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RESEARCH ARTICLE

The Administrative Performance of the Laguna Lake Development Authority on the Small Lakes of the Laguna de Bay Region, Philippines

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Abstract: Few studies have dealt with small lakes in the Philippines, particularly aspects of their governance, which translate to information deficit on the status of administration of many lakes in the country. At the core of governance in any lake is its administrative agency, and in the eight crater lakes of San Pablo City, it is the Laguna Lake Development Authority (LLDA). Under this context, this article examines the administrative performance of the LLDA on the eight small lakes (i.e., Sampaloc Lake, Bunot Lake, Palakpakin Lake, Calibato Lake, Mohicap Lake, Pandin Lake, Yambo Lake, and Tadlac Lake) of the Laguna de Bay Region. The study evaluates the agency using four criteria deemed fundamental in managing, conserving, and developing small lakes: (1) having an approved management and development plan (MDP); (2) regulating fish pens and cages; (3) implementing the shoreline easement; and (4) conducting maintenance activities. Using data from interviews, site observations, documents, reports, and other secondary sources, the study contends that the LLDA's performance is ambivalent because its management of the small lakes can be characterized as slow and lacking in follow-through in the MDP issue; unsatisfactory in the regulation of aquastructure and shoreline easement; but decent in water quality monitoring, clean-up operations, and fingerlings dispersal. On the whole, the assessment exemplifies the inconsistent actions of the LLDA and underscores the long-term commitment and accountability of the agency in governing the crater lakes.

Keywords: Bunot Lake, Calibato Lake, Governance, Laguna Lake Development Authority (LLDA), Mohicap Lake, Palakpakin Lake, Pandin Lake, Sampaloc Lake, Tadlac Lake, Yambo Lake

The Laguna Lake Development Authority (LLDA) is the custodian of the Laguna de Bay Region. Laguna de Bay is the largest lake in the country and the third-largest in Southeast Asia. The Laguna de Bay Region is a strategic area encompassing the two main economic enclaves, as well as the most populous regions in the Philippines— Metro Manila and CALABARZON (Cavite, Laguna, Batangas, Rizal, and Quezon provinces). The LLDA has the largest administrative jurisdiction for an inland body of water, and hence, considered as a leading authority in ecological governance and development of a lake and its basin in the country. The LLDA's administrative performance has been noteworthy over the years. Among the agency's notable undertakings are: the Environmental User's Fee System (EUFS) which was

launched in 1997, pioneering water pollution charge system in the country; the Laguna de Bay Institutional Strengthening and Community Participation (LISCOP) Project which was supported by the Netherlands Government and the World Bank, institutionalizing the partnership with local government units, river councils, and other stakeholders; and more recently, the Laguna Lakeshore Expressway Dike proposal, a multibillion peso project which intends to build a 47-kilometre-long, six-lane flood control dike-highway and reclaim 700 hectares of Laguna de Bay (Department of Public Works and Highways, 2014). Moreover, the LLDA has also been enforcing basic regulations in Laguna de Bay such as issuing "cease and desist order" for water polluters, demolishing illegal fish pens/cages and aquastructures, and issuing "notice of violation" on shoreline easements (see LLDA, 2009b, 2010, 2011, 2012, 2013b, 2014c, 2015). On the whole, these endeavors point to the LLDA as a performing administrative agency.

However, the LLDA is not all about Laguna de Bay. Unknown to many people, the agency also manages eight small lakes situated in the southern part of the Laguna de Bay Region, namely, Sampaloc Lake, Bunot Lake, Palakpakin Lake, Mohicap Lake, Pandin Lake, Yambo Lake, and Calibato Lake of the seven crater lakes system of San Pablo City, and Tadlac Lake of Los Banos, Laguna (see Figure 1). The eight crater lakes are small freshwater lakes that lie within the watershed system of Laguna de Bay. The LLDA's administrative jurisdiction over them took effect in 1983 by virtue of Executive Order 927, which expanded the LLDA's authority provided in its original charter (i.e., The Laguna lake development authority act, 1966) by granting exclusive water rights overall water bodies in Laguna de Bay Region. After more than three decades, the eight crater lakes seem to be out of the attention of the LLDA, as the agency's focus is mainly confined to Laguna de Bay, its principal concern. Except for the recent LLDA's (2014B) Board Resolution No. 464, which established the Framework for the Formulation of Development and Management Plan for the Seven Crater Lakes, the eight small lakes have generally been taking peripheral consideration from the administrative agency. The development of eight small lakes has not been identified among the key programs and projects by the LLDA in its annual reports (see LLDA, 2009b, 2010, 2011, 2012, 2013b, 2014c, 2015). The Laguna de Bay Master Plan of 1995, and its recent update, the Laguna de Bay Basin Master Plan of 2016 did not give explicit reference to the eight small lakes despite the master plans' emphasis on watershed management (see LLDA, 2016). Even superficially, the well-circulated official map of the LLDA's administrative jurisdiction has inadvertently failed to include the eight crater lakes (see Figure 2).

Properly managing the small lakes in the Philippines is important because the inland water resources are abundant in the country, and many of them are a potential catalyst for the development of the surrounding impoverished communities. This rationale is aligned with the concept of development as an improvement that is shared and sustainable (Global Monitoring Report, 2015), which in small lake development simply means improving the situation of the local people (making development inclusive) and ensuring the conservation of the water resource (making development sustainable).

