In Sampaloc Lake's arrangement, the fish cage belt's configuration has been implemented and settled at present [see Figure 2, Apple Maps (2022b), Zoom Earth (2022a), and Google Earth (2022a)]. Overall, the tilapia floating cages have been organized and assembled in the lake's structure area, and the fish cage operators have complied with the LLDA's directive. The dimension, alignment, and distance have adhered to the government agency's regulation, as the fish cages correspond to the required size, grouping, and space in the aquaculture structure zone. In the navigational and access lanes, this maar lake's corridor is accessible and cognizant to the populace, as the water pathway can be reachable by fish cage operators, tourists, and inhabitants. In Sampaloc Lake's limitation, the fish cage allocation abides by the allowable ceiling under the Philippine Fisheries Code. Currently, the tilapia floating cages have been able to roughly maintain the 10% stipulation following the LLDA's mandate. Thus, Sampaloc Lake's arrangement and limitation have confirmed the authority's requirements.

In Bunot Lake's arrangement, the fish cage belt's configuration has not been fully implemented and regulated at present [see Figure 3, Apple Maps (2022c), Zoom Earth (2022b), and Google Earth (2022b)]. Altogether, the tilapia floating cages have not been thoroughly assembled and clustered in the lake's structure zone, and the fish cage operators have not entirely complied with the LLDA's directive. The dimension, alignment, and distance have not abided by the government agency's regulation, as the fish cages are inconsistent with the required size, grouping, and space in the aquaculture structure zone. In the navigational and access lanes, this maar lake's corridor is more cluttered and less promulgated to the populace, as the water passageway has less congenial in reaching by fish cage operators, tourists, and inhabitants. In Bunot Lake's limitation, the fish cage allocation still exceeds the allowable limit under the Philippine Fisheries Code. Currently, the tilapia floating cages have surpassed the 10% stipulation following the LLDA's mandate. Thus, Bunot Lake's arrangement and limitation have not yet conformed to the authority's requirements.



In Palakpakin Lake's arrangement, the fish cage belt's configuration has been organized but not thoroughly completed at present [see Figure 4, Apple Maps (2022d), Zoom Earth (2022c), and Google Earth (2022c)]. On the whole, the tilapia floating cages have been assembled but not strictly clustered in the lake's structure zone, and the fish cage operators have not wholly met with the LLDA's directive. The dimension, alignment, and distance have loosely consistent with the government agency's regulation, as the fish cages are generally disproportionate to the required size, grouping, and space in the aquaculture structure zone. In the navigational and access lanes, this maar lake's corridor is not impeded and applied to the populace, as the water pathway can be attainable by fish cage operators, tourists, and inhabitants. In Palakpakin Lake's limitation, the fish cage allocation abides but requires tight checking to accomplish the allowable limit under the Philippine Fisheries Code. Currently, the tilapia floating cages have to be stringent to maintain the 10% stipulation following the LLDA's mandate. Thus, Palakpakin Lake's arrangement and limitation must be scrutinized to adhere to the authority's requirements.

In Pandin Lake's arrangement, the fish cage belt's configuration has not been enacted, but the prevailing cages are minimal at present [see Figure 5, Apple Maps (2022e), Zoom Earth (2022d), and Google Earth (2022d)]. Overall, the fish floating cages are few, so they have not yet assembled in the lake's structure area, and the fish cage operators have not yet met the LLDA's directive. The dimension, alignment, and distance have not yet been applied by the government agency's regulation, as the fish cages are still pending the required size, grouping, and space in the aquaculture structure zone. In the navigational and access lanes, this maar lake's corridor is accessible and open to the populace, as the water passageway can be passable by fish cage operators, tourists, and inhabitants. In Pandin Lake's limitation, the fish cage allocation accepts the allowable ceiling under the Philippine Fisheries Code. Currently, the fish floating cages have long been maintaining the 5% stipulation following the LLDA's mandate. Thus, Pandin Lake's arrangement has to be completed, whereas the limitation has satisfied the authority's requirements.

