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A HOLISTIC APPROACH TO MATERNALISTIC SUSTAINABLE BUSINESS EDUCATION

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This paper will focus on how maternalistic management perspective is taking place in french management university education. A holistic new learning approach emerges today, caring for the organizations, employee teams, costumers and the whole community. Maternalistic management is understood as a caring way to deal with people and encourages sustainable growth, leadership and corporate responsibility. This paper will show how this new management educational philosophy provides radical tools for a different management style: autonomy, self-management, self-governance, decentralized control, transformational leadership, etc. Questioning traditional educational business, maternalistic learning will change the business educational environment with responsible potential leaders, perceived by the business community as “coordinators”, “caring employees”, “associates” which incorporate the notions of pleasure and well-being into the workplace. This maternalistic and sustainable perspective in education can be another way to develop an understanding about how to create a positive work atmosphere that encourages worker’s involvement and sustainable growth. This paper will discuss about the effects of maternalistic management in 21st century business organizations and how paternalistic management has been identified with the family male leaders. From this perspective, maternalistic sustainable business education rethinks responsibility for guiding, making decisions, taking leadership and promoting a holistic way of working, questioning preconceived notions of productivity, performance and profitability from a pure economic perspective.

Maternalistic educational management will be therefore related to motherhood as a supporter and nurturer of a community that care about all its members. This new way takes into consideration the notions of caring, well-being, sustainable happiness and global responsibility. Maternalistic management has the key elements and behaviors to be more “inside” this new perspective. The paper will consider companies like Semco from Brazil, as well as NGO’s (The Green Belt Movement, SEWA, Women World Bank), Foundations (Melinda Gates Foundation) and Charity Organizations (The Barefoot College) as world leaders towards a more ethically responsible business environment with feminine and caring values.

Keywords: holistic education, maternalistic management, well-being, global responsibility, caring.

Accounting for rhinos – the case of South African National Parks

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Abstract

Biodiversity represents the most significant natural resource required to sustain life on earth. The explosion in the illegal trade in wildlife species and products over the past decade has created an urgent global conservation challenge, with Africa being a major casualty. End-user consumers require illegally traded wildlife products for a diverse range of uses such as food, fuel, construction materials, medicines, ornaments, pets, cultural objects, and high-value gifts or investments.

Environmental governance involves the rules, laws, regulations, policies and social norms adopted by organisations about the use and/or protection of environmental resources. Despite the illicit wildlife trade covering a wide range of wildlife products, this paper focuses on the poaching of rhinos in South Africa, which has been especially hard hit. Reported incidents of rhino poaching in South Africa has grown exponentially from only 36 animals in 2006 to 1,175 by 2015.

As a South African public entity, SANParks is obliged to comply with the provisions of the Public Finance Management Act, and its associated treasury regulations. This *inter alia* includes requiring all public entities to disclose their actual performance against their strategic objectives and outcomes in their annual reports. The paper uses Atlas.ti to establish whether the increase in rhino poaching is reflected in the annual reports of SANParks over the ten-year period from 2006 to 2015. The objective of this paper is therefore to establish the extent to which SANParks publically account to their broader stakeholders about how they have performed in respect of their biodiversity mandate relating to rhino conservation and poaching. This interdisciplinary paper accordingly investigates the rhino poaching and conservation phenomenon within the context of biodiversity preservation and public sector accountability.

Accounting for rhinos – the case of South African National Parks

"The only way to save a rhinoceros is to save the environment in which it lives, because there's a mutual dependency between it and millions of other species of both animals and plants."

Sir David Attenborough[1]

1. Introduction

Traditionally, accounting research has tended to focus on financial information. Even though numbers remain the essence of accountancy, more recently it has expanded to include issues relating to the wider aspects of governance as well. Organisations are now expected to report to their broader stakeholders about their non-financial performance. In this regard, corporate social responsibility reporting (i.e. the ubiquitous triple bottom line) and more recently, integrated reporting, are rapidly becoming part of the accounting discourse, with extinction accounting emerging as one of the newest areas for accounting research. Although it is generally acknowledged that the effective utilisation of biological diversity is a precondition for sustainable development, biodiversity is increasingly being threatened by human activities, such as industrialisation, urbanisation, deforestation, population growth and the illicit wildlife crime. Environmental governance and accountability involve the rules, laws, regulations, policies and social norms that guide the use and/or protection of environmental resources by organisations. Extinction accounting assists in articulating the link between biodiversity preservation and organisational accountability.

