BEACH RESORTS OPERATION AS POTENTIAL LAKE WATER POLLUTANTS: SKETCHES ON SYNERGY AMONG STAKEHOLDERS

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ABSTRACT

The overarching goal of this paper is to contribute to the discourse on capitalism's collision with the environment. Particularly, this study examines the potential lake water pollution of the local beach resorts operations in Talisay, Batangas, Philippines. The increasing volume of wastes from beach resorts in the study sites is one of the major threats in the water quality of the Lake. Specific contributors of beach water pollutant include wastes from sewage system, boating, beach goers, fresh water debris, and plastic pollution. The average results of the water quality indicator tests elucidate that the Dissolved Oxygen (3.59 mg/L), Phosphate (0.06 mg/L), Nitrates (2.53 mg/L), and Chloride (449 mg/L) of the beach resorts sites of the study do not conform to the standards set by the Department of Environment and Natural Resources (DENR). T-test results show significant differences in Dissolved Oxygen and Phosphate test of two compared sites ($p<0.05$) which clearly indicates water pollution. Consequently, dissolved oxygen and phosphates has no direct human health implications, but an important indicator of overall water quality. Thus, beach resorts in Talisay can still be used for primary contact recreation such as bathing, swimming, and skin diving. This paper sees the insistence for the Local Government Unit to strengthen the Local Sanitation Law for all beach resorts in the study sites. I provide preliminary sketches to protect the water quality of the Lake. I argue that the four main stakeholders—the local government, the locals/entrepreneurs, beach resort owners and the tourists—need to create a synergy. This synergy, following Peter Evans, pertains to institutional partnerships and embeddedness of actors' relations, among others.

***Key words**: beach resorts, water quality, lake water pollution, Local Sanitation Code, synergy*

INTRODUCTION

The very attractive location and proximity to the country's capital gives Talisay, Batangas and the rest of the towns surrounded by Taal Lake the potential to become one of the most important tourist destination of the country. The increasing demands of tourist give ways to more potential businessmen to operate beach resorts and to be consider as one of the income generating source of the town. Consequently, (Davenport & Davenport, 2006) considers the impact of tourism at two levels, the uncontrollable numbers of tourists that exceeds carrying capacity and the possible pollution brought by them. Tourism has long been considered as a clean industry with almost no negative effects on the environment worth considering. However, human populations are still increasingly concentrating in the coastal zone and the beaches are subjected to ever-expanding pressures from recreational activities, leading to environmental destruction if not manage (Gheskiere, Vincx, Marcin, Scapini, & Degraer, 2005). According to (Ã, 2012) the government can avoid the dilemma of encouraging destructive development, and instead protect the environment by clearly announcing the sustainable development concept in all its authorities. Commitment towards protecting the nature and culture are required in order to harmonize development and environment protection. In the context of tourism in Vietnam, economic and social considerations may influence sustainable development. The tourism industry must generate more employment than it destroys, compliment local and domestic industries and maintain the physical and cultural environmental integrity (Haley, Haley, & Haley, 1997).

Recreational waters can contain various toxic chemicals and pathogenic microorganisms, which are a potential threat for human health and can cause beach closures (Schernewski, Fischer, Huttula, & Jost, 2016). In the Philippines, disposal of wastewater is turning to be an enormous challenge. Untreated wastes are hazards to health and environment and may lead to epidemics, fish kills, and other related disasters. In line with this, the Philippine government has formulated policies and guidelines that will ensure proper management of the country's wastewater (Environment & Series, n.d.). In relation to increasing demand of beach resort industries, understanding the development of large-scale and complex socioecological systems requires long-term knowledge and cross-disciplinary analysis. Therefore, there is a clear need to discuss the relation between environment (discharges) and society (legislation) in terms of the structures of wastewater treatment and resulting load to water bodies (Academy, 2016).

The significant information about the available resources for supporting life in an ecosystem will determine by the quality of water in any