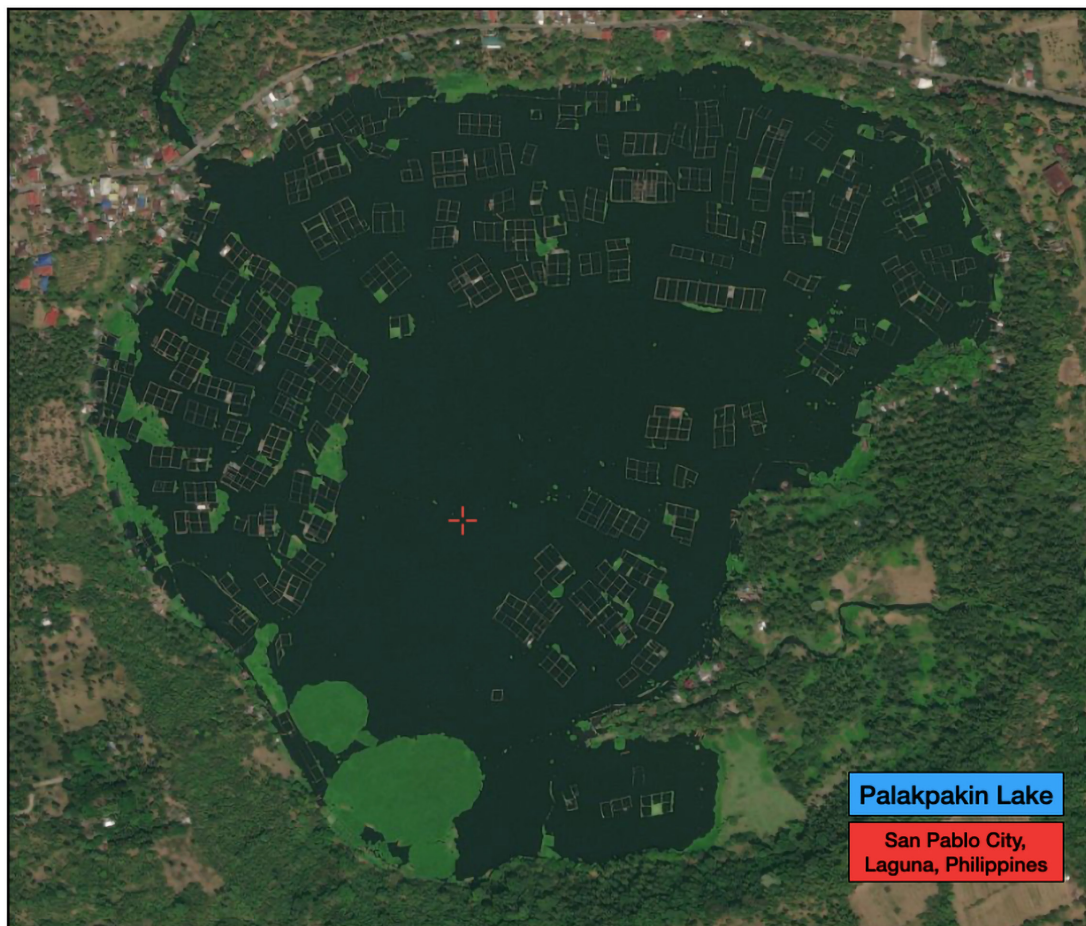


Figure 4. Palakpakin Lake (Apple Maps 2022d).





Figure 5. Pandin Lake (Apple Maps 2022e).

In Yambo Lake's arrangement, the fish cage belt's configuration has not been achieved, but the existing cages are minimum at present [see Figure 6, Apple Maps (2022f), Zoom Earth (2022e), and Google Earth (2022e)]. Altogether, the fish floating cages are a handful, so they have not yet been organized in the lake's structure area, and the fish cage operators have not yet carried out the LLDA's directive. The dimension, alignment, and distance have not yet been fulfilled by the government agency's regulation, as the fish cages are still unsettling the required size, grouping, and space in the aquaculture structure zone. In the navigational and access lanes, this maar lake's corridor is accessible and usable to the populace, as the water pathway can be navigable by fish cage operators, tourists, and inhabitants. In Yambo Lake's limitation, the fish cage allocation embraces the allowable ceiling under the Philippine Fisheries Code. Currently, the fish floating cages have long been standing the 5% stipulation following the LLDA's mandate. Thus, Yambo Lake's arrangement has to be accomplished, whereas the limitation has performed the authority's requirements.