Over the past decade, the illegal trade in wildlife species and products has exploded, creating an urgent global conservation challenge. In this regard, the illegal wildlife trade involves the harvesting, trading and use of a wide range of flora, fauna and fungi (Cooney *et al*., 2016). This includes the trade in both live specimens and various wildlife products needed or valued by consumers. While some of the most profitable species include iconic animals such as rhinoceros (hereinafter referred to as rhinos), elephants, tigers and even fish, in South Africa, rhinos have been especially hard hit by these developments (NABU, 2016). It is suggested that global poaching activities and the illicit wildlife trade, estimated to be worth between US$5 and 20 billion per annum, may be the single most serious immediate threat to biodiversity, even greater than habitat loss, climate change, and environmental degradation (Truong, Dang and Hall, 2016, p.354).

End-user consumers require illegally traded wildlife products for a diverse range of uses such as food, fuel, construction materials, medicines, ornaments, pets, cultural objects, and high-value gifts or investments (Phelps, Biggs and Webb, 2016). Biodiversity represents the most significant natural resource, *inter alia* including providing a source of food, medicines, clothes, energy, building material, clean air, clean water, psychological well-being (UNEP, 2008). Although the effective utilisation of biological diversity (biodiversity) may be considered to be a precondition for sustainable development, anthropogenic activities (Vačkář, ten Brink, Loh, Baillie and Reyers, 2012) is increasingly attributed to being a primary cause of

[1] https://www.brainyquote.com/quotes/quotes/d/davidatten214800.html.

global biodiversity reduction (UNEP, 2008). Environmental governance involves the rules, laws, regulations, policies and social norms used by organisations involved in the use and/or protection of environmental resources (Novellie, Biggs and Roux, 2016).

Representing the global south, and constituting a significant proportion of the underdeveloped world (Kutor, 2014), the African continent is a major casualty of the scourge of the illicit wildlife trade. Even though the illegal trade in wildlife products covering a wide range of species, this paper broadly focuses on the poaching of rhinos in Africa, and in South Africa in particular. Although rhinos are not the most threatened South African species, the recent scourge of rhino poaching, has highlighted the devastating impact of the illicit wildlife trade.

Over the last decade, reported incidents of rhino poaching in Africa has grown exponentially from only 60 animals in 2006 to 1,342 by 2015 (Emslie *et al*., 2016). This represents a cumulative increase of 2.2% over the period, or a simplistic annual average of 224%. Despite the extent of this problem, a closer scrutiny of the affected African countries reveals that the impact on the South African rhino population has been even more dramatic. The decimation of the South African rhino population is illustrated through the poaching of 36 rhinos in 2006, compared to 1,175 rhinos in 2015 (Emslie *et al*., 2016); representing a cumulative increase of 3.3%, or a simplistic average of 326% per annum.

One of the primary mechanisms used around the world to combat wildlife crime, is the proclamation of protected areas, which now covers a total of 13% of the Earth's land mass (Le Saout *et al*., 2013). The International Union for Conservation of Nature (IUCN) identifies six different categories of protected areas. Access to these areas range from strictly controlling and limiting human visitation, use and impacts, to low-level non-industrial use of natural resources that are compatible with nature conservation (IUCN, sa}. Within the scope of this paper, Category II: National Parks, may be defined as being large natural or near natural areas specifically set aside to protect large-scale ecological processes, integrating the species and ecosystems representative of the area, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities (Ibid.).

Responding to the recent decimation of rhinos, over the past decade many scholars have extensively researched various components relating to rhino conservation and poaching. Accepting society's concerns about anthropogenically induced species extinction, this paper acknowledges that the multidisciplinary nature of biodiversity preservation extends beyond the traditional domain of the natural sciences and conservation, where this phenomenon is typically studied. Instead, this paper examines the interventions deployed by the South African National Parks (SANParks) to account to their stakeholders about the extent to which they discharge their biodiversity mandate.