given ecosystem. Physico-chemical parameters and biological characteristics are dependent on good quality of water resources. Assessment and monitoring of these parameters is essential to identify the magnitude and source of any presence of pollution. These characteristics can identify certain condition for the ecology of living organisms and suggest appropriate conservation and management strategies (Thirupathaiah, Samatha, & Sammaiah, 2012). The Physico-chemical tests necessary to assess lake water quality are dissolved oxygen, pH, chlorides, phosphates and nitrates Oxygen are important parameters of the lake water ecosystem which is essential to the metabolism of all aquatic organisms that possess aerobic respiration (Theresa, 2015). Dissolved Oxygen (DO) is measured in it's dissolved from organic oxygen. The addition of a variety of biodegradable pollutants from domestic and industrial sources stimulates the growth of microorganisms, which consume the DO. If more oxygen is consumed than is produced, DO levels decline and some sensitive animals may move away, weaken, or die (Singare, Lokhande, & Naik, 2010). Nitrate on the other hand, is a form nitrogen and vital nutrient for growth and reproduction of water organism while phosphorus was considered to be the most significant nutrients responsible for eutrophication of lake (Adeyemo, Adedokun, Yusuf, & Adeleye, 2008). The pH controls the chemical state of many nutrient including dissolved oxygen, phosphate, nitrate etc. It regulates most of the biological processes and biochemical reaction. (Parashar, Dixit, & Shrivastava, 2006). Chloride is essential for natural balance of water electrolytes but excessive amount will be damaging and killing some parts of the body each time one bathes or swims in the river. High chloride content can also cause poisoning of aquatic organisms. (Hallare, Factor, Santos, & Hollert, 2009).

The Department of Environment and Natural Resources (DENR), in coordination with the Committees on Environment and Ecology of the Senate and the House of Representatives, respectively and other concerned agencies, shall promulgate the implementing rules and regulations issued by other government agencies and instrumentalities for the prevention and/or abatement of water pollution (Environment & Series, n.d.). Determination of the water pollution from irregularities of environmental protection law was one of the major objectives of this study. The cooperation of all concern stakeholders in the protection of natural lake environment was necessary to the everlasting greater harmony between the lake environment and its residents. "State-society synergy" can be a promoter for development. Rules of cooperation and networks of municipal engagement among ordinary citizens can be promoted by public agencies and used for developmental ends. Figuring out how such public-private cooperation might show more widely should be a priority for those interested in development (*Author :*

State-Society Synergy : Government and Social Capital in Development Edited by Peter Evans, 1997).

Objectives of the Study

The primary goal of this study is to contribute to the discourse on capitalism's collision with the environment, particularly it examines the potential lake water pollution of the local beach resorts operations in Talisay, Batangas, Philippines. Specifically, it aims to determine the Talisay beach resorts compliance checklist on Local Sanitation Code; identify and categorize the lake water quality of Talisay beach resort sites; test the difference of water quality of two compared sites and sketch synergy among stakeholders in protecting Taal Lake waters.

METHODOLOGY

Study Site

Located at (14°00, N, 121°19, E), Taal Lake known as Lake Bombon, is the deepest and the third largest lake in the Philippine Archipelago. It is classified as an oligotrophic lake with a maximum depth of 180 meters and drains through the Pansipit River into Balayan Bay to the southwest (Papa, Pagulayan, & Pagulayan, 2009). The Lake was declared as protected area in 1996 through the Administrative Order No. 118. The stretch of the Lake covers the municipalities of Talisay, Malvar Tanauan, Laurel, Agoncillo, Sta. Teresita, Cuenca, Alitagtag, Mataas na Kahoy, Lipa City, Balete, and San Nicolas in Batangas. Thirty-seven (37) tributaries drain into the Lake and its only outlet is the Pansipit River (Asian Development Bank, 2003) as cited by (Lake & Martinez, 2011)

Figure 1. Location Map of the Study

Water Sampling

Water samples were collected randomly in a three trial dates (April 11, May 16 and June 6, 2015). Two sites were selected as representation of east and west side beach resorts of Talisay, Batangas. Baranggays Aya to Tumaway, of the east sides, which only have two beach resorts considered as Site A. While the concentrated beach resorts area of the west of Talisay has a representation of 12 beach resorts scattered from barangays Sampalok to Banga assigned as Site B. See figure 1 for the location of the study.

Physico-chemical Analysis

The collected water samples were immediately tested to find the results of the physico-chemical analysis. The approved methods of analysis set by the DENR ("PRIME - M4 Page 1 of 11," 1990) were used.

Parameters	Methods of Analysis
Dissolved Oxygen	Membrane Electrode (DO meter)
pH	Glass Electrode Method/pH Meter
Nitrates	Specific ion electrode for fresh water
Phosphates	Stannous chloride method
Chlorides	Argentometric method

Data Analysis

Interview and observation were done in determining the Talisay beach resorts compliance checklist on Local Sanitation Code. Weighted mean of each physico-chemical analysis were compared against the standard set by the Department of Environment and Natural Resources-Environment (DENR-EMB, Administrative Order no. 34, 1990) ("PRIME - M4 Page 1 of 11," 1990). T-test for equality of means were used to test the difference of water quality of two compared sites and link the results to Peter Evans "state-society" synergy methods and evidence pertaining to institutional partnerships and embeddedness of actors' relations, among others.

