

An Assessment of Development of a Transboundary Small Lake: Calibato Lake, San Pablo City and Rizal, Laguna, The Philippines

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Abstract: Commencing on the scarcity of development studies on lakes (as the field is dominated by limnology and aquaculture studies) and small-lake studies (as the field is heavily concentrated on big-lake studies), this study assesses the underdevelopment of Calibato Lake, a small transboundary lake. The article reveals the lack of development initiatives in the lake as well as definitive time table from its administrative agencies on when they will be carried out. It argues that the LLDA, the City Government of San Pablo and the Local Government of Rizal must now take action to instigate and bring development in the lake. Particularly, by initiating the crafting of a zoning-development plan which is crucial for managing the water resource, regulating aquaculture, and facilitating subsequent actions; by promoting ecotourism which is essential in extending work opportunities and community development; and by protecting the many natural springs and their watershed which is critical in the preservation of the lake and its environment.

Key words: Development, Philippine lake, small lake, transboundary lake, Calibato lake (or Kalibato lake).

Introduction

Calibato Lake is one of the seven crater lakes of San Pablo City; namely, Sampaloc (106 ha), Bunot (30.5 ha), Palakpakin (47.98 ha), Pandin (24 ha), Yambo (30.5 ha), Mohicap (22.89 ha) and Calibato (43 ha) (see Figure 1). Calibato Lake is a small transboundary lake since around half of it lies in San Pablo City and the other half in Rizal, Laguna. The lake is distinct among the seven crater lakes since it is the deepest and has the largest volume of water storage. As a natural resource, Calibato Lake is mainly used for fishing and aquaculture, specifically, tilapia pen/cage farming, and tourism in the lake is virtually nonexistent in spite of its high potential for development. The lake currently is threatened by pollution, illegal fish farm operations and presence of informal settlements. On the whole,

these attributes offer a compelling basis for development actions to come into the lake; yet, till now, there was none. Presently, Calibato Lake lacks development, as there is no definitive time line from its administrative agencies—the Laguna Lake Development Authority (LLDA), the City Government of San Pablo and the Local Government of Rizal—on when and how the development initiatives would be carried out in the lake. In addition, Calibato Lake is also understudied since it lacks development-grounded studies, as the few existing scholarly works on the lake are limited to limnology and aquaculture studies.

The study explores the underdevelopment of Calibato Lake. It illustrates the paucity of development activities and the absence of clear timeline on when the administrative agencies will introduce development initiatives in the lake. In particular, the study contends

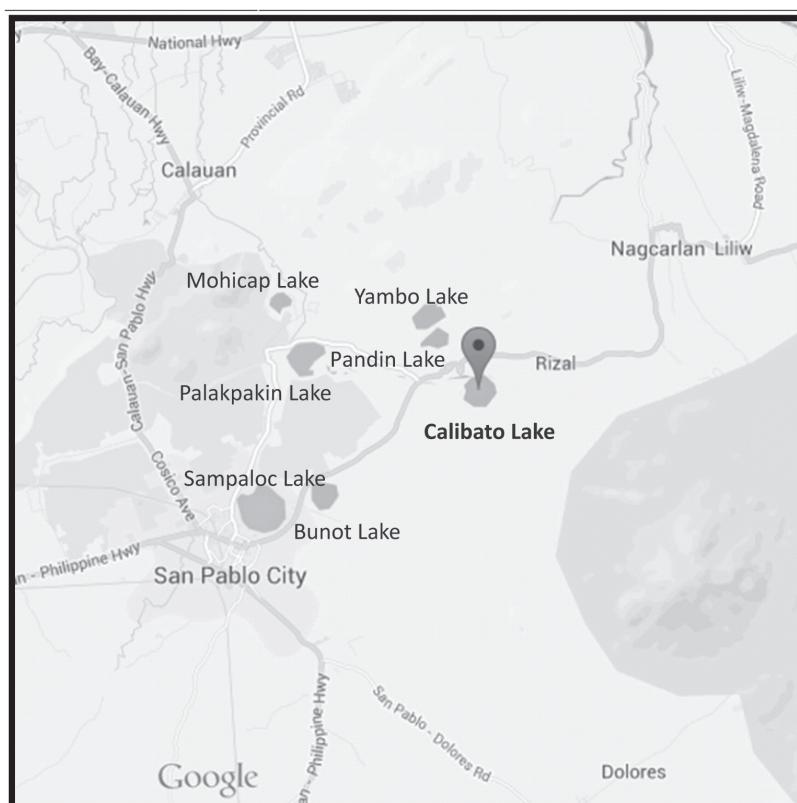


Figure 1: Calibato Lake and the other crater lakes of San Pablo city (Google Maps, 2015).

that the lack of development in Calibato Lake is evident in the absence of a zoning-development plan, tourism activities, and actions to manage the natural springs. It further argues that the LLDA, the City Government of San Pablo and the Local Government of Rizal must now take action to facilitate development in Calibato Lake; specifically: (1) by formulating a zoning-development plan since it is fundamental in administering the lake, regulating fish farms, and precipitating succeeding actions; (2) by promoting ecotourism since it is critical for local development and expanding livelihood opportunities; and (3) by managing the natural springs and their watershed since they are vital in the conservation of the lake and its ecology.

Overall, this article intends to address the existing scholarly gap in Philippine lake studies—the scarcity of development studies on small lakes in the country (Brillo, 2015a). It is part of a long-term research project of documenting and conducting development studies on small lakes in the Philippines. Moreover, the study also fills in a lacuna—there is no existing operationalized

description of small lakes in literature—by defining small lakes as lakes with a surface area of only 200 hectares or less. This definition was subjectively arrived at after surveying the sizes of the “minor” and least-studied lakes in the country. The paper proceeds to discuss the following: firstly, a review of literature on Philippine lake studies and the importance of small lakes; secondly, the current situation in Calibato Lake; thirdly, the administration and dynamics in the lake; and lastly, the contemporary development issues in the lake.