Given that the South African government is accountable to its stakeholders, including its citizens, residents and visitors, public entities too must account to the same stakeholders about how they have discharged their primary responsibilities as defined by their respective mandates. Moreover, as a public entity, SANParks is

obliged to comply with the provisions of the Public Finance Management Act (PFMA), Act no. 1 of 1999 (as amended by Act 29 of 1999), and its associated treasury regulations. In this regard, Treasury Regulation 28.2 relating to section 55(10(d)(i) of the PFMA, specifically requires all public entities to *inter alia* disclose any material losses through criminal conduct, as well as their actual performance against their strategic objectives and outcomes in their annual reports. The study specifically examines the extent to which the literal explosion of rhino poaching in South Africa has been reflected in the annual reports of SANParks over the ten-year period from 2006 to 2015. The purpose of this paper is to understand whether and how SANParks publically accounts to their broader stakeholders about their performance in respect of their biodiversity mandate relating to rhino conservation and poaching. This interdisciplinary paper accordingly investigates the rhino poaching and conservation phenomenon within the context of biodiversity preservation and public sector accountability.

The remainder of the paper continues by describing the theoretical foundation, which not only provides pertinent contextual information, but also provides the integrated theoretical framework used for this study. Thereafter, the research design that identifies the research objectives, approach, population and methods adopted are described. Finally, the paper describes and interprets the results of the empirical study within the context of the theoretical framework, before concluding with a few pertinent observations.

2. Theoretical foundation

2.1 Introduction to African and South African rhino populations and poaching

As one of the world's oldest species, palaeontologists estimate that rhinos first evolved around 50 million years ago (NABU, 2016) with the modern rhino species emerging around 15 million years ago (WILDAID, 2015). Rhinos are part of the iconic "Big Five" animals that tourist want to see when visiting game/nature reserves and farms. At the beginning of the 20th century, around 500,000 rhinos were estimated to roam across Africa and Asia (NABU, 2016, p.3). Today only five rhino species still exist; three species representing an estimated cumulative total of 3,403 animals located in Asia (Emslie, 2016, p.14); and two species totalling 25,628 animals in Africa (Emslie, 2016, p.1). European colonisation of Africa resulted in several large mammalian species being hunted to the brink of extinction. Amongst these near extinct species, in South Africa only 110 black rhinos remained in game reserves by the 1930s and only 20 white rhinos in the Hluhluwe uMfolozi Game Reserve (South Africa, 2013, p.9).

Table 1: African rhino population and poached African rhinos – 2015 (Emslie, 2016, p.1&2)

	White rhinos	**Black rhinos**	**Total rhinos**	**Poached rhinos**	**Poached rhinos as a percentage of total rhino population**
South Africa	18,413	1,893	20,306	1,175	5.8%
Other African countries	1,965	3,357	5,322	167	3.1%
Total	20,378	5,250	25,628	1,342	5.2%

As reflected in table 1, South Africa's white rhinos represent 90.4% of Africa's threatened white rhino population (Ceratotherium simum simum), with South Africa's black rhinos representing 36.1% of Africa's critically endangered black rhinos (Diceros bicornis) (Emslie, 2016; Lee and du Preez, 2016). South Africa's rhino populations can be found on both state-owned and privately-owned reserves. Presently, around 5,100 of South Africa's rhinos live on privately owned reserves (4,600 white and 500 black rhinos), with the remaining 15,200 being located on state-owned reserves (Lee and du Preez, 2016, p.106). Assisted by conservation non-governmental organisations (NGOs) such as the Endangered Wildlife Trust (EWT) and World Wildlife Fund (WWF), rhino owners in both the private and public sectors cooperate and collaborate to combat rhino poaching (Lindsey, Romanach and Davies-Mostert, 2009).