In Mohicap Lake's arrangement, the fish cage belt's configuration has not been conducted, but the remaining cages are few at present [see Figure 7, Apple Maps (2022g), Zoom Earth (2022f), and Google Earth (2022f)]. On the whole, the fish floating cages are not many, so they have not yet been categorized in the lake's structure area, and the fish cage operators have not yet complied with the LLDA's directive. The dimension, alignment, and distance

have not yet been attained by the government agency's regulation, as the fish cages are still awaiting the required size, grouping, and space in the aquaculture structure zone. In the navigational and access lanes, this maar lake's corridor is accessible and applicable to the populace, as the water passageway can be opened by fish cage operators, tourists, and inhabitants. In Mohicap Lake's limitation, the fish cage allocation complies with the allowable ceiling under the Philippine Fisheries Code. Currently, the fish floating cages have been sustaining the 10% stipulation following the LLDA's mandate. Thus, Mohicap Lake's arrangement has to be carried on, whereas the limitation has obtained the authority's requirements.

In Calibato Lake's arrangement, the fish cage belt's configuration has not been methodically executed and conducted at present [see Figure 8, Apple Maps (2022h), Zoom Earth (2022g), and Google Earth (2022g)]. Mostly, the tilapia floating cages have been cluttered and scattered in the lake's structure zone, and the fish cage operators have not yet followed the LLDA's directive. The dimension, alignment, and distance have not been compatible nor parallel with the government agency's regulation, as the fish cages are not proportional to the required size, grouping, and space in the aquaculture structure zone. In the navigational and access lanes, this maar lake's corridor is constrained and less enacted to the populace, as the water pathway has not clearly defined by fish cage operators, tourists, and inhabitants. In Calibato Lake's limitation, the fish cage allocation still surpasses



Figure 6. Yambo Lake (Apple Maps 2022f).



Figure 7. Mohicap Lake (Apple Maps 2022g).





Figure 8. Calibato Lake (Apple Maps 2022h).

the allowable limit under the Philippine Fisheries Code. Currently, the tilapia floating cages have exceeded the 10% stipulation following the LLDA's mandate. Thus, Calibato Lake's arrangement and limitation have not yet abided by the authority's requirements.

## CONCLUDING REMARKS

This paper examines the aquaculture structure's configuration of the Seven Crater Lakes. Sampaloc Lake, Bunot Lake, Palakpakin Lake, Pandin Lake, Yambo Lake, Mohicap Lake, and Calibato Lake look into the fish cage zone's arrangement and limitation by taking from the above standpoint. These two central features are rudimentary but essential requirements for addressing and tackling the prevailing impediments of the small lakes, whether complementing, reciprocating, or augmenting from conservation-development connection to the aquaculture-tourism engagement.

The seven maar lakes' arrangement and limitation present the following findings. [1] In Sampaloc Lake, the arrangement has been implemented and settled for the fish cage belt's configuration, and the limitation abides by the allowable ceiling of the fish cage allocation. [2] In Bunot Lake, the arrangement has not been fully implemented and regulated for the fish cage zone's configuration, and the limitation still exceeds the allowable limit of the fish cage allocation. [3] In Palakpakin Lake, the arrangement has been organized but not thoroughly completed for the fish cage belt's configuration, and the limitation adheres but requires stringent checking to accomplish the allowable ceiling of the fish cage allocation. [4] In Pandin Lake, the arrangement has not been enacted, but the prevailing cages are minimal for the fish cage zone's configuration, and the limitation accepts the allowable limit of the fish cage allocation. [5] In Yambo Lake, the arrangement has not been achieved, but the existing cages are minimum for the fish cage belt's configuration, and the limitation embraces the allowable ceiling of the fish cage allocation. [6] In Mohicap Lake, the arrangement has not been conducted,



but the remaining cages are few for the fish cage zone's configuration, and the limitation complies with the allowable limit of the fish cage allocation. [7] In Calibato Lake, the arrangement has not been methodically executed and conducted for the fish cage belt's configuration, and the limitation still surpasses the allowable ceiling of the fish cage allocation.