Philippine Lake Studies and Small Lakes¹

The literature is replete with studies underscoring the importance of lakes to humanity. From the inception of civilizations to contemporary modern societies, the lakes have served man’s needs, from rudimentary uses, such as drinking water, source of food and transportation, to more complex uses, such as fish farming, ecotourism, agricultural irrigation, flood control and hydroelectric power. On the whole, the value of lakes to mankind is

1. This section is derived from the previous works of the author on Philippine lakes, and is a standard part of his long-term research project of documenting and conducting development studies on small lakes in the Philippines.

captured by the clichéd fact that over 90 percent of the liquid freshwater on the earth's surface (Shiklomanov, 1993; ILEC, 2007; Nakamura and Rast, 2011, 2012). Furthermore, lakes are also critical in the preservation of the global biodiversity and ecosystem. The water resources are habitat for an array of flora and fauna and are crucial in natural processes such as climate mediation and nutrient cycling.

Notwithstanding the worth of lakes, human activities in the past, such as food production, increasing population, settlement, urbanization and industrialization have brought unprecedented degradation on the natural resource. At present, many lakes around the world continue to face problems, such as eutrophication, acidification, toxic contamination, water-level changes, salinization, siltation, overfishing and exotic species/weed infestation (Kira, 1997; World Lake Vision Committee, 2003; ILEC, 2005). This observation was resonated by the Global Environment Facility-Lake Basin Management Initiative's (GEF-LBMI) study of 28 major lakes around the world from 2003 to 2005, where the project concluded that the condition of many lakes is not improving (ILEC, 2007; World Lake Conference, 2009, 2011).

The global situation is similar in the Philippines, as many lakes in the country are suffering from ecological decline. This reality has been conceded in the First National Congress on Philippine Lakes held in 2003, when the body acknowledged that lakes in the country are susceptible to degradation (Cuvin-Aralan et al., 2005); and in the Second National Congress on Philippine Lakes held in 2011, when the body recognized that despite incremental improvements, the condition of lakes in the country remains threatened (LakeCon2011, 2011). Under this context, lake studies in the Philippines have been gradually increasing over the years. Most of the scholarly outputs, however, come from the natural sciences and are heavily concentrated on big lakes (Brillo, 2015a). A recent survey of Philippine lake studies using the online database of the three universities (i.e. University of the Philippines, De La Salle University, and Ateneo de Manila University) showed that: (1) 77 percent of the scholarly materials are classified under the natural sciences and only 23 percent under the social sciences; and (2) 80 percent of the scholarly materials are studies on big lakes and only 8.7 percent on small lakes (Brillo, 2015a). The natural science outputs are mostly about limnology and aquaculture, and the big lake studies are overwhelmingly concentrated on the largest lakes in the country (e.g. Laguna de Bay, Taal Lake, Lanao Lake

and Buhi Lake). Thus, this implies that lake studies in the country are lacking on two areas: (1) social science outputs, particularly development studies (as well as governance, socioeconomic and cultural studies); and (2) small lake studies, specifically lakes with a surface area of 200 hectares or less.

In addressing the literature gap, development studies (and the other fields in the social sciences) and small lake studies must advance to parallel the progress achieved in the natural sciences and big lake studies. On development studies, simultaneous advancement in both academic areas is critical to better understand the issues/problems of lakes and to offer better solutions in improving their conditions, as they complement and supplement each other. A single perspective is simply inadequate in dealing with the multitude of issues facing lakes today since biophysical-environmental problems and socio-economic-governance problems are intertwined and cannot be effectively addressed in isolation. To this point, limnology and aquaculture studies have already made decent progress, and hence, it is now high time for development studies (and the other fields in the social sciences) to post significant gains to balance the scholarly deficit.

On small lake studies, documenting their existence and the issues facing them are imperative to expand the knowledge base on Philippine lakes. Small lakes are extensive all over the country, yet little is known or written about them. Small lakes are least studied since they are considered to have minimal pecuniary significance (compared to big lakes) which translates to tangential interest from government agencies, private-funding institutions and scholars. In addition, the locational remoteness of many small lakes in the country is another contributing factor, as they require more resources and efforts to study. In general, there are four reasons why it is urgent to study small lakes: (1) the shorter time line on irreversibility in terms of ecological degradation; (2) the necessity of information for salvaging them; (3) their connection to other natural resources; and (4) the need to document the natural resource for posterity (Brillo, 2015b; Brillo, 2015c; Brillo, 2015d).

The first reason refers to the inherent characteristics of small lakes being naturally more fragile and vulnerable to environmental deterioration. Other things being equal, compared to big lakes, their small size equates to less absorptive capacity in neutralizing pollutants and shorter time in reaching ecological irreversibility. The second reason refers to the need for critical information in improving the condition of small

lakes. Substantive knowledge must be gained since it is the starting point and the basis in the long process of properly managing and conserving the water resource. The third reason refers to the ecological interlink since many small lakes are integral components of the system of other natural resources, such as river system and watershed or basin of big lakes. In this setup, addressing the issues and problems of other systems would require knowing essential information about small lakes. The fourth reason refers to recording small lakes for the future generations. All lakes eventually become extinct, usually through loss of its water, infilling by sediments and other materials or succession (Choiński and Ptak, 2009; Downing, 2010; Lane, 2015); but small lakes, in general, “die” at a much faster rate than big lakes.²

In development studies, studying and developing small lakes in the Philippines are important since they are abundant in the country and they usually are surrounded by impoverished communities. In the context of development defined as progress or growth that is inclusive and sustainable (Global Monitoring Report, 2015), small lake development in essence is about, on one hand, improving the living conditions of small lake inhabitants (so as to help make development inclusive, reaching local areas), and on the other hand, ensuring the conservation of the water resource (so as to make development sustainable in the long term).