Small lakes (together with major lakes in the country) are contemporarily ecologically threatened. The First National Congress on Philippine Lakes held in 2003 and the Second National Congress on Philippine Lakes held in 2011 have recognized that many lakes in the country, despite incremental improvements, remain at risk of environmental degradation due mainly to indiscriminate utilization and increasing demands of economic growth (Aralar et al., 2005; Fernandez, 2011; Aralar et al., 2013; Global Nature Fund, 2014). Against this backdrop, studies on Philippine lakes have been incrementally increased over the years. However, the concentration of scholarly works is on the abiotic and biotic features of the major lakes in the country (Brillo, 2015a; see also Guerrero, 2001, 2005). Presently, few studies have dealt with small lakes, particularly on the aspects of their governance (see International Lake Environment Committee, 2005; Downing, 2010; United Nations Development Programme-Water Governance Facility, 2015; Brillo, 2015a, 2017a). This reality translates to information deficit in small lakes as well as in the status of their administration. Governance is fundamental because enforcing the key regulations nd implementing the many scientific findings on lakes are contingent in it (see Nowlan & Bakker, 2007; Simms & de Loë, 2010; Melnychuk, Murray, & de Loë, 2012). At the core of governance in any lake is its administrative agency, and in the eight small lakes, it is the LLDA.

Predicated on the preceding discussions, this study addresses the literature deficit by examining the LLDA's performance in managing, conserving, and developing the eight crater lakes under its jurisdiction. Consistent with the gap in the literature, governance and administration studies on the eight crater lakes are deficient, as the great majority of existing scholarly works are under limnology and aquaculture aspects (see Brillo, 2015b, 2015c, 2016a, 2016b, 2016c, 2016d, 2017b). Overall, the study argues that the LLDA's performance is ambivalent because its administration of the eight small lakes can be characterized as slow and lacking in follow-through in the management and development plan (MDP) issue; unsatisfactory in regulating aquastructure and shoreline easement; but satisfactorily in water quality monitoring, clean-up operations, and fingerlings dispersal. Moreover, the findings illustrate the lack of consistency in the actions of the LLDA and underscore two key features— the long-term commitment and accountability of the agency in governing the eight crater lakes.

Criteria for Analysis

The study employs a case study design to look into the administrative performance of the LLDA on the eight crater lakes of the Laguna de Bay Region. The data are generated from interviews, site surveys, reports, and other secondary sources. The data are then systematically analyzed using a content analysis approach and outlined using administrative criteria deemed basic in the sound management, development, and conservation of small lakes in the Philippines; specifically: (1) having an approved management and development plan (MDP); (2) regulating fish pens and cages (i.e., enforcing the 10% area limit rule for aquastructures pursuant to the Fisheries Code of the Philippines, 1998); (3) implementing the shoreline easement (i.e., enforcing the 20-meter easement rule pursuant to the Water Code of the Philippines, 1976); and (4) conducting maintenance activities, specifically water quality analysis, clean-up operations, and fingerlings dispersal. These criteria were developed based on the lessons learned from a series of exploratory case studies conducted on small lakes in the Philippines over the years (see Brillo, 2015b, 2015c, 2016a, 2016b, 2016c, 2016d, 2017b; Brillo, Anastacio, Dicolen, & Baconguis, 2017; Brillo, Quinones, & Lapitan, 2017). Unlike water governance which has accumulated adequate scholarly discussions (e.g., Rogers & Hall, 2003; Biswas, 2004; Biswas & Tortajada, 2005; Nowlan & Bakker, 2007; Simms & de Loë, 2010; Biswas & Tortajada 2010; Melnychuk et al., 2012), the literature in lake governance is

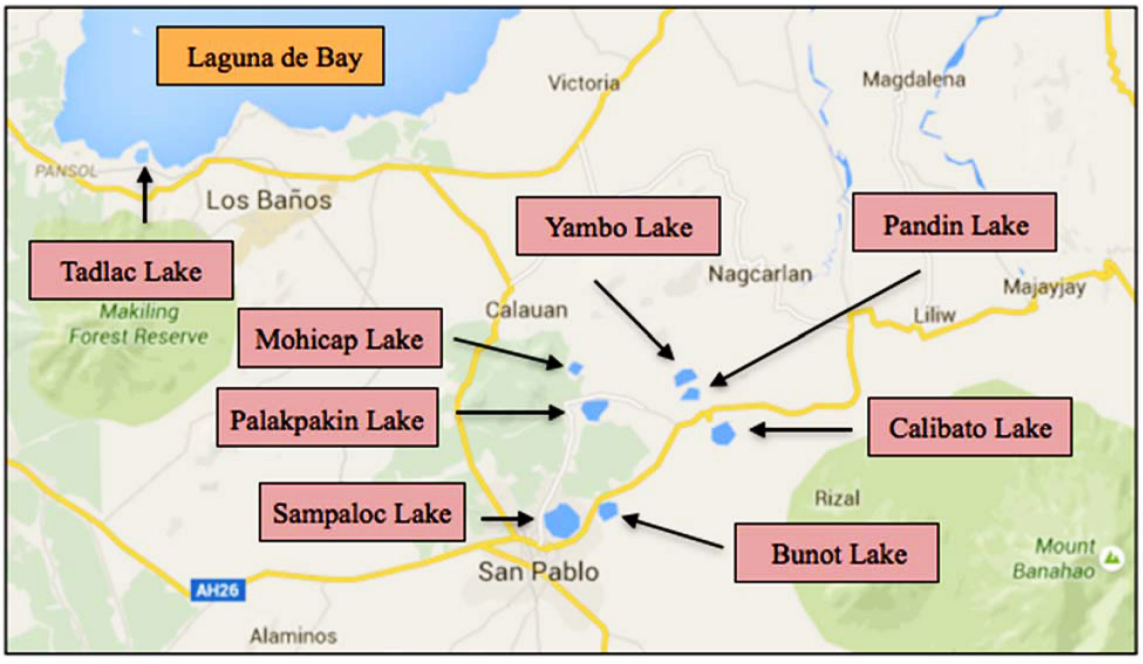

Figure 1. The eight crater lakes of the Laguna de Bay Region.