RESULTS AND DISCUSSION

Beach Resorts Compliance Checklist on Local Sanitation Code

Table 1 presented the Talisay Beach Resorts Compliance Checklist on Local Sanitation Code. In the sanitation code of the Philippines (Environment & Series, n.d.) only 4 or 19% of the beach resorts in Talisay Batangas has complied in the sewage disposal provisions. Most of the beach resorts failed to comply with Septic Tank Effluent field. The effluent from septic tank shall be discharged into a subsurface soil, absorption field where applicable or shall be treated with some type of a purification device. The treated effluent may be discharged into a stream or body of water if it conforms to the quality standards prescribed by the National Water and Air Pollution Control Commission. Similarly in the study of (Pinto, Pereira, Gorayeb, Sousa, & Costa, 2011) coastal water of amzon will greatly affected by the pollution results from poor management of treated effluent discharge.

Table 1. Beach Resorts Compliance Checklist on Local Sanitation Code

Beach Resorts	Sewage Disposal	Drainage Provision	Ecological Solid Waste Management
Beach Resort Site A 1	✗	✗	✗
Beach Resort Site A 2	✗	✗	✓
Beach Resort Site B 1	✗	✗	✗
Beach Resort Site B 2	✗	✗	✓
Beach Resort Site B 3	✓	✓	✓
Beach Resort Site B 4	✗	✓	✓
Beach Resort Site B 5	✗	✗	✗
Beach Resort Site B 6	✓	✓	✓
Beach Resort Site B 7	✗	✗	✓
Beach Resort Site B 8	✓	✓	✓
Beach Resort Site B 9	✓	✓	✓
Beach Resort Site B 10	✗	✗	✗
Beach Resort Site B 11	✗	✗	✓
Beach Resort Site B 12	✗	✗	✓
Beach Resort Site B 13	✗	✗	✗
Beach Resort Site B 14	✗	✗	✗
Beach Resort Site B 15	✗	✗	✓
Beach Resort Site B 16	✗	✗	✗
Beach Resort Site B 17	✗	✗	✗
Beach Resort Site B 18	✗	✗	✓
Beach Resort Site B 19	✗	✗	✗

(Environment & Series, n.d.) provision cited when artificial means are employed to drain water from higher to lower land, the owner of the higher land shall select the routes and methods of drainage that will cause the minimum damage to the lower lands., subject to the requirements of just compensation. 16 or 76% of the beach resorts failed to show the said provisions resulting an increasing patterns of lake water pollution. According to (Slomp et al., 2016) beach erosion is a worldwide problem and that has been widely observed in the state of Rio Grande do Sul (RS), southern Brazil. This occurrence started with uncontrollable drainage system patterns from upper land and streams.

Among the important local satination code for beach resort operations only the ecological solid wastes management has the highest record of compliance. The 12 or 57% was complied even with the little details of solid waste management provisions, other beach resorts failed to show the practice of segregation of waste resulting for their inclusion on the non compliance list. Seemingly, a group of american tourists were so cooperative in segration of wastes while they visiting different tourist destination in North America, this was based on behaviour of tourist study of (Williams, Barugh, Williams, & Barugb, 2016).

Lake Water Quality Test Results

The lake water quality tests of two compared sites were measured by getting the averages of three trials. Site A, representing the two beach resorts of the east side of Talisay namely, barangay Aya and Tumaway and Site B characterizes the concentrated beach resorts of the west side of Talisay (Baranggays Buco to Sampalok).

Table 2. Weighted Mean of Water Quality Tests of Two Compared Sites

Parameters	Site A	Site B	Mean	Standard Set by DENR-EMB	Interpretation
pH	8.3	8.6	8.5	6.7-8.5	Within the Standadrd
Phosphates	0.03 mg/L	0.08 mg/L	0.06 mg/L	.01-.03 mg/L	Exceed the Standard
Nitrates	2.42 mg/L	2.63 mg/L	2.53 mg/L	below 1 mg/L	Exceed the Standard
Chloride	445 mg/L	452 mg/L	449 mg/L	below 250 mg/L	Exceed the Standard
Dissolved Oxygen	3.74 mg/L	3.44 mg/L	3.59 mg/L	*6 mg/L minimum	Below the Standard

Despite of the few presence of beach resorts in site A, still the computed value of nitrates, chlorides and dissolved oxygen (DO) do not conform on the standard set by Department of Environment and Natural Resources. Results maybe based on the factors such as poor drainage system and sewage disposal, presence of numerous farm lots near the lake and uncontrollable drainage system patterns from upper land and canals. In site B, results shows that all water quality tests, as well, do not conform to the standards set by the Department of Environment and Natural Resources. This results coencide with the data gathered on Beach Resorts Compliance Checklist on Local Sanitation Code of Talisay, were most representative beach resorts do not completely comply on sewage disposal and drainage provisions.