Table 2: Poached rhinos in South Africa (Emslie, 2016, p.2)

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Rhinos poached	36	13	83	122	333	448	668	1004	1215	1175
Poached per day	0.10	0.04	0.23	0.33	0.91	1.23	1.83	2.75	3.33	3.22

The exponential growth in rhino poaching in South Africa is clearly illustrated in table 2 and figure 1, which reveal that while one rhino was poached every 240 hours in 2006, by 2015 this had accelerated to one rhino every 7.5 hours. Despite this high incidence in rhino poaching, this situation is not irreversible. Evidence has shown that the introduction of costly conservation measures has previously rescued South Africa's white rhino population from near extinction at the beginning of the 19th century, to recover at around 18,400 by 2015 (Lee and du Preez, 2016). Therefore, even though the present scale of the rhino poaching phenomenon is unprecedented, and is strongly influenced by being perceived as a status symbol and an indicator of affluence amongst a rapidly growing middle class, primarily within Vietnam and China, history has shown that it is possible to contain the scourge. However, in order to provide an effective solution that is sustainable must involve interventions that require both offensive and defensive mitigation strategies to contain the prevailing rhino poaching situation.

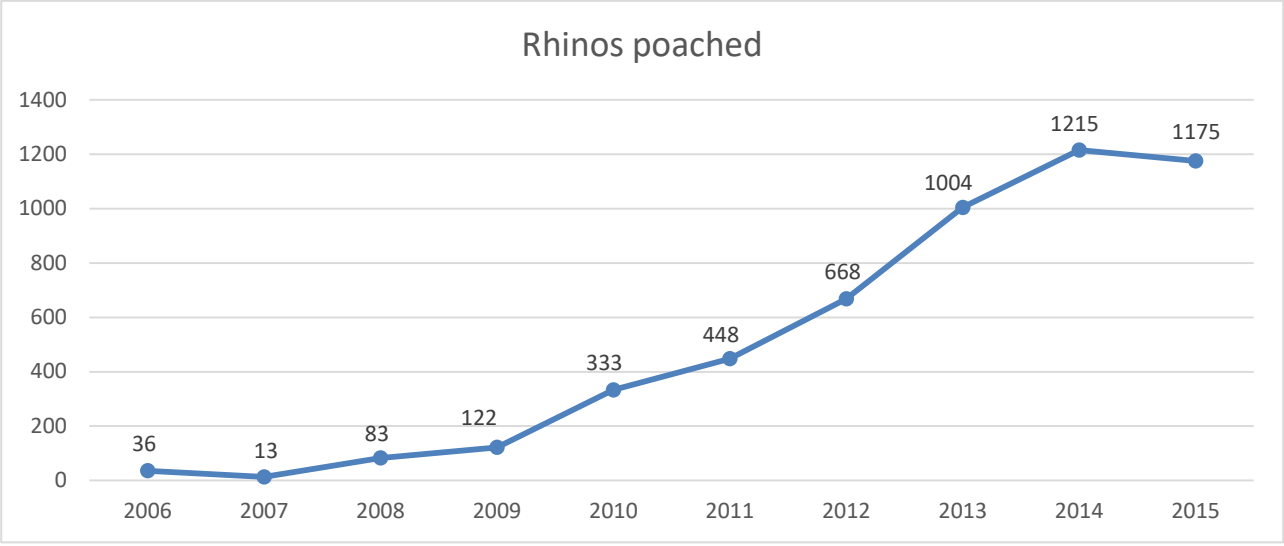

Figure 1: Growth in rhino poaching in South Africa from 2006 to 2015

2.2 Factors driving rhino poaching

Researchers continue to offer various reasons for the recent increase in rhino poaching activity. Firstly, the demand for rhino horn, primarily from China and Vietnam, is mainly driven by misconceptions around its medicinal benefits, and for an increasingly affluent segment in their societies to display their wealth and status (Conrad, 2012; Lee and du Preez, 2016). Secondly, the paradox that the CITES ban on the international trade in rhino horn has stimulated a burgeoning black market (Conrad, 2012; Lee and du Preez, 2016). Thirdly, the absence of clearly defined property rights which impede conservation efforts (Lee and du Preez, 