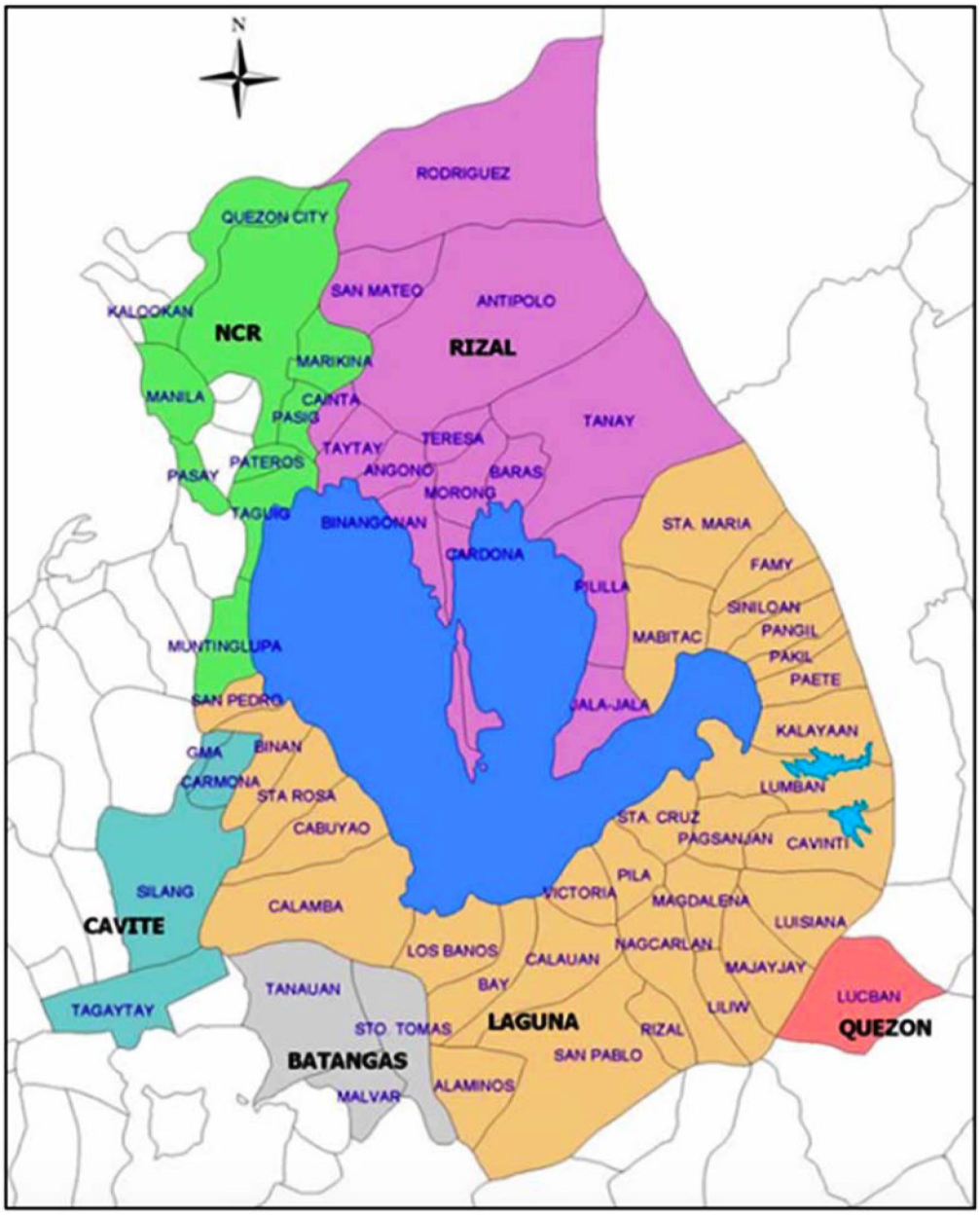

Figure 2. Administrative jurisdiction of the LLDA (LLDA, 2010, 2011).

scarce. This situation is in the extreme when it comes to small-lake governance, which is hardly discussed in the literature (see International Lake Environment Committee, 2005; Downing, 2010; United Nations Development Programme-Water Governance Facility, 2015; Brillo, 2015a). These criteria are also consistent with the Integrated Lake Basin Management (ILBM), the most recent approach for large-lake governance that is globally promoted by the International Lake Environment Committee (ILEC) (see ILEC, 2007; Nakamura & Rast, 2011, 2012). The ILBM is based on the lessons learned from a comprehensive study conducted by the Global Environment Facility-Lake Basin Management Initiative (GEF-LBMI) of 28 major lakes around the world from 2003 to 2005. The study complements the ILBM approach by supplying empirical data on the regulations, interventions, and practices of small-lake governance in the Philippines.

The discussion and results of the study are delineated as follow: firstly, the mandate of the LLDA and the administration of eight crater lakes of the Laguna de Bay Region; secondly, the status of the eight small lakes; thirdly, the LLDA's administrative performance on the eight crater lakes; and lastly, the conclusion. As a caveat, the study is not making an evaluation of LLDA's performance on its principal concern— Laguna de Bay, but on its peripheral responsibility— the eight small lakes under its jurisdiction. Small lake in the study is defined as an inland body of water that is permanent in nature (not intermittent) with a surface area of at least one hectare but not more than 200 hectares (Brillo, 2015a). Moreover, the concept of lake governance is defined broadly in the study as referring to the administrative arrangements (formal or informal) in place that impact the small lake's management, utilization, conservation, and development. This definition is compatible with the well-circulated definition of the broader concept of water governance (see Rogers & Hall, 2003; Nowlan & Bakker; 2007; United Nations Development Programme-Water Governance Facility, 2015).