(Kazi et al., 2009) Nitrogen and phosphorus are nutrients that may cause increased growth of aquatic plants and algae. Nitrate-nitrogen concentrations above 1 mg/L and any detectable amounts of total Phosphate-phosphorus may be indicative of pollution from fertilizers, manures or other nutrient-rich wastes. Reducing nutrient levels is critical to control nuisance growth of aquatic plants and algae. This can be accomplished by reducing the use of fertilizers near the water, keeping geese and domestic animals away from the lake, redirecting runoff from

barnyards and fertilized areas, maintaining a 30-foot or wider buffer strip of higher grass around the perimeter of the pond and maintaining or relocating nearby septic systems.

Dissolved oxygen, nitrates, phosphates and chloride of Baiyangdian Lake analyzed water quality variation in different scenarios. The results showed that return water such as domestic sewage with large organic load would worsen the eutrophication of Baiyangdian Lake. Reducing pollutant loads and improving sewage disposal could improve water quality to certain degree (Chong, Wei, & Zhifeng, 2010).

According to (Sallam & Elsayed, 2015) Low dissolved oxygen level (0–8 mg/L) is an indicator of high oxygen demand on the water caused by either high biological or chemical oxygen demand (BOD or COD). High BOD is caused by the decomposition of organic material in industrial and municipal effluents (pulp and paper plants and sewage treatment facilities) and production of organic material in the lagoon itself that can result in fish kills

Lake water should generally fall between 6.0 and 9.0. Lake water organisms tolerate different pH levels but, in general, most fish will do better in lakes with a pH near 7.0. pH less than 6.0 may result in decrease or even absent fish populations. Low-pH lakes are often treated by applying limestone. This is most easily done by spreading pulverized limestone over the lake surface. (Environmental & Agency, n.d.)

The sources of chloride in fresh water include soil and rock formations, sea spray and waste discharges. Sewage contains large amounts of chloride, as do some industrial effluents. Because sewage is such a rich source of chloride, a high result may indicate pollution of a water by a sewage effluent. Natural levels in rivers and other fresh waters are usually in the range 15-35 mg/l Cl - much below drinking water standards (Chaoui, Attoui, Benhamza, Bouchami, & Alimi, 2015)

Test of Difference

Table 3. T-test for Equality of Means

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
pH	Equal variances assumed	.720	.444	-1.66	4	.173	-.347	.209	-.927	.234
	Equal variances not assumed			-1.66	3.39	.185	-.347	.209	-.971	.277
Phosphates	Equal variances assumed	3.20	.148	-7.60	4	.002	-.057	.007	-.077	-.036
	Equal variances not assumed			-7.60	2.94	.005	-.057	.007	-.081	-.033
Nitrates	Equal variances assumed	1.29	.319	-1.42	4	.228	-.210	.148	-.620	.200
	Equal variances not assumed			-1.42	2.70	.260	-.210	.148	-.711	.291
Chlorides	Equal variances assumed	.168	.703	-2.77	4	.050	-6.333	2.285	-12.678	.011
	Equal variances not assumed			-2.77	3.86	.052	-6.333	2.285	-12.771	.104
Dissolved Oxygen	Equal variances assumed	.047	.839	3.12	4	.035	.300	.096	.0334	.567
	Equal variances not assumed			3.12	4.00	.035	.300	.096	.0332	.567

Table 3 shows the t – test result of site 1 and site 2 for equality of means. The result shows that there is a significant difference in phosphates (.005) and dissolved oxygen (.035) of the two sites at Taal Lake. The dissolved oxygen level of a receiving water maybe depleted by some inorganic waste discharges such as fertilizers and sewage disposal while phosphates occurs widely in nature in plants, in micro-organisms, in animal wastes and so on. It is widely used as an agricultural fertilizer and as a major constituent of detergents, particularly those for domestic use. Run-off and sewage discharges are thus important contributors of phosphorus to surface waters ("PRIME - M4 Page 1 of 11," 1990).