Taking off from the preceding discussion, this study directly addresses the identified gap in Philippine lake studies by assessing the development issues of a small lake in San Pablo City—Calibato Lake. Consistent with the lacuna in the literature, the few existing scholarly publications found on Calibato Lake are limited (Brillo, 2015a; see also Guerrero, 2001) and mainly confined to limnology and aquaculture (e.g. Pullin and Lowe-McConnel, 1982; LLDA, 2005, 2008).

The Present Situation of Calibato Lake

Calibato Lake is a transboundary lake as it is located within the jurisdiction of two municipalities—approximately two thirds of the lake lies in Barangay Sto. Angel, San Pablo City, and the remaining part in Barangay Tala and Antipolo, Rizal, Laguna. The lake is accessible via the Sto. Angel road or via the Rizal-Nagcarlan road which runs several metres from its northern tip. Calibato Lake is circular shaped and

considered a catchment area of Mount San Cristobal; a feature shared with all the seven crater lakes. The lake is widely believed to be volcanic in origin, which was formed through a phreatic eruption when shallow lava from Mount San Cristobal reached groundwater causing an explosion that resulted in a crater-like depression (LLDA, 2008).

As a water resource, Calibato Lake has a surface area of 43 hectares, an elevation of around 170 metres and an average water depth of 156 metres, making it the highest-located, the deepest, and has the greatest volume of water in storage (approximately 29,600 cubic metres) among the seven crater lakes (LLDA, 2005, 2008). The water sources of the lake are rainfall, surface runoff, and inflows from Mayton River and from various surrounding springs; the two main are “Eliw-eliw” Spring³ (San Pablo City side) and Nalagalas Waterfall/Spring (Rizal side). In terms of volume, the flow of water from Calibato Lake’s natural springs is a lot greater compared to the other crater lakes. The lake discharges water through seepage, evaporation and outflow to Palakpakin Lake via Pagbuga Stream.

Calibato Lake is primarily utilized for fishing activities and aquaculture, particularly tilapia farming via floating cages, as it supplies the city and nearby towns with abundant fish (LLDA, 2008). In the seven crater lakes, aquaculture was first introduced in Bunot Lake in 1976 after the successful introduction of tilapia cage farming in Laguna de Bay by the LLDA in 1974 (Radan, 1977; MNR, 1982). In time, tilapia cage farming spread to Calibato Lake and the other crater lakes. Since the makeup of Calibato Lake is suitable for aquaculture, floating cage farming has extensively expanded over the years, becoming an integral feature of the lake (see Figure 2). In 2004, the LLDA has reported that the area occupied by fish pens/cages in the lake has exceeded the 10 percent allowable area allocation for aquastructure operation pursuant to the Fisheries Code of the Philippines (see Republic Act [RA] 8550, section 51) (LLDA, 2005). In 2012, the Provincial Government of Laguna reported that Calibato Lake has 49 registered fish pen/cage operators (Provincial Government of Laguna, 2013). The actual figure is higher since the report did not include the illegal operators in the lake. Presently, the number of fish pens/cages in the lake are still many and beyond the 10 percent threshold, although they have dwindled

2. Some small lakes in the country may be lost in just a few decades, like Manlalayes Lake (the twin lake of Gunao/Gunaw Lake in Dolores, Quezon) which dried out a few years ago before anyone was able to document its existence (Brillo, 2015a).

3. The natural spring is locally known by this name.

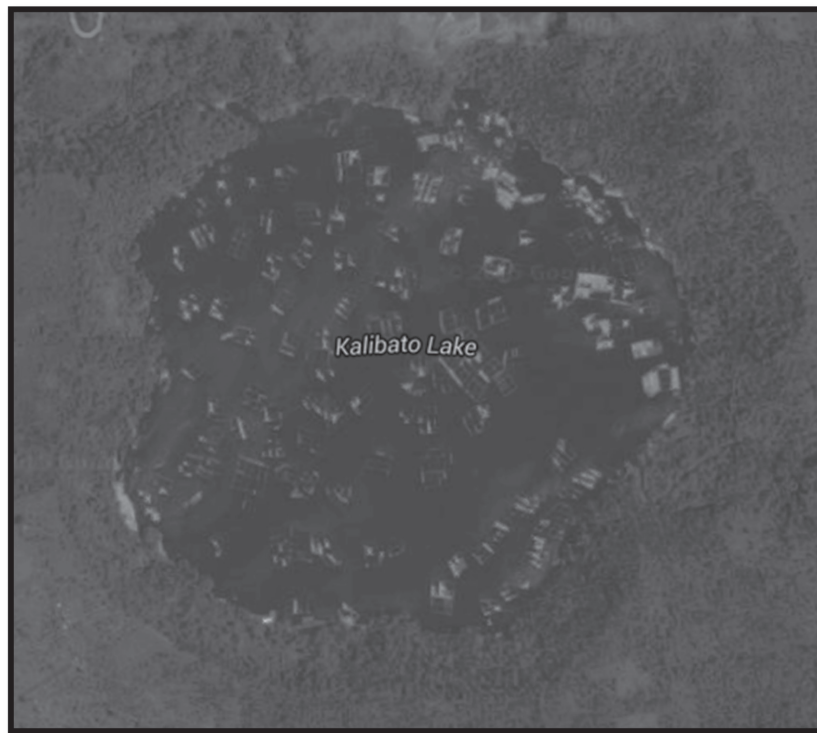


Figure 2: Satellite photo of the fish pens/cages in Calibato Lake (Google Maps, 2015).

already. This decline is attributable to the high cost of commercial feeds which makes it hard to sustain the operation of a fish farm, and to the passing of the Typhoon “Glenda” (internationally known as Typhoon Rammasunin) in July 2014 which destroyed many of fish pens/cages. The excessive number of fishery pens/cages and the remnants of bamboo structures on the lake are noticeable via an ocular inspection of Calibato Lake.