Overall, Pandin Lake, Yambo Lake, Mohicap Lake, and Sampaloc Lake have attained the fish cage structures' restriction. This achievement is facilitated since Pandin Lake, Yambo Lake, and Mohicap Lake have been limited on fish cage operators in the past, whereas Pandin Lake and Sampaloc Lake have been the City Government's precedence for tourism. In the fish cage structures' dimension, alignment, and distance, Sampaloc Lake has accomplished, whereas Pandin Lake, Yambo Lake, and Mohicap Lake have to be satisfied the authority's requirements. Although Pandin Lake, Yambo Lake, and Mohicap Lake have not yet completed the layout and formation, this is considered a minor issue since the three small lakes have a few existing fish cages. In Palakpakin Lake, this has confirmed the fish cage structures' reduction, as well as the fish cage structures' dimension, alignment, and distance. But in the web maps, Palakpakin Lake shows that the aquaculture structure's configuration has not been strictly observed and, hence, this requires stringent implementation. Lastly, Bunot Lake and Calibato Lake have not yet conformed to the fish cage structures' reduction as well as the fish cage structures' dimension, alignment, and distance. Bunot Lake and Calibato Lake are still behind the rest and, thus, these necessitate responding urgently.

In the aquaculture-tourism nexus, the Seven Crater Lakes' trajectory is still a work in progress. The LLDA and the City Government have already provided agenda *vis-à-vis* the fish cage structures and tourism development, respectively. Although ongoing, the aquaculture structure's configuration is striving the LLDA (*e.g.* Development and Management Plan, Zoning and Management Plan), and the tourism progression is attempting the City Government (*e.g.* Tourism Master Plan). Hence, it has to be prioritized—promptly completed and implemented in the seven small lakes. The fish cage farms and tourism pursuits are not zero-sum but the positive-sum tradeoff in protecting the water resources and in developing the local economy—as balanced, connected, and supplemented. After settling the aquaculture structure issue, thus, the maar lakes would be secured environmentally and lifted developmentally. In time to come, the aspiration is to sustainably and economically link the Seven Crater Lakes—Sampaloc Lake, Bunot Lake, Palakpakin Lake, Pandin Lake, Yambo Lake, Mohicap Lake, and Calibato Lake intimately.

## AUTHOR'S STATEMENTS

**[Declaration of ownership]** This report is my original work. **[Conflict of interest]** The author declares no conflict of interest. **[Ethical standards]** This study was approved by the institution. **[Data availability statement]** Data sharing does not apply to this article.

## REFERENCES

- APPLE MAPS. 2022a. San Pablo City, Laguna, Philippines. Apple Inc., United States.
- APPLE MAPS. 2022b. Sampaloc Lake, Laguna, Philippines. Apple Inc., United States. Retrieved on 01 Oct 2022 from [https://satellites.pro/Philippines\\_map#14.078691,121.333748,16](https://satellites.pro/Philippines_map#14.078691,121.333748,16)
- APPLE MAPS. 2022c. Bunot Lake, Laguna, Philippines. Apple Inc., United States. Retrieved on 01 Oct 2022 from [https://satellites.pro/Philippines\\_map#14.080570,121.343184,17](https://satellites.pro/Philippines_map#14.080570,121.343184,17)
- APPLE MAPS. 2022d. Palakpakin Lake, Laguna, Philippines. Apple Inc., United States. Retrieved on 01 Oct 2022 from [https://satellites.pro/Philippines\\_map#14.110654,121.340488,17](https://satellites.pro/Philippines_map#14.110654,121.340488,17)
- APPLE MAPS. 2022e. Pandin Lake, Laguna, Philippines. Apple Inc., United States. Retrieved on 01 Oct 2022 from [https://satellites.pro/Philippines\\_map#14.113972,121.368016,17](https://satellites.pro/Philippines_map#14.113972,121.368016,17)
- APPLE MAPS. 2022f. Yambo Lake, Laguna, Philippines. Apple Inc., United States. Retrieved on 01 Oct 2022 from [https://satellites.pro/Philippines\\_map#14.119018,121.366578,17](https://satellites.pro/Philippines_map#14.119018,121.366578,17)
- APPLE MAPS. 2022g. Mohicap Lake, Laguna, Philippines. Apple Inc., United States. Retrieved on 01 Oct 2022 from [https://satellites.pro/Philippines\\_map#14.121861,121.334344,17](https://satellites.pro/Philippines_map#14.121861,121.334344,17)
- APPLE MAPS. 2022h. Calibato Lake, Laguna, Philippines. Apple Inc., United States. Retrieved on 01 Oct 2022 from [https://satellites.pro/Philippines\\_map#14.103209,121.377837,16](https://satellites.pro/Philippines_map#14.103209,121.377837,16)
- BAGHRAMIAN M. 2004. Relativism. London: Taylor & Francis.
- BALLARES L, MASANGKAY F, DIONISIO J, VILLAFLORES O, PINEDA-CORTEL MR, MILANEZ G. 2020. Molecular detection of *Acanthamoeba* spp. in seven crater lakes of Laguna,