2016). Fourthly, the potential for rhino-human conflict which adds to their sustainability costs (Ibid.). Fifthly, the poor rate of conviction of offenders along the rhino poaching value chain, which is exacerbated by corruption in the legal system (Ibid). Other factors influencing the illicit wildlife trade and accordingly the demand for rhino horn are: China's economic expansion into Africa; rapid economic growth in both China and Vietnam over the last 15 years; corrupt officials across the rhino horn value chain; weak laws relating to wildlife crimes; poor enforcement of related legislation and regulations; lack of political and diplomatic will on an international level; and an obsessive-compulsive need for status and luxury goods amongst Asian nations (International Rhino Coalition, 2014, p.19). The Wildlife Crime Scorecard depicted in figure 2 below graphically illustrates the primary countries involved in the illicit trade in rhino horn (as well as elephant and tiger products); either as a country of origin, transit or destination. It identifies South Africa as a 'source' country for rhino horn that fails on "key aspects of compliance or enforcement"; and clearly identifies Thailand, China and Vietnam as primary destination countries.

These demand factors collectively contribute to conservation efforts to protect the rhino being prohibitively expensive, especially for private nature reserves that do not receive financial and related support from the South Africa government. With the prohibitive cost of anti-poaching activities to protect rhinos often exceeding the financial benefits accruing from ecotourism, it is often not economically viable for private landowners to maintain their rhino populations (Lee and du Preez, 2016). The high cost of anti-poaching interventions and the difficulties involved in patrolling vast tracts of land, has even forced SANParks' Kruger National Park to relocate some of its rhinos to secret, smaller locations around Southern Africa in order to preserve its rhino populations (Ibid.).

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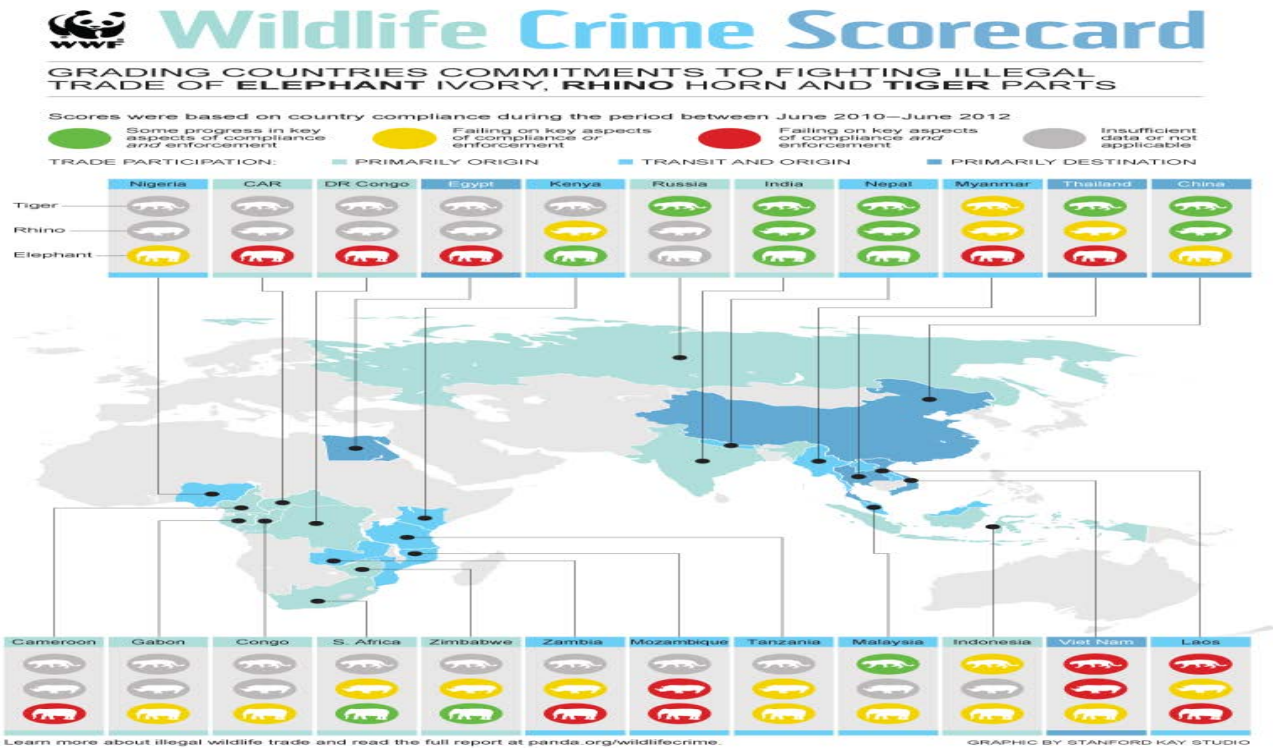