Results

The LLDA and the Administration of the Eight Small Lakes.

The LLDA was created by The Laguna Lake Development Authority Act (1966), which gave it the mandate to administer Laguna de Bay Region. The LLDA is a quasi-government agency that leads, promotes, and accelerates sustainable development of Laguna de Bay and its watershed and surrounding urban areas amidst the multiple political jurisdictions (LLDA, 2013a). The Laguna de Bay Region includes all cities and municipalities in the provinces of Laguna and Rizal; Manila, Marikina, Pasig, Quezon City, Caloocan, Muntinlupa, Pasay, Pateros, and Taguig in the National Capital Region; Tanauan, Sto. Tomas, and Malvar in the province of Batangas; Carmona, GMA, Silang, and Tagaytay in the province of Cavite; and Lucban in the province of Quezon. The agency's regulatory and enforcement functions are carried out with provisions on environmental management and control, preservation of the quality of life and ecological systems, and the prevention of undue ecological disturbance, deterioration, and pollution (LLDA, 2005a, 2009a). The agency was placed under the Department of Environment and Natural Resources (DENR) for administrative supervision and policy coordination via Executive Order 149 (1993). The mandate of the LLDA was amended and strengthened by Presidential Decree 813 (1975) which expanded its powers to address environmental concerns and conflicts over jurisdiction and control of the lake, and by Executive Order 927 (1983) which conveyed the exclusive rights over the water bodies in the Laguna de Bay region, including the management of the eight crater lakes.

In managing the eight crater lakes, the LLDA's administrative authority is shared by the local government units by virtue of The Local Government Code (1991). In particular, the City Government of San Pablo for the seven crater lakes (a lesser part of Yambo Lake and Calibato Lake are under the jurisdiction of the Municipal Government of Nagcarlan and Rizal, respectively, being transboundary lakes) and the Municipal Government of Los Banos for Tadlac Lake also have jurisdiction to the small lakes being municipal bodies of water. As LLDA is the main administrative agency and the local government units have territorial dominion, in principle, the supervisory undertaking requires collaboration and coordination between the two government agencies. For instance, LLDA Board Resolution No. 26 (1996) sets forth a co-management approach in the seven crater lakes where some administrative functions were shared with the local government units (LLDA, 2014a). The usual practice is that the LLDA lays down the comprehensive development framework and approves the plans/programs submitted to it by the local government units and the other stakeholders. Meanwhile, the local government units implement projects/activities (as well as legislate supporting ordinances) in line with the LLDA's development agenda. On regulations, the usual arrangement is that the LLDA initiates and the local government units enforce, as they have authority over the police force and the barangay officials.

On the ground, the LLDA and the local government units tap the Fisheries and Aquatic Resources Management Council (FARMC) in administering and organizing the residents and fisherfolk of the small lakes. The partnership with FARMC was first established by Executive Order 240 (1995) and then institutionalized by the Philippine Fisheries Code (1998), which requires the creation of an organization to assist government agencies in the management and

conservation of the water resources in the country. FARMC was devolved from the Department of Agriculture (DA) to the LLDA in the Laguna de Bay Region in recognition of the latter's exclusive jurisdiction via The Laguna Lake Development Authority Act (1966). FARMCs are established from the national to municipality level and are mandated to be multi-representative in its composition, particularly community stakeholders and non-governmental organizations operating in the area of the water bodies. In the eight crater lakes, the FARMC's members are mostly fisherfolk and inhabitants in the lake. In securing the small lakes, FARMC is assisted by the barangay officials and the members of the Bantay Lawa (fish warden deputies) of the locality. Under the Local Government Code (1991), a barangay is the smallest and lowest administrative-legislative unit under the local government unit in the country. Although Bantay Lawa is a local volunteer organization under the Bureau of Fisheries and Aquatic Resources (BFAR) of DA, it usually received cash assistance (honorarium) from the provincial government of Laguna.

The development of tourism-related initiatives and projects in the eight small lakes is guided by the Tourism Act (2009). The law recognizes tourism as a key engine of the national economy, particularly in promoting socio-economic development. It also encourages ecotourism development among the many lakes in the country. The eight crater lakes have long been identified by the community stakeholders and the administrative agencies as ideal for ecotourism development. Ecotourism is seen as an effective means of augmenting the livelihood opportunities, enhancing the economic stature of the locality, and preserving the water resource (LLDA, 2014c, 2015). Recently, ecotourism has become more attractive in the eight crater lakes in the light of the restriction imposed on the lakes by the 10% area limit rule for aquastructures and the present-day problems brought about by the over-expansion of commercial fish farming.

The Eight Crater Lakes of the Laguna de Bay Region

The seven crater lakes and Tadlac Lake are oval-shaped freshwater lakes and are part of the catchment area of Mount San Cristobal and Mount Makiling, respectively. All the small lakes are considered a maar of the Laguna Volcanic Field, which formed through a phreatic eruption when contact between shallow lava and groundwater caused an explosion that resulted in a crater-like depression (LLDA, 2008; Philippine Institute of Volcanology and Seismology, 2015). Sampaloc Lake is the largest lake among the small lakes with a surface area of 104 hectares and is the traditional tourism attraction of San Pablo, being located within the city proper (LLDA, 2005a, 2008). Bunot Lake has a surface area of 30.5 hectares, situated in Barangay Concepcion, and is considered the sister lake of Sampaloc Lake (LLDA, 2005b, 2008). Palakpakin Lake has a surface area of 47.98 hectares, lies within three barangays, namely, San Buenaventura, San Lorenzo, and Dolores, and is the shallowest among the small lakes with an average depth of only 7.7 meters