- Philippines. *Journal of Water & Health* 18(5): 776–784. DOI: <https://doi.org/10.2166/wh.2020.146>
- [BFAR] Bureau of Fisheries and Aquatic Resources. 2022. Bunot lake, Palakpakin lake, and Calibato lake. Quezon City, Philippines.
- BOARD RESOLUTION NO. 5. 1996. The revised zone map of 1996 and its implementing rules. Laguna Lake Development Authority, San Pablo City, Philippines.
- BOARD RESOLUTION NO. 26. 1996. A co-management approach in the seven crater lakes. Laguna Lake Development Authority, San Pablo City, Philippines.
- BOARD RESOLUTION NO. 70. 1998. A policy framework on the use of the seven crater lakes of San Pablo City. Laguna Lake Development Authority, San Pablo City, Philippines.
- BOARD RESOLUTION NO. 464. 2014. The framework for the formulation of development and management plan for the seven crater lakes of San Pablo City. Laguna Lake Development Authority, San Pablo City, Philippines.
- BOARD RESOLUTION NO. 481. 2014. A resolution approving the five-year development and management plan for Pandin lake. Laguna Lake Development Authority, Quezon City, Philippines.
- BOARD RESOLUTION NO. 505. 2016. A resolution approving the five-year development and management plan for Yambo lake. Laguna Lake Development Authority, Quezon City, Philippines.
- BOARD RESOLUTION NO. 543. 2018. Approving the 5-year Mohicap lake development and management plan. Laguna Lake Development Authority, Quezon City, Philippines.
- BOARD RESOLUTION NO. 544. 2018. Approving the 5-year Palakpakin lake development and management plan. Laguna Lake Development Authority, Quezon City, Philippines.
- BOARD RESOLUTION NO. 566. 2019. A resolution approving the 5-year Calibato lake basin development and management plan. Laguna Lake Development Authority, Quezon City, Philippines.
- BRILLO BB. 2015a. Development issues of Bunot lake: The lesser lake among the seven lakes of San Pablo City, Philippines. *Lakes & Reservoirs: Research & Management* 20(3): 155–165.
- BRILLO BB. 2015b. The status of Philippine lake studies: scholarly deficit on social science studies and on small-lake research. *Asia-Pacific Social Science Review* 15(1): 78–101.
- BRILLO BB. 2015c. Developing Mohicap lake, San Pablo City, Philippines. *The Social Sciences* 11(3): 283–290.
- BRILLO BB. 2016a. Developing a small lake: the case of Palakpakin lake, San Pablo City, Philippines. *Water Resources* 43(4): 611–620.
- BRILLO BB. 2016b. An assessment of development of a transboundary small lake: Calibato lake, San Pablo City and Rizal, Laguna, Philippines. *Asian Journal of Water, Environment, and Pollution* 13(2): 55–67.
- BRILLO BB. 2016c. Urban lake governance and development in the Philippines: the case of Sampaloc lake, San Pablo City. *Taiwan Water Conservancy Journal* 64(3): 66–81.
- BRILLO BB. 2016d. The case of Yambo lake, San Pablo City, Nagcarlan, and Rizal, Laguna, Philippines. *The Social Sciences* 11(23): 5693–5702.
- BRILLO BB. 2016e. Development of a small lake: Ecotourism enterprise for Pandin lake, San Pablo City, Philippines. *Lakes & Reservoirs: Research & Management* 21(4): 284–292.
- BRILLO BB. 2017a. The governance of the seven crater lakes, San Pablo City, Philippines. *Asian Journal of Water, Environment, and Pollution* 14(2): 13–25.
- BRILLO BB. 2017b. The politics of lake governance: Sampaloc lake, Pandin lake and Tadalac lake of the Laguna de Bay Region, Philippines. *Asia-Pacific Social Science Review* 17(1): 66–79.
- BRILLO BB. 2020. Initiation and establishment of ecotourism development: Pandin lake of San Pablo City and Tayak hill of Rizal, Laguna, Philippines. *GeoJournal: Spatially Integrated Social Sciences and Humanities* 86(6): 2573–2586. DOI: 10.1007/s10708-020-10216-1
- BRILLO BB. 2022a. The government and lake governance criteria on the seven crater lakes of San Pablo City, Laguna, Philippines. *Lakes & Reservoirs: Research & Management* [forthcoming]. DOI: 10.1111/lre.12435
- BRILLO BB. 2022b. Underlying cornerstone of Bunot lake, Palakpakin lake, and Calibato lake: aquaculture structure, road infrastructure, and legal easement. *Science & Engineering Journal (SciEnggJ)* 15(2): 181–191.
- BRILLO BB. 2022c. Government, premier leader, and small lake's people *vis-à-vis* lake governance. *Social Sciences-Basel* 11(4): 165. DOI: <https://doi.org/10.3390/socsci11040165>
- BRILLO BB. 2022d. A conceptual framework for understanding lake governance: lake's people, development, conservation and government [unpublished].