Similar in all the crater lakes, the expansion of aquaculture has brought informal settlements in Calibato Lake over the years. Around 40 houses and man-made structures are currently scattered throughout the banks of the lake. The proliferation of informal settlers in Calibato Lake was somehow limited by the mostly steep terrain around the lake which makes it unfavourable for building settlements, and the lack of access road which requires passing through the trails off the steep slopes to go in and out of the lake. The primary consequence of the extensive presence of fish farms and informal settlers in the lake is pollution. Discharges from fish farms, excessive use of commercial fish feeds, and domestic wastes have significantly contributed to the

deterioration of the water quality of the lake. This problem is exacerbated by the absence of drainage system in the lake, the lack of sewage system among the homes, and the trash, particularly plastic materials, that is thrown in Mayton River (which flows from the nearby communities and discharges in the lake). Consequently, this problem has significantly contributed in the deterioration of Calibato Lake’s water quality. For instance, on the 1996-2005 water quality report of the LLDA on Calibato Lake, the agency concluded that the water of lake is in critical state, and on the 2006-08 water quality report of the LLDA on the seven crater lakes, Calibato Lake registered the following results:⁴ (a) for dissolved oxygen (DO) criterion, it consistently failed (Figure 3); (b) for ammonia criterion, it consistently failed⁵ (Figure 4); and (c) for phosphate concentration, it consistently failed (Figure 5).

An immediate ramification of the pollution in Calibato Lake is eutrophication or the depletion of oxygen level in the water, due to accumulated dissolved nutrients and organic matter, which encourage the disproportionate growth of oxygen-depleting plants. In

4. The analyses are based on the Class C classification of the Department of Environment and Natural Resources (DENR) on fresh surface water (see DENR Administrative Order no. 34 series of 1990, section 68 paragraph A). Class C means that lake waters can be used as: (1) fishery water, (2) recreational water (class 2) and (2) industrial water supply (class 1).

5. This is based on the criterion set by the Environmental Study Board in 1973.

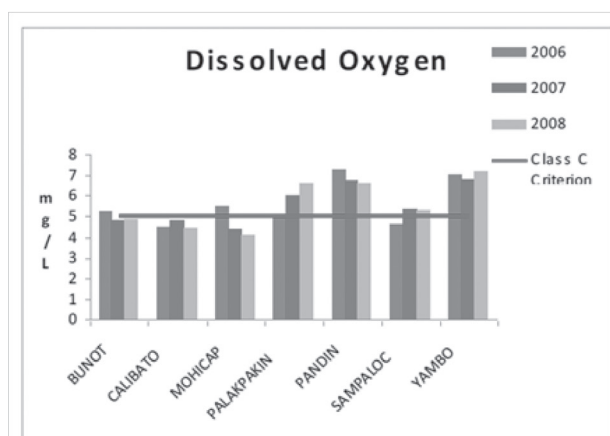


Figure 3: Dissolved oxygen level of the seven crater lakes (LLDA, 2008).

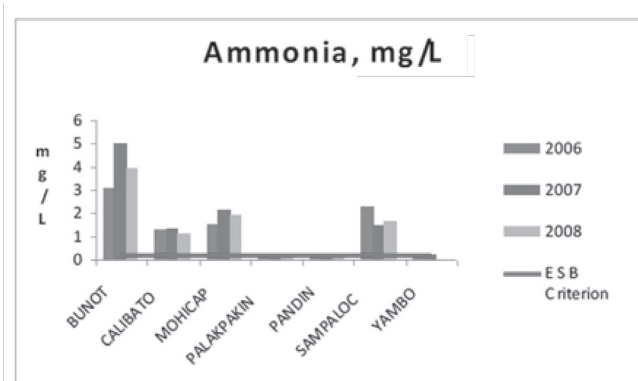


Figure 4: Ammonia levels of the seven crater lakes (LLDA, 2008).

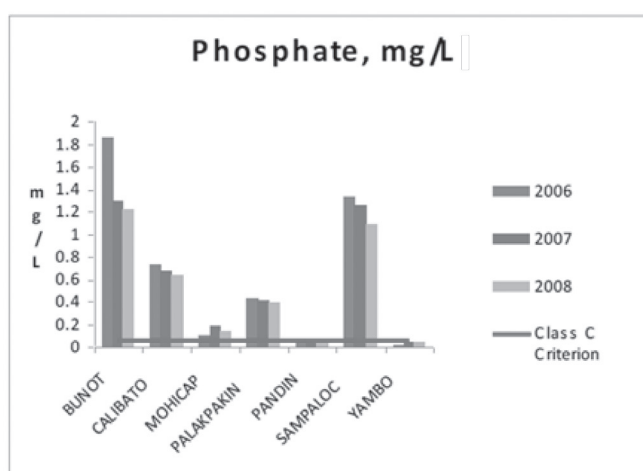


Figure 5: Phosphate levels of the seven crater lakes (LLDA, 2008).

the past, this undue nutrients inputs in the lake have been associated with algal blooms and proliferation of hyacinths which usually result in slow tilapia growth, emission of foul smell and recurring fish kills (such as the one that occurred in the lake in 1990s to 2000s). Moreover, fish kills in the seven crater lakes are also related to upwelling or overturning, an ecological phenomenon usually occurring in the cold months (i.e. December to February), where the bottom water of the lake which is usually loaded with toxic substances (e.g. hydrogen sulphides and ammonia) is brought up to the surface, resulting in substantial fish kills (Araullo, 2001; LLDA, 2014).