Table 1

Surface Area of the Eight Crater Lakes

Eight Small Lakes of the Laguna de Bay Region	Surface Area in Hectares
Sampalok Lake	104.00
Palakpakin Lake	47.98
Calibato Lake	43.00
Bunot Lake	30.50
Yambo Lake	30.50
Tadlac Lake	24.70
Pandin Lake	24.00
Mohicap Lake	22.89

(LLDA, 2005c, 2008). Mohicap Lake has a surface area of only 22.89 hectares, located in Barangay San Buenaventura, and is the smallest among the small lakes (LLDA, 2005d, 2008). Pandin Lake has a surface area of 24 hectares, located in Barangay Santo Angel, and is considered the twin of Yambo Lake, as only a narrow ridge separates the two lakes (LLDA, 2005e, 2008). Yambo Lake has a surface area of 30.5 hectares, situated in Barangay Sulsugin in Nagcarlan, Barangay Antipolo in Rizal, and Barangay San Lorenzo in San Pablo City, and thus, making it is a transboundary lake (approximately two-thirds of the small lake's area is within the jurisdiction of San Pablo City; LLDA 2005f, 2008). Calibato Lake has a surface area of 43 hectares, located in Barangay Sto. Angel, San Pablo City, with a small part in Barangay Tala and Barangay Antipolo, Rizal (making it also a transboundary lake), and is the highest-located and the deepest among the small lakes (LLDA, 2005g, 2008). Tadlac Lake has a surface area of 24.7 hectares, found in Barangay Tadlac, Los Baños, Laguna, and is adjacent to Laguna de Bay, is situated on its southern tip, with a mere 50-meter wide strip of land between them (LLDA, 2007; see Table 1). Tadlac Lake is separated because it is about 30 kilometers away from the seven crater lakes system of San Pablo City.

In the past, the eight crater lakes have been utilized mainly for recreational activities and fishing. Despite being known for their natural scenery and ideal for fishing, tourism was not organized, and aquaculture has not been established in the small lakes back then. Aquaculture, specifically commercial tilapia farming in pens and cages, was introduced in the lakes in the early 1980s. Tilapia pen/cage farming was first launched in Bunot Lake in 1976 after the LLDA's successful introduction in Laguna de Bay in 1974 (Radan, 1977; Ministry of Natural Resources, 1982). By the late 1980s, fish pens and cages have become a common feature among the eight crater lakes; and by the late 1990s, tilapia farming reached its peak, where most lakes breached the 10% area limit rule for aquastructures. The expansion of aquaculture and overcrowding of fish pens/cages have resulted in the proliferation of illegal settlements/structures (along the shoreline and in the lake itself) and pollution in the small lakes. In turn, these led to problems, such as water quality degradation, excessive algal blooms, and exacerbated fish kills during the natural upwelling or overturning of the lakes. As a consequence, in the past, the LLDA has concluded that the seven crater lakes and Tadlac Lake are extremely threatened by pollution (Borja, 2008; LLDA, 2008), and in 2014, the Global Nature Fund tagged the seven crater lakes as threatened lake of the year (Global Nature Fund, 2014). At present, Sampaloc Lake, Bunot Lake, Palakpakin Lake, Calibato Lake, and Mohicap Lake continue to have a substantial number of fish pens and cages, minimal in Pandin Lake and Yambo Lake, and completely eradicated in Tadlac Lake (see Borja, 2008; LLDA, 2008; Provincial Government of Laguna 2013, Barangay Tadlac 2015).

Ecotourism has recently become an attractive development alternative for the small lakes in the light of the undesirable effects of and problems associated with commercial fish farming. Since the eight crater lakes have high potential as tourist destinations, ecotourism is deemed as the most feasible option in expanding the livelihood opportunities of inhabitants as well as in guaranteeing the conservation of the water resources. So far, Pandin Lake and Sampaloc Lake have made a significant advance in organizing ecotourism. Tadlac Lake and Yambo Lake have made some headway, while the rest of the small lakes still wanting in development. With the ongoing progress in Sampaloc Lake and Pandin Lake, the two lakes have even been referred to as a beacon for advancing ecotourism among the eight crater lakes and as a possible model for ecotourism development of a small lake in the country.

The LLDA's Administrative Performance on the Eight Small Lakes

As mentioned, the LLDA's performance on the small lakes is assessed: firstly, based on the basic criteria for managing small lakes, namely, facilitating and ratifying an MDP, enforcing the 10% area limit for fish pens/cages, and enforcing the 20-meter shoreline easement; and secondly, based on conducting rudimentary maintenance activities, namely, water quality analysis, clean-up operations, and fingerlings dispersal.

The foremost criterion is the existence of an MDP because the plan is fundamental for the effective administration and conservation of the eight crater lakes. An MDP operates as the overall framework for the policies, programs, and projects on the water resources. It conveys direction as well as precipitates subsequent initiatives in the small lakes and ensures

that they are systematic, coherent, and effective. In addition, an MDP is a primary instrument that addresses the constant issue on the utilization of the small lakes—the partitioning of the water resource and designating the specific areas (including the extent and arrangement) for aquaculture and ecotourism. The plan also facilitates the regulation of fish farms and the establishment of ecotourism in the lakes.