- BRILLO BB, BONCOCAN R. 2016. The ecotourism-based administration and development of Pandin lake, San Pablo City, Philippines. *Silliman Journal* 57(2): 59–76.
- BRILLO BB, BELLO R, SERRANO E. 2019. The administrative performance of the Laguna Lake Development Authority on the small lakes of the Laguna de Bay Region, Philippines. *Asia-Pacific Social Science Review* 19(4): 29–43.
- BRILLO BB, SIMONDAC-PERIA A. 2021. Sustainability of a local government-instituted ecotourism development: Tayak adventure, nature and wildlife park in Rizal, Laguna, Philippines. *Environment, Development, and Sustainability* 23(11): 16145–16162. DOI: 10.1007/s10668-021-01336-w
- CITY GOVERNMENT OF SAN PABLO. 2015a. San Pablo City tourism master plan 2015–2020. CHACTO, San Pablo City, Philippines.
- CITY GOVERNMENT OF SAN PABLO. 2015b. Proposed zoning and development plan for Sampaloc lake. San Pablo City, Laguna, Philippines.
- CROTTY M. 2015. *Foundations of social research: meaning and perspective in the research process*. London: Sage.
- [DENR] Department of Environment and Natural Resources. 2016. DENR Administrative Order no. 2016-08. Quezon City, Philippines.
- DE LEON J, FUJIBAYASHI M, PETILLA FM, YUMUL BI, MENDOZA-PASCUAL M, PAPA RD, OKUDA N. 2022. Identification of aquatic consumer trophic pathways in four volcanic tropical lakes using fatty acid biomarkers. *Journal of Limnology* 81(1): 2070. DOI: <https://doi.org/10.4081/jlimnol.2022.2070>
- EXECUTIVE ORDER NO. 927. 1983. Further defining certain functions and powers of the Laguna Lake Development Authority. Office of the President of the Republic of the Philippines.
- EXECUTIVE ORDER NO. 149. 1993. Streamlining of the office of the President. Office of the President of the Republic of the Philippines.
- GEOLOGY.COM. 2022. Maar and phreatic eruptions. Retrieved on 01 Oct 2022 from <https://geology.com/stories/13/maar/>
- GLOBAL VOLCANISM PROGRAM. 2013. Smithsonian Institution: National Museum of Natural History. Retrieved on 01 Oct 2022 from <https://volcano.si.edu/volcano.cfm?vn=273060>
- GOOGLE EARTH. 2022a. Sampaloc Lake, San Pablo City, Laguna. Google, California, United States.
- GOOGLE EARTH. 2022b. Bunot Lake, San Pablo City, Laguna. Google, California, United States.
- GOOGLE EARTH. 2022c. Palakpakin Lake, San Pablo City, Laguna. Google, California, United States.
- GOOGLE EARTH. 2022d. Pandin Lake, San Pablo City, Laguna. Google, California, United States.
- GOOGLE EARTH. 2022e. Yambo Lake, San Pablo City, Laguna. Google, California, United States.
- GOOGLE EARTH. 2022f. Mohicap Lake, San Pablo City, Laguna. Google, California, United States.
- GOOGLE EARTH. 2022g. Calibato Lake, San Pablo City, Laguna. Google, California, United States.
- GOOGLE MAPS. 2022. Lakes, Laguna and Quezon province, Philippines. Retrieved on 01 Oct 2022 from <https://www.google.com.ph/maps/search/Lakes,+Laguna+and+Quezon+Province,+Philippines/@14.2458706,121.0342881,10z/data=!3m1!4b1?hl=en>
- GOOGLE SCHOLAR. 2022a. “Sampaloc Lake”. Google, California, United States.
- GOOGLE SCHOLAR. 2022b. “Pandin Lake”. Google, California, United States.
- [LLDA] Laguna Lake Development Authority. 2008. Water quality report of the seven crater lakes 2006–2008. Retrieved on 01 Oct 2022 from <https://llda.gov.ph/wp-content/uploads/dox/7lakes/7craterlakes.pdf>
- [LLDA] Laguna Lake Development Authority. 2014. Pandin lake development and management plan, Volume 1. LLDA, Quezon City, Philippines.
- [LLDA] Laguna Lake Development Authority. 2018. LLDA Memorandum Circular No. 2018-03. LLDA, Quezon City, Philippines.
- [LLDA] Laguna Lake Development Authority. 2019. Bunot lake basin development and management plan. LLDA, Quezon City, Philippines.
- [LLDA] Laguna Lake Development Authority. 2022. Agency Profile. Retrieved on 01 Oct 2022 from <https://llda.gov.ph/agency-profile/>
- MEMORANDUM CIRCULAR NO. 43. 2005. The zoning and development plan of Sampaloc lake (zodep). LLDA, Quezon City, Philippines.
- MEMORANDUM CIRCULAR NO. 2017-03. 2017. Revised guidelines in implementing the zoning of aquaculture structures in Sampaloc lake. LLDA, Quezon City, Philippines.