In the past, the San Pablo City Water District (SPCWD) has proposed that Calibato Lake be a source of potable water and reservoir for domestic water supply due to its high volume of water storage (Banzuela, 2005), while the Municipality of Rizal has considered a proposal to use the many natural springs on its side of the lake as a source of water supply for the town or irrigation. On the part of San Pablo, the City Government has set aside the proposal since questions were raised on possible detrimental effects to Calibato Lake and its ecology in diverting or siphoning significant amount of water from the lake and its natural springs; and on the part of Rizal, the Local Government is still weighing on the viability of the project.

The Administration of Calibato Lake⁶

The administration of Calibato Lake involves a multitude of overlapping-interrelated laws and three key government agencies—the LLDA, the City Government of San Pablo and the Local Government of Rizal. The mandate of the LLDA comes from The Laguna Lake Development Authority Act of 1966 (as amended by Presidential Decree 813, October 1975) or RA 4850, which is the principal law in the administration of Laguna de Bay (the largest lake in the country) and its watershed area (which includes the seven crater lakes of San Pablo City) (Figure 6). RA 4850 created the LLDA and designated it as the main agency in supervising and managing the water bodies in the Laguna de Bay region⁷ (see RA 4850, section 1 and section 4). Specifically, the LLDA has the primary responsibility to promote the development of the Laguna de Bay region, while

6. Portions of this section were derived from the previous works of the author on the seven crater lakes of San Pablo City.

7. The Laguna de Bay region includes the provinces of Rizal and Laguna; the cities of San Pablo, Pasay, Caloocan, Quezon, Manila and Tagaytay; the towns of Tanauan, Sto. Tomas and Malvar in Batangas Province, the towns of Silang and Carmona in Cavite Province; the town of Lucban in Quezon Province, and the cities of Marikina, Pasig, Taguig, Muntinlupa, and Pateros in Metro Manila.



Figure 6: The seven crater lakes of San Pablo City and Laguna de Bay (Google Maps, 2015).

providing for environmental management and control, preservation of the quality of life and ecological systems, and the prevention of undue ecological disturbance, deterioration and pollution (LLDA, 2005). The LLDA's authority was strengthened by Executive Order no. 927 issued by then President F. Marcos in December 1983 which gave the LLDA the exclusive water rights over the lakes in the Laguna de Bay region. In effect, it reinforces the administrative arrangement that the LLDA's central concern is Laguna de Bay while its jurisdiction over Calibato Lake (and the other crater lakes) is incidental, being part of the watershed of the Laguna de Bay region. In practice, this administrative setup renders that the attention and resources of the LLDA (which generally are inadequate like in many government agencies in country) are concentrated on Laguna de Bay, while the small lakes within its region (i.e. the seven crater lakes and Tadalac Lake in Los Baños, Laguna) take peripheral consideration.

The mandate of the City Government of San Pablo and the Local Government of Rizal comes from The Local Government Code of 1991 or RA 7160, which gives them the authority over Calibato Lake being municipal water. Since RA 4850 confers the administration of Calibato Lake to the LLDA while RA 7160 bestows the local government units the territorial jurisdiction, this implies "coordinative-supplementary" setup between the government agencies. The LLDA lays down the comprehensive development framework and approve/disapprove the plans and projects submitted to it by the local government units. Conversely, the local government units initiate programmes and legislate ordinances in support of the overall development strategy of the LLDA. This arrangement was formalized in a Memorandum of Agreement (MOA) signed by the LLDA and the local government units in 1997.

On regulations, the LLDA takes the overseeing role and the local government units take the execution

responsibilities. The local government units primarily enforce the regulations on the lake since it controls the local police and the barangay units. In the seven crater lakes, this role was highlighted when the City Government of San Pablo spearheaded the demolition of illegal structures in Sampaloc Lake in the early 2000s. This capacity gives the local government units some leverage over the “upper” authority of the LLDA, as the latter’s regulatory actions on the seven crater lakes are almost always anchored on the formers’ cooperation and assistance. On ground, the downside of this administrative arrangement is seen when the LLDA procrastinates in deciding on plans or projects submitted by the local government units (e.g. zoning-development plan proposals); and when the local government units oppose or become reluctant in enforcing the directives of the LLDA (e.g. demolition of illegal fish pens/cages).

In administering Calibato Lake, the LLDA and the local government units rely on the Fisheries and Aquatic Resources Management Council (FARMC). The FARMC is principal organization mandated by law, specifically the Philippine Fisheries Code of 1998 or RA 8550⁸ to assist government agencies in the management, development, utilization and conservation of the water resources throughout the country. The FARMCs are established from the national level to cities and municipalities and formed locally by fisherfolk organizations/cooperatives and NGOs in the locality with the assistance of the government agencies. In the Laguna de Bay region, FARMCs’ formation, sustenance and supervision, which by the Philippine Fisheries Code is under the Department of Agriculture, was devolved to the LLDA in recognition of its exclusive jurisdiction. The Philippine Fisheries Code also mandates that the FARMC be multi-representative in its composition and guarantees the organization’s funding. The experience in seven crater lakes, however, the FARMC lacks diversity, as the organization is mainly led and comprised fisherfolks residents. The FARMC also lacks funding, as its leaders have often complained that the funds allocated to them are inadequate to effectively function, sustain and carry out the responsibilities of the organization. In Calibato Lake, the FARMC’s most discernable work is leading the cleaning efforts on the lake. The cleaning scheduled is usually determined by the local FARMC’s leadership and supported/participated by members from the other crater lakes, but subject to the LLDA’s allocation of their allowance.