The consequence is that the actual concentrations of DO in a lake will be lowest in summertime when it is usually the case that the risk of damage to a water supply source or of environmental pollution is greatest, especially in areas developed as tourist centers or where such farming operations as silage-making are carried on (Badar, Romshoo, & Khan, 2013)

The significance of phosphate is principally in regard to the phenomenon of eutrophication (over-enrichment) of lakes. Phosphates gaining access to such water bodies, along with nitrogen as nitrate, promotes the growth of algae and other plants leading to blooms, littoral slimes, diurnal

dissolved oxygen variations of great magnitude and related problems (Brazil et al., 2016).

Subsequently dissolved oxygen and phosphates has no direct health implications, but an important indicator of overall water quality, Taal Lake, particularly beach resorts in Talisay can be still be used for primary contact recreation such as bathing, swimming, and skin diving.

Synergy among Stakeholders in Protecting Taal Lake Waters

The main stakeholders concerned in the protection of Taal Lake waters are: Local Government Unit (LGU), locals/entrepreneurs, beach owners/operators, and tourists. The Local Government Unit (LGU) primarily has the obligation to strict the implementation of the policy regarding sanitation code. The goal of sustainable development in the area of lake waters will have a great effect in the improvement of tourism industry that's benefits all the stakeholders. Beach owners, on the other hand must comply in the national sanitation code for the continuous effort of maintaining the required water quality of the beach waters. Lake water pollution includes wastes from sewage system, boating, beach goers, fresh water debris, and plastic pollution pose a great threats in the water quality of the lake. Problems of pollution will greatly affect the local economy resulting from decreasing number of tourists as well as quality of catcher fishes affected by water pollution. Locals/entrepreneurs and tourists also has a great contributions of lake water pollution. The concerned stakeholders can be controlled by both LGU and beach resorts owners as they have a great influence in imparting sustainable development practices.

Figure 2 shows the diagram of synergy among stakeholders in protecting Taal lake waters. This synergy, following Peter Evans, pertains to institutional partnerships and embeddedness of actors' relations, among others.

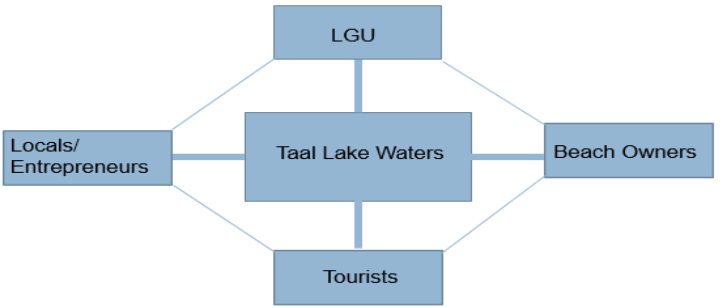

Figure 2. Synergy among stakeholders in protecting Taal lake waters

In relation, "State-society synergy," that active government and mobilized communities can enhance each other's developmental effort and it can be also a promoter for progress. Rules of cooperation and networks of civic engagement among ordinary citizens can be promoted by public agencies and used for developmental ends. Figuring out how such public-private cooperation might flourish more widely should be a priority for those interested in development (Evans, n.d.)

Inspired action by government organizations can stand-in social capital and the assessment of synergistic strategies was manifest. Blending strong public institutions and organized communities is a dominant tool for development. Better understanding of the nature of synergistic relations between state and society and the conditions under which such relations can most easily be constructed should become a component of future theories of development (*Author : State-Society Synergy : Government and Social Capital in Development Edited by Peter Evans*, 1997)

CONCLUSION AND RECOMMENDATION

Majority of the beach resorts in Talisay Batangas were not completely complied with the local sanitation code. Improvement in drainage provisions and sewage disposal will be necessary to avoid water pollution. All water quality tests conducted in Site B which represents the west side and the concentrated area of beach resorts do not conform in the standards set by DENR. T-test for equality of means shows significant difference in phosphates (.005) and dissolved oxygen (.035) level which considers as sign of water pollution. Since dissolved oxygen and phosphates has no direct health implications, but an important indicator of overall water quality, Taal Lake, particularly beach resorts in Talisay can still be used for primary contact recreation such as bathing, swimming, and skin diving. I argue that the four main stakeholders—the local government, the locals/entrepreneurs, beach resort owners and the tourists—need to create a synergy. This synergy, following Peter Evans, pertains to institutional partnerships and embeddedness of actors' relations, among others.

The study will recommend the strict implementation of the Local Government Unit of Talisay, Batangs in the compliance of local sanitation code for beach resorts. Responsible agencies must have a frequent monitoring of water quality and immediate action to mitigate the subsequent problems. A follow-up study on synergetic relationship among stakeholders in protecting Taal lake waters will also be recommended.

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