- MEMORANDUM CIRCULAR NO. 2017-04. 2017. Pagpapatibay sa mga susog sa Kautusan Blg. 2010-03 “Gabay sa pagpapatupad ng mga patakaran at pamantayan sa paggamit at pagsasaayos ng mga palaisdaan sa lawa ng Palakpakin.” LLDA, Quezon City, Philippines.
- MEMORANDUM CIRCULAR NO. 2018-04. 2018. Revised rules and regulations of the multiple use and management of Mohicap lake. LLDA, Quezon City, Philippines.
- MEMORANDUM CIRCULAR NO. 2021-04. 2021. Revised guidelines for implementing Kautusan Blg. 2010-05 “Gabay sa pagpapatupad ng mga patakaran at pamantayan sa paggamit at pagsasaayos ng mga palaisdaan sa lawa ng Yambo.” LLDA, Quezon City, Philippines.
- MEMORANDUM CIRCULAR NO. 2021-05. 2021. Revised guidelines for implementing Kautusan Blg. 2010-04 “Gabay sa pagpapatupad ng mga patakaran at pamantayan sa paggamit at pagsasaayos ng mga palaisdaan sa lawa ng Pandin.” LLDA, Quezon City, Philippines.
- MENDOZA M, BRIONES JC, ITOH M, PADILLA KSA, AGUILAR J, OKUDAN, PAPA RD. 2019. Small maar lakes of Luzon Island, Philippines: their limnological status and implications on the management of tropical lakes – a review. *Philippine Journal of Science* 148(3): 565–578.
- PALLER VG, MAGCALE-MACANDOG D, DE CHAVEZ ER, PARASO MG, TSUCHIYA MC, CAMPANG J, PLETO JV, BANDAL M, CABILLON YC, ELEPAÑO A, MACARAIG JR, MENDOZA D. 2021. The seven lakes of San Pablo: assessment and monitoring strategies toward sustainable lake ecosystems. *Philippine Science Letters* 14(1): 158–179.
- PRESIDENTIAL DECREE NO 813. 1975. Amending certain sections of Republic Act numbered forty eight hundred fifty, otherwise known as the Laguna Lake Development Authority Act of 1966.
- QUINTAL AL, GOTANGCO CK, GUZMAN MAL. 2018. Forecasting urban expansion in the seven lakes area in San Pablo City, Laguna, the Philippines using the land transformation model. *Environment and Urbanization ASIA* 9(1): 69–85. DOI: <https://doi.org/10.1177%2F0975425317748531>
- REPUBLIC ACT NO. 4850. 1966. The Laguna Lake Development Authority Act. Congress of the Republic of the Philippines.