Figure 2: Wildlife crime scorecard (Source: International Rhino Coalition, 2014, p.17)

Rhino horns are made of keratin, a fibrous protein and structural material also found in human skin, fingernails, bird beaks and porcupine quills (NABU, 2016, p.3). To contextualise the increase in rhino poaching incidents, it should be noted that the illicit rhino horn trade is estimated to be worth around US$20 billion p.a. (Truong *et al*., 2016, p.354).

The illicit nature of the illegal trade in rhino horn implies that it is difficult to precisely value the illicit trade in rhino horn and associated products; it is nevertheless important to note that rhino horn is presently amongst the most expensive goods in the world, with an estimated value of between US$25,000 and US$120,000 per kilogram (Hübschle, 2016, p.193). Shepard, Gray and Nijman (2017) found that rhino horn could sell for as much as US$224,360 per kilogram, when sold in small quantities. The average weight of a pair of rhino horns is 5½ kilograms (Hübschle, 2016, p.193), which means that the horns of the average rhino could be worth around US$137,500 to US$1,233,980, or more. By comparison, in 2016 the average price[2] of purchasing a live rhino at an auction was only US$33,840[3]. In addition, it is estimated that sustaining the high levels of protection that is required for the anti-poaching interventions necessary to preserve rhinos is between US$53 million and US$151 million per annum (South Africa [sa], p.7). From a purely economic perspective, the difficult predicament facing parties involved in rhino conservation is how to go about protecting rhinos when they are worth far more dead than alive; especially when taking the high cost of anti-poaching measures into account.

[2] Based on Wildlife Auctions sales data, accessed online on 20 April 2017 at http://wildlifeauctions.co.za/getHistory.php.
[3] USD to ZAR exchange rate @ 20 April 2017 – ZAR 13.28 = USD 1.00

2.3 Protected areas

The IUCN defines a protected area as "A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values". It expands protected areas into the following six management categories: strict nature reserves and wilderness areas, national parks, natural monuments or features, habitat or species management areas, protected landscape or seascape, and protected areas with sustainable use of natural resources. The establishment of protected areas is acknowledged as one of the more effective tools to preserve biodiversity and to conserve endangered species (Worboys, Lockwood, Kothari, Feary and Pulsford, 2015, p.21). Well-managed protected areas are able to effectively protect individual species, biodiversity and ecosystem services (Ibid.). Protected areas are mostly publicly owned and managed, and can extend from a few square kilometres to thousands of square kilometres (Prato and Fagre, 2014). The protection provided to protected areas is influenced by several factors such as: adequate funding, diligent law enforcement, effective management practices, and citizenry support (Ibid.).

The International Union for Conservation of Nature (IUCN) is the world's largest and most diverse environmental network consisting of 1,300 member organisations representing both government and civil society organisations[4]. Established in 1948, the IUCN provides public, private and non-governmental organisations with knowledge and tools to ensure the simultaneous coexistence of human progress, economic development and nature conservation. By 2014, there were over 209,000 designated protected areas representing 15.4 per cent of the world's terrestrial area (excluding Antarctica) and 3.4 per cent of the total marine area (Worboys *et al*., 2015, p.21). Despite the successful establishment of these protected areas, concerns persist that this is insufficient to meaningfully conserve the Earth's species. The Earth's nations have accordingly agreed to establish additional protected areas, targeting at least 17 per cent of terrestrial areas and 10 per cent of coastal and marine areas by 2020 (Ibid.).

The management objectives applicable to protected areas include: conservation of the composition, structure, function and evolutionary potential of biodiversity; contributing to regional conservation strategies; maintaining diversity of landscape