The absence of an MDP is considered as the most pressing issue in the eight crater lakes by the administrative agencies and community stakeholders (e.g., LLDA, 2008, 2014b; Borja, 2008; City Government of San Pablo, 2015). Since 1983, when the crater lakes were placed under the jurisdiction of the LLDA, up to the 2000s, the administration of the small lakes has been done arbitrarily without the basic plan (LLDA, 2014a, 2014b). Because of this, the formulation of the MDP has been identified as the most critical problem in the many fora on the eight crater lakes in the past decades. The serious move to have an MDP for each of the small lakes only came about in 2014 when the LLDA issued Board Resolution No. 464 provides the framework for the formulation of MDP for the seven crater lakes (LLDA, 2014a). As a consequence, Pandin Lake, Sampaloc Lake, and Yambo Lake were able to have their MDPs duly approved by the LLDA in 2015. Meanwhile, Tadlac Lake already had an approved MDP in 2008 but was officially launched by the LLDA only in 2015 (see Table 2). With these, four lakes—Bunot Lake, Palakpakin Lake, Calibato Lake, and Mohicap Lake—remain to be without a basic management plan (see Table 2). The four lakes, unlike the lakes with MDPs, are the ones in more precarious conditions in terms of water quality, the number of fish pens/cages, and the presence of informal settlements. Thus, the situation entails the immediate and resolute action from the LLDA to set in motion the formulation of their basic plan.

The move to formulate an MDP for Pandin Lake and Yambo Lake was initiated by the LLDA, which was supported by the local government units and the community stakeholders. Pandin Lake was deemed the pilot project of the LLDA due to the well-publicized success of its locally-initiated ecotourism enterprise. Yambo Lake was next in line in the LLDA's agenda because it is the most well-preserved and has the least problems among the seven crater lakes. In both lakes, the LLDA allocated funds and personnel and conducted a series of consultation meetings and workshops with the local government units and community stakeholders. In Sampaloc Lake, the most recent and decisive move to have an MDP was instigated in 2014 (a year after the 2013 local elections) by the new administration of the City Government of San Pablo. Being situated within the city proper and the traditional tourism emblem of San Pablo, Sampaloc Lake was designated as the flagship of the new administration's tourism agenda and the model for the ecotourism development of the other crater lakes. In Tadlac Lake, after the move to formulate an MDP fizzled out in 2001, it was revived by the LLDA in 2007 after a change in its leadership. Tadlac Lake was envisioned to be developed into a world-class ecotourism destination by the LLDA, the community stakeholders, and the Local Government of Los Banos (LLDA, 2007). The LLDA facilitated the crafting of the MDP by releasing the funds (originally allocated in 2001), allocating manpower, and convening consultation meetings and workshops.

Although Pandin Lake, Yambo Lake, Sampaloc Lake, and Tadlac Lake all have MDPs, currently, their main problem is carrying out the plans, particularly obtaining the needed funds to commence and implement the MDPs. So far, the LLDA has not taken the lead role in facilitating the generation of the necessary capital to finance the basic plans, which, as a consequence, left the MDPs unimplemented. For instance, in Sampaloc Lake, the immediate concern is funding for the removal of remaining illegal structures, the rearrangement of fish pens and cages, and the completion of the unfinished housing project for relocating the remaining informal settlers in the lake. In Pandin Lake and Yambo Lake, the pressing concern is finance for the key infrastructure projects, particularly the construction of the essential facilities needed to set up (in Yambo Lake) fully and to scale up (in Pandin Lake) their ecotourism enterprises. In Tadlac Lake, the current concern is the capital and infrastructure investments needed to launch the Tadlac Lake Nature Park.

The regulation of fish pens and cages criterion refers to the LLDA's enforcement of the 10% area limit for aquastructures on the eight crater lakes. This regulatory rule is constituted in Section 51 of the Fisheries Code of the Philippines, which states that: "That not over ten percent (10%) of the suitable water surface area of all lakes and rivers shall be allotted for aquaculture purpose like fish pens, fish cages and fish traps; and the

Table 2

LLDA's Administrative Performance on the Eight Crater Lakes

Eight Small Lakes of the Laguna de Bay Region	(1) Management and Development Plan	(2) Regulation of Fish Pens/Cages	(3) Regulation of Shoreline Easement
Sampalok Lake	existing; still to be implemented	poorly implemented	partially implemented
Palakpakin Lake	none	poorly implemented	partially implemented
Calibato Lake	none	poorly implemented	partially implemented
Bunot Lake	none	poorly implemented	partially implemented
Yambo Lake	existing; still to be implemented	few and within limit	abiding
Tadlac Lake	existing; still to be implemented	no pens/cages	partially implemented
Pandin Lake	existing; still to be implemented	few and within limit	abiding
Mohicap Lake	none	poorly implemented	abiding

Table 3

LLDA's Administrative Performance on the Eight Crater Lakes

Eight Small Lakes of the Laguna de Bay Region	(4) Maintenance Activities		
	Water Quality Monitoring	Clean Up Operations	Fingerlings Dispersal
Sampalok Lake	being done	being done	being done
Palakpakin Lake	being done	being done	being done
Calibato Lake	being done	being done	being done
Bunot Lake	being done	being done	being done
Yambo Lake	being done	being done	being done
Tadlac Lake	being done	being done	being done
Pandin Lake	being done	being done	being done
Mohicap Lake	being done	being done	being done

stocking density and feeding requirement which shall be controlled and determined by its carrying capacity." The limitation is critical because the utilization of the eight crater lakes has been associated with commercial fish pens/cages farming (ever since the introduction and eventual boom of Tilapia farming in the small lakes in the late 1980s) and their unbridled expansion has been the frequently cited reason for the degradation of the water quality of the small lakes (see LLDA, 2005a, 2005b, 2005c, 2005d, 2005e, 2005f, 2005g, 2008; Barangay Tadlac, 2015). Thus, restraining the excessive expansion of aquaculture is crucial in the conservation of the eight crater lakes. Furthermore, the regulation of fish pens and cages is also critical

in facilitating the development of ecotourism in the small lakes. The extent of the area for fish farming and the arrangement of fish pens/cages are consequential if ecotourism will have enough and suitable space to take root in the crater lakes.