Beyond the Philippine Fisheries Code, the other major laws that have direct bearing on the development of Calibato Lake are the Philippine Clean Water Act of 2004 or RA 9275 and the Tourism Act of 2009 or RA 9593. In principle, the laws interlock and supplement each other, particularly in the utilization of the lake. In practice, the laws are also a source of divergence since each statute advances distinct agenda over the utilization of the natural resource. Specifically, the Philippine Clean Water Act prioritizes the preservation of the water resource; the Tourism Act promotes ecotourism for socio-economic development; and the Philippine Fisheries Code underscores the interest of the fisherfolks and the fishing industry. Under this context, the advocates and constituents of each law compete and negotiate over in the utilization of the lake. Consequently, the initiatives, plans and programmes in Calibato Lake have to be framed within the scope that these laws and the intertwined interests they represent.

Development Issues in Calibato Lake

The foremost issue in Calibato Lake is the lack of development. This circumstance ensued despite the lake having attributes conducive for development. Calibato Lake is probably the most important water resource among the seven crater lakes in terms of: water storage capacity due its depth, volume of water flow from its many natural springs, and location since it is situated on highly elevated grounds. The water of the lake is also suitable for aquaculture, as it rivals Palakpakin Lake and Bunot Lake in tilapia production. On the downside, the lake suffers from the presence of illegal fish pen/cage operators, informal settlers and deteriorating water quality. Despite these, there had been no tangible development initiatives or programmes introduced in the lake by its administrative agencies for a long time. The LLDA’s involvement is mainly confined to its routine tasks of conducting water quality monitoring, seeding of fingerlings and clearing of water lilies (LLDA, 2005), while the City Government of San Pablo’s action is largely focused on the development of Sampaloc Lake (i.e. the premier lake of the city), and the Local Government of Rizal’s action is mainly confined to the development of Tayak Hill. Sampaloc Lake and Tayak Hill are primed by the local government units as the principal promotional emblem and tourist destination in their respective municipalities.

8. The precursor law of the Philippine Fisheries Code is Executive Order (EO) 240 issued in 1995 which instigated the formation of the Fisheries and Aquatic Resources Management Committees (FARMCs) nationwide.

In the past, the LLDA and the local government units' lack of actions have been attributed to shortage of resources and organizational/political reality. In particular, on the part of the LLDA, the agency has often alluded to inadequate manpower to cover the small lakes⁹ (as most of its resources are allocated to Laguna de Bay, its principal concern), and to frequent turnover of leadership resulting in shifting priorities (as the agency had four different General Managers from 2005 to 2013). For instance, in the case of Tadalac Lake, the LLDA infused manpower and financial resources to prepare the lake's zoning-development plan but the project was not completed primarily due to the change in leadership which, in turn, resulted in revised priorities at the agency in 2001 (Santos-Borja, 2008). On the part of the local government units, they have often cited insufficient funds due to the lingering financial difficulty and sensitivity of local politicians to the pleas from vested interests (e.g. fish pens/cages operators and fisherfolks leadership), particularly against the move to take drastic actions on the lakes. For instance, the planned demolition of illegal settlements in Bunot Lake in the mid-2000s did not push through due to the intercession of local politicians, petitioning the LLDA and the City Government to give the informal settlers more time to prepare.

Over the years, the interaction between the LLDA and the local government units has also been hampered by coordination problems, diverse priorities and passing of responsibilities. For instance: (1) on coordination, the construction of the boardwalk in Sampaloc Lake was carried out by the Third District Congressional Office and the City Government of San Pablo without properly coordinating with the LLDA; (2) on the focus of each agency, the LLDA's priority is Pandin Lake, while the City Government of San Pablo's priority is Sampaloc Lake and the Local Government of Rizal's priority is Tayak Hill; (3) on who decide on the three submitted zoning-development plan proposals for Sampaloc Lake, the LLDA believes that the City Government of San Pablo should decide on the three proposals and re-submit only the compromised plan, while the City Government of San Pablo believes that it has done its duty (as the plans were already submitted) and it is up for the LLDA to decide via choosing one among the three or reconciling them (Brillo, 2015e). Furthermore, these factors have greatly contributed to the cynicism among lake residents and stakeholders, as many of them

see the administrative agencies' actions as lacking in long-term commitment and political will, and merely tokenism and symbolic efforts.

A key indicator of the lack of development in Calibato Lake is the absence of a zoning-development plan. The formulation of the zoning-management plan has been consistently a key item on the agenda in forums on the seven crater lakes since the early 2000s. The administrative agencies have acknowledged the necessity for such a plan. For instance, the issue has been mentioned in the LLDA's 2005 water quality report on Calibato Lake, the LLDA's 2008 water quality report on the seven crater lakes, and the City Government of San Pablo's 2014 citizen charter report. A zoning-development plan is considered a basic need since it is necessary for the management, utilization and conservation of a lake. The plan furnishes a developmental framework in which initiatives, programmes and projects in the lake must conform to be coherent and efficient. Specifically, the zoning-development plan is the first step in the administration of the water resource since it provides direction and guidance to subsequent plans as well as precipitates succeeding actions.