- REPUBLIC ACT NO. 6975. 1990. Department of the Interior and Local Government Act. Congress of the Republic of the Philippines.
- REPUBLIC ACT NO. 7160. 1991. Local Government Code. Congress of the Republic of the Philippines.
- REPUBLIC ACT NO. 8550. 1998. The Philippine Fisheries Code. Congress of the Republic of the Philippines.
- REPUBLIC ACT NO. 9593. 2009. Tourism Act. Congress of the Republic of the Philippines.
- REPUBLIC ACT NO. 10654. 2015. Amending the Philippine Fisheries Code. Congress of the Republic of the Philippines.
- SUMMERA, TRIBE M. 2008. International development studies: Theories and methods in research and practice. London: Sage.
- [USGS] US Geological Survey. 2015. Volcano hazards program: glossary – maar. Retrieved from <https://volcanoes.usgs.gov/vsc/glossary/maar.html>
- ZOOM EARTH. 2022a. Sampaloc Lake, Laguna, Calabarzon, Philippines. Microsoft, Washington, United States. Retrieved on 01 Oct 2022 from <https://zoom.earth/#view=14.0774,121.3304,16z>
- ZOOM EARTH. 2022b. Bunot Lake, Laguna, Calabarzon, Philippines. Microsoft, Washington, United States. Retrieved on 01 Oct 2022 from <https://zoom.earth/#view=14.081496,121.34421,17z>
- ZOOM EARTH. 2022c. Palakpakin Lake, Laguna, Calabarzon, Philippines. Microsoft, Washington, United States. Retrieved on 01 Oct 2022 from <https://zoom.earth/#view=14.110192,121.34041,16z>
- ZOOM EARTH. 2022d. Pandin Lake, Laguna, Calabarzon, Philippines. Microsoft, Washington, United States. Retrieved on 01 Oct 2022 from <https://zoom.earth/#view=14.1142,121.3682,17z>
- ZOOM EARTH. 2022e. Yambo Lake, Laguna, Calabarzon, Philippines. Microsoft, Washington, United States. Retrieved on 01 Oct 2022 from <https://zoom.earth/#view=14.119266,121.366021,17z>
- ZOOM EARTH. 2022f. Mohicap Lake, Laguna, Calabarzon, Philippines. Microsoft, Washington, United States. Retrieved on 01 Oct 2022 from <https://zoom.earth/#view=14.122322,121.334169,17z>
- ZOOM EARTH. 2022g. Calibato Lake, Laguna, Calabarzon, Philippines. Microsoft, Washington, United States. Retrieved on 01 Oct 2022 from <https://zoom.earth/#view=14.1032,121.3774,17z>