Among the eight crater lakes, the number of fish pens/cages in Tadlac Lake, Yambo Lake, and Pandin Lake are within the 10% area limit (see Table 2). Tadlac Lake leads in this category, as fish farms were totally eradicated in the lake; Yambo Lake and Pandin Lake have a nominal presence of fish pens and cages. Tadlac Lake benefited from the massive and unprecedented fish kill in 1999, which united the community stakeholders in appealing to the fish farm owners to halt operations to let the lake recuperate. With the availability of transferring fish farm operations in the adjacent Laguna de Bay and the risk of continuing operations under poor water conditions, the fish farm owners voluntarily left, which culminated in the complete removal of fish pens and cages in Tadlac Lake (LLDA, 2007; Borja, 2008; Barangay Tadlac, 2015). Yambo Lake and Pandin Lake were greatly helped by the oligotrophic nature of their water, which generally translates to slower fish growth (LLDA, 2008). This condition made fish farming costly; thus, less attractive to operate compared to the other crater lakes, which eventually led to the decline of fish pens and cages in the two lakes. Overall, these experiences reveal that the decline of fish pens and cages in Tadlac Lake, Yambo Lake, and Pandin Lake is more to the credit of circumstances than to the direct regulatory actions of the LLDA.

Sampaloc Lake, Palakpakin Lake, Calibato Lake, Bunot Lake, and Mohicap Lake continue to have a substantial presence of fish pens and cages (see Table 2). So far, the LLDA has not taken the initiative to strictly enforce the 10% area limit rule on the aquastructures of these lakes. Mohicap Lake has the least number of fish pens and cages among them, but not relative to its size as it is the smallest among the eight crater lakes. Palakpakin Lake, Calibato Lake, and especially Bunot Lake are the most congested with fish pens and cages. Anecdotal evidence even suggests the significant presence of unregistered fish farms in these lakes. Sampaloc Lake, despite having an MDP, is still waiting for LLDA's action to remove the excess/illegal fish pens/cages and to rearrange them according to the zoning arrangement in the plan.

The regulation of the shoreline easement criterion refers to the LLDA's enforcement of the 20-meter easement on the banks of the eight crater lakes. The regulatory requirement is constituted in Article 51 of the Water Code of the Philippines (1976), which states that the shores of lakes throughout their entire length and within a zone of 20 meters in agricultural areas (three meters in urban areas and 40 meters in forest areas) along their margins are subject to the easement of public use (i.e., for recreation, navigation, floatage, fishing, and salvage) wherein no structures can be built. In essence, this regulation guarantees the public's access to and enjoyment of the water resource.

Among the eight crater lakes, Yambo Lake, Pandin Lake, and Mohicap Lake can be classified as abiding with the 20-meter shoreline easement regulation (see Table 2). The three lakes currently have the minimal presence of illegal structures and establishments along their banks. This favorable condition is generally attributable to the vigilance of the community stakeholders in each lake, as well as, in Yambo Lake and Pandin Lake, to the nominal existence of fish farming (the twin lakes being oligotrophic), and in Mohicap Lake, the steep slopes in most of its banks (being unfavorable for settlements). Sampaloc Lake, Palakpakin Lake, Calibato Lake, and Tadlac Lake can be categorized as partially implementing the easement regulation because portions of the lakes' shoreline continue to be burdened with the existence of illegal establishments (see Table 2). In Sampaloc Lake, since the success of the multisectoral movement in the 2000s in removing the illegal structures along the entry side of the lake, a third of its banks continue to be occupied by illegal settlements and structures. In Palakpakin Lake, Calibato Lake, and Tadlac Lake, illegal settlements and structures encroach along their banks: mostly on the northern tip in Palakpakin Lake, scattered around in Calibato Lake, and by private lot and resort owners in Tadlac Lake. Bunot Lake shares the same problem, except that illegal settlements and structures proliferate around the shoreline of the lake, making it with the most crowded shore among the eight crater lakes (see Table 2). On the whole, with easement violations occurring in the majority of the crater lakes (five out of eight lakes), the LLDA's performance in this category is evidently inadequate.

The maintenance activities criteria refer to the LLDA's carrying out of the common conservation practices for water resources such as water quality monitoring, clean-up operations, and fingerlings

dispersal. These undertakings are deemed rudimentary and routine for the preservation of the eight crater lakes. In the first, the practice of regularly evaluating the water quality of the small lakes in the Laguna de Bay Region is pursuant to two objectives— to accurately assess the suitability of the lake for all its present and intended beneficial uses, and to evaluate the impacts of development activities on the lake's water quality that will serve as important criteria for environmental planning and management (LLDA, 2005a). It is also based on the Class C Water Quality Criteria under the DENR Administrative Order 34 Series of 1990 (LLDA, 2008). At present, the water quality monitoring is conducted during the first (January, February, March) and last quarters (October, November, and December) and in June and September (LLDA, 2005a, 2007, 2008). In the eight crater lakes, the water quality evaluation has been conducted since the 1980s except at certain times where the LLDA suffered problems such as equipment breakdown (see Table 3). Among the local stakeholders, the issue here is not whether the water quality monitoring is being implemented but on the dissemination of the results. They have often complained that the LLDA has not been keen on promptly sharing or passing information. Currently, the LLDA's online published water quality reports on the small lakes are solely on the seven crater lakes (without Tadlac Lake) and are only from 1996–2005 and 2006–2008.