Currently, the LLDA is preoccupied in coming up with a zoning-development plan for Pandin Lake, the City Government of San Pablo is focused on formulating a zoning-development plan for Sampaloc Lake, and the Local Government of Rizal is concentrating its resources in developing Tayak Hill. The administrative agencies prioritization is reasonable since Pandin Lake is deemed a model for ecotourism development of the seven crater lakes, and Sampaloc Lake and Tayak Hill are the centrepiece of the tourism programme of San Pablo City and Rizal, respectively. But what is unacceptable is the exclusive concentration of efforts on them at the expense and neglect of the other crater lakes, like Calibato Lake which also needs administrative attention. Indeed, Pandin Lake, Sampaloc Lake and Tayak Hill may take precedence in many development-oriented actions but not in the drafting of a zoning-development plan since it is rudimentary for all the crater lakes, as they are all equally threatened (Global Nature Fund, 2014). Crafting a zoning-development plan requires marginal capital and resources (compared to the other ambitious development project proposed through the years) and the impact having one to the management and conservation of Calibato Lake is substantial. The

9. For instance, the LLDA's surveillance and monitoring officer usually conducts quarterly visits/inspections in a year on each of the seven crater lakes.

main element needed to have one is political resolve of the administrative agencies.

The principal advantage of such a plan in Calibato Lake is that it will systematize the utilization of the water resource and will facilitate the regulation of fish farms and promotion of tourism in the lake. Since at the moment the fish pens/cages are disorganized and scattered throughout the lake and no zone is identified for tourism development, the zoning-development plan addresses this by designating the specific area (including the extent and arrangement) for fish pens/cages as well as reserve areas for tourism development. Another benefit is that, considering the transboundary feature of the Calibato Lake, the move to craft a zoning-development plan will compel the City Government of San Pablo and the Local Government of Rizal (as well as the LLDA) to work together in coming up with a common plan and consistent strategies for the lake. Furthermore, the process in crafting a zoning-development plan will also draw attention to the many issues in the lake, such as: (1) the proliferation of illegal fish farms and implementation of the 10-percent-limit rule on fish pens/cages; (2) the presence of informal settlers; (3) the enforcement of the lake's 20-meter easement along its banks; and (4) the degradation/contamination of the lake's water.

These problems have long been identified (e.g. LLDA, 2005, 2008, 2014) and are still wanting of resolute and sustained actions from the administrative agencies. Moreover, having a zoning-development plan to all the seven crater lakes would bestow the following advantages: firstly, better identification of the similarities, diversities and unique features of each lake; secondly, better planning/strategy coordination since the lakes are proximate and customarily linked to each other; and lastly, a safety net so that no lake is developmentally isolated and left behind. As to the stakeholders, the process of having a plan empowers them since this provides an opportunity to engage the administrative agencies and an arena to communicate their views and opinions. As to the administrative agencies, the move to craft a zoning-development plan enhances goodwill among the locals since it is a tangible manifestation that they are doing something significant for the well-being of the lakes.

The nonexistence of tourism is another indication of the lack of development in Calibato Lake. Developing tourism is important in the seven crater lakes since the industry can offer a reliable source of livelihood

and employment among the locals. The value of tourism on a small lake has been demonstrated by ecotourism success of Pandin Lake (Brillo, 2015f). At present, fish farming, fishing and related activities are the main source of income in Calibato Lake, as no tourism initiatives or projects have been introduced over the years. Ecotourism development in the lake has been mentioned in the past by the City Government of San Pablo (specifically as haven for extreme adventure sports), and the Local Government of Rizal (specifically as supplementary to the on-going tourism development at Tayak Hill), but so far no action has been taken. Calibato Lake has good prospect as tourist destination because of its natural scenery— water, terrain (conducive for adventure and nature seekers), waterfall and natural springs. Beyond this, ecotourism has the advantages of having more potential for growth and expansion (i.e. multiplier effect) and has least harmful consequence to the water resource; compared to aquaculture which is limited by the 10 percent rule and has discharges that are detrimental to the lake. In addition, because of the experience in Pandin Lake, the locals are now more receptive to ecotourism being promoted in Calibato Lake. This openness among the lake residents is important since it can be a critical factor in instigating ecotourism development in the lake and in mitigating opposition/resistance.

Among the immediate concerns the administrative agencies can do to prepare the ground for ecotourism development in Calibato Lake are the following: (1) enhancing accessibility of the lake by securing the right of way, particularly the traditional entries in San Pablo City and in Rizal since they traverse on private land; (2) rebuilding and improving the dilapidated steps and trail (in San Pablo and in Rizal) leading in and out of the lake; (3) installing directional signage from Sto. Angel road (in San Pablo) and Rizal-Nagcarlan road (in Rizal) to the entry points of the lake; (4) putting up a permanent trail around the lake and going to the two main natural springs—"Eliw-eliw" Spring (in San Pablo) and Nalagalas Waterfall/Spring (in Rizal), stopover stations and restrooms; (5) removing abandoned structures and bamboo remnants in the lake; and (6) providing training workshops to the locals on the basics of tourism (e.g. organizing lake tour, rafting trips, and safety measures). Moreover, one problem that is often overlooked in Calibato Lake is the threat of landslide and soil erosion due to the mostly stiff sloping terrain around the lake. This problem is evident in the

main entrance trails both in San Pablo and in Rizal, as the recent typhoon had eroded trees and portions of the steps leading to the lake.¹⁰

The lack of concrete policy on how to manage the many natural springs and their watershed is another manifestation of the want of development in Calibato Lake. The natural springs are important since they directly feed the lake and are a source of fresh water to the locals. In Calibato Lake, the natural springs are distinct since their water flow, particularly *Eliw-eliw* Spring and Nalagalas Waterfall/Spring, is a lot greater relative to the natural springs in other crater lakes. In the past, this feature (combined with the large water storage capacity and high elevation of the lake) has led the City government of San Pablo and the Local Government of Rizal to consider the natural springs' potential for domestic uses in their respective municipalities.

Since the many natural springs and their watershed in Calibato Lake (as well as in the other crater lakes) are typically located near or within privately-owned lands, it is necessary to come up with clear guidelines to protect them, such as prohibiting cutting of trees, clearing of vegetation, and constructing houses and other concrete structures near them. Presently, the administrative agencies have no definitive regulation or programme being implemented on the natural springs and their watershed in the lake (as their efforts are mainly confined on managing aquaculture and the lake's water quality). Under this context, the administrative agencies must now take notice and spearhead the move to conserve them, including conducting scientific studies to clearly establish the link between the natural springs and the lake, particularly their inflow contribution and ecological ramifications.

Conclusion

Calibato Lake is a transboundary small lake and part of the seven crater lakes of San Pablo City. Typical of a small lake in the Philippines, it is least studied, particularly the development dimension of the lake. Administratively, the management of Calibato Lake is complex since it involves an array of overlapping-interconnected laws and interlocking institutions (i.e. the LLDA, the City Government of San Pablo, the Local Government of Rizal, and FARMC), which leads to issues such as coordination problems, diverse priorities and passing of responsibilities. Presently,

the lake is mainly utilized for fishing and aquaculture (specifically tilapia farming on floating pens/cages), and is ecologically threatened by extensive fish farming (due to illegal operations and infringing the 10-percent-limit rule), presence of informal settlers, and pollution (from fish farms and domestic discharges). Despite this, Calibato Lake has much potential for development. The lake possesses attractive natural landscape and scenery, and has the largest volume of water storage (due to its enormous depth) and water flow from its various natural springs among the seven crater lakes.

Oddly, Calibato Lake is underdeveloped; no concrete development activities were instigated to the lake by its administrative agencies over the years and no definite time table is set on when initiatives will be introduced at present. This unfortunate condition is evident in the absence of the zoning-development plan, tourism activities and actions to manage the natural springs. Under this premise, the LLDA, the City Government of San Pablo and the Local Government of Rizal must now go beyond their current preoccupation—Pandin Lake, Sampaloc Lake and Tayak Hill, respectively—and bring development to Calibato Lake. A zoning-development must be had since it is basic for managing the lake, regulating aquaculture, and crucial for encouraging and facilitating other actions, ecotourism must be promoted since it is essential in expanding work opportunities of the locals and enhancing their community, and natural springs and their watershed must be protected since they are a key life source of the lake.

This article directly addressed the identified gap in literature by conducting a development assessment on a small lake in the country. Particularly, the study examined the current situation and development issues in Calibato Lake. Overall, the work advances two key aspects in Philippine lake studies: firstly, development studies (including governance, socio-economic, history and cultural studies) must advance and supplement the progress in limnology and aquaculture studies to have a comprehensive perspective on lakes; secondly, small lakes are also important (as they are numerous [compared to big lakes] and found all over the archipelago) and must be accounted for to fully capture the plight of lakes. Advancement in both aspects is indispensable if real gains are to be achieved in improving the condition of lakes in the country. Finally, this study is a small contribution in literature since there is still a vast number of small lakes in the country that

10. There is also a need to study the effects of the on-going quarrying activities near Calibato Lake.

need to be documented and explored under the lenses of development studies. It hopes to set off more studies on Calibato Lake, in particular, and on small lakes in the Philippines, in general.

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Calendar of Events

3rd International Conference on Coastal and Ocean Engineering (ICCOE 2016)

8th and 9th April 2016

Tokyo, Japan

Website: <http://www.iccoe.org/>

Contact person: Ms Mickie Gong

Organized by: IJESD

India Water Forum 2016

20th to 22nd April 2016

New Delhi, India

Website: <http://www.teriin.org/events/iwf/>

Contact person: Dr. Shresth Tayal

Organized by: The Energy and Resources Institute (TERI)

19th International Water Technology Conference

21st to 23rd April 2016

Sharm El Sheikh, Egypt

Website: <http://iwtc.info>

Contact person: IWTC team

Organized by: IWTA

6th International Conference on Environment Science and Engineering (ICESE 2016)

Ei Compendex, Scopus – 2016

24th and 25th April 2016

Antalya, Turkey

Website: <http://www.icese.org/>

Contact person: Mr. Issac Lee

Organized by: CBEES

Smart Water Systems

25th and 26th April 2016

London, United Kingdom

Website: <http://www.smart-water-systems.com/conferencealerts>

Contact person: Vinh Trinh

Organized by: SMi Group

Water and Wastewater Engineering Conference

7th and 8th June 2016

London, United Kingdom

Website: <http://atnd.it/50956-0>

Contact person: Rosie Perkins

Organized by: Institution of Mechanical Engineers

Environmental Impact 2016

8th to 10th June 2016

Valencia, Spain

Website: <http://www.wessex.ac.uk/16-conferences/environmental-impact-2016.html>

Contact person: Irene Moreno Millan

Organized by: Wessex Institute, UK; Universitat Politècnica de València, Spain

Aquatech China 2016

15th to 17 June, 2016

Shanghai, China

Website: <http://www.aquatechtrade.com/press-releases/china/access-the-chinese-water-market-at-aquatech-china-2016/>

Contact person: Quynh Ngo

Organised by: RAI Amsterdam, The Netherlands

2nd International Conference on Water Technology (ICWT 2016) Ei Geobase – 2016

25th to 27th June 2016

Bali, Indonesia

Website: <http://www.icwt.org/>

Contact person: Ms. Iris Tang

Organized by: CBEES

Urban Water 2016

27th to 29th June 2016

Venice, Italy

Website: <http://www.wessex.ac.uk/16-conferences/urban-water-2016.html>

Contact person: Irene Moreno Millan

Organized by: Wessex Institute, UK; Politecnico di Milano, Italy

Water Pollution 2016

27th to 29th June 2016

Venice, Italy

Website: <http://www.wessex.ac.uk/16-conferences/water-pollution-2016.html>

Contact person: Irene Moreno Millan

Organized by: Wessex Institute, UK