In the second, the clean-up operations on the eight crater lakes were borne under the River Rehabilitation Program, which was intended to clear the waterways and tributaries of Laguna de Bay. In 2013, the LLDA started to distinguish between the small lake and river clean-up operations in its annual report (see LLDA, 2013b). At present, the clean-up operations are done annually on all the small lakes where the LLDA spearheads in collaboration with the local government units and FARMC (see LLDA, 2013b, 2014c, 2015; see Table 3). Among the local stakeholders, the issue here is the frequency of operations because the once a year clean-up of lakes is not enough, as they believe that it should be done several times in a year.

In the third, the fingerlings seeding operations in the eight crater lakes are designed to improve the lake productivity and to benefit the fisherfolk (LLDA, 2014). Lake seeding has been a regular activity in Laguna de Bay and was extended to the eight small lakes. At present, tilapia and carp fingerlings dispersals have been launched annually in all the small lakes by the LLDA in partnership with BFAR (see LLDA, 2013b, 2014c, 2015; see Table 3). In 2015, a total of 120,000 fingerlings were seeded in the eight crater lakes (LLDA, 2015).

Discussion

The LLDA's administrative performance on the eight crater lakes is ambivalent. In general, the agency's actions on the basic criteria for managing small lakes is mediocre, but not in the category of rudimentary maintenance activities, which is satisfactory. Firstly, the MDP issue is fundamental for the effective management of the eight crater lakes, especially in the regulation of fish farms and the promotion of ecotourism. The LLDA performance in this criterion can be characterized as slow and lacking in follow-through. The agency is slow to action because the small lakes have been under its jurisdiction from the 1980s onwards, and it took resolute actions only in 2014–2015. These resulted in the least problematic lakes (Pandin Lake and Yambo Lake) and the local governments' favored lakes (Sampaloc Lake by the City Government of San Pablo and Tadlac Lake by the Municipal Government of Los Banos) having their respective MDPs. But this also bares that the remaining four small lakes—Bunot Lake, Palakpakin Lake, Calibato Lake, and Mohicap Lake—which are relatively in more serious condition, continue to be managed without the basic plan. The agency lacks follow-through because the MDPs that have been approved remain unimplemented. The local stakeholders (of the small lakes with MDPs) continue to seek the intervention of the LLDA to facilitate the needed funds for the operation of the basic plans; yet, there is no clear resolution on the matter. Consequently, it creates an impression that the agency is not keen on further shouldering the cost of improvement in the small lakes beyond the MDPs.

Secondly, the enforcement of the 10% area limit rule is critical in controlling the expansion of fish pens/cages, preventing further deterioration of the water quality, and encouraging the development of ecotourism in the eight crater lakes. The LLDA performance in this criterion is considered dismal because after decades under its administration, the regulation continues to be poorly implemented in the majority of the small lakes (i.e., Sampaloc Lake, Palakpakin Lake, Calibato

Lake, Bunot Lake, and Mohicap Lake), as these lakes continue to have considerable presence of fish pens and cages. Although the three lakes complying to the limit rule were able to do so due more to the existence of favorable circumstances— oligotrophic nature and slow fish growth for Pandin Lake and Yambo Lake, availability of proximate transfer site, and high risk for fish operations due to poor water conditions for Tadlac Lake— rather than the agency's direct regulatory actions. Thirdly, the enforcement of the 20-meter shoreline easement is important in guaranteeing public access to and enjoyment of the water resources. The LLDA performance in this criterion is deemed unsatisfactory because the regulation remains unimplemented in the eight crater lakes overall. Only three lakes (i.e., Yambo Lake, Pandin Lake, and Mohicap Lake) are substantially abiding with the easement regulation with minimal presence of illegal structures along their banks. Four lakes (i.e., Sampaloc Lake, Palakpakin Lake, Calibato Lake, and Tadlac Lake) are partially implementing the easement regulation as portions of the lakes' banks remain to be burdened with illegal establishments, whereas Bunot Lake is in the worst condition, having the most crowded shoreline. Lastly, the conduct of rudimentary maintenance activities— water quality monitoring, clean-up operations, and fingerlings dispersal— is crucial and rudimentary to the conservation of the eight small lakes. The LLDA performance in these categories is decent. In general, water quality evaluation has been regularly conducted, lake clean-up operations and tilapia and carp fingerlings dispersals have been launched annually. Despite these efforts, the agency needs to address some concerns such as immediate sharing of the water assessment results, especially to the community stakeholders and enhancing the clean-up operations several times in a year.

The evaluation provides a glimpse of how the small lakes have been administered over the years. The criteria are not only a catalyst for the preservation of the eight crater lakes but an enabler of their governance. Thus, improving them is pivotal with the now universally acknowledged view that many issues on water resources are largely associated with failure of governance (United Nations Educational, Scientific and Cultural Organisation, 2012; World Water Council, 2012, United Nations World Water Assessment Programme, 2015). On the whole, the assessment underscores the long-term commitment and accountability of the LLDA in governing the small lakes. It must be able to extirpate the agency's lingering governance problem—inconsistent actions. A key recommendation is for the LLDA to create a unit within its organization that is particularly dedicated to administering the eight crater lakes. This will enhance accountability by clearly identifying responsible personnel (in case of negligence and nonfeasance). It will also guarantee that the small lakes get equitable attention and resources (in the light of the agency's much devotion to Laguna de Bay). In addition, the LLDA also needs to extend its maintenance activities to include the natural springs which feed water to most of the eight crater lakes (except for Yambo Lake and Tadlac Lake, which have no natural springs around them). So far, the agency has not taken preservation actions to secure and protect the surrounding natural springs despite their direct repercussion on the conservation of the small lakes. These concerns are essential if the eight crater lakes are to march alongside and not be left behind by the development in Laguna de Bay.

Declaration of ownership

This report is our original work.

Conflict of interest

None.

Ethical clearance

This study was approved by the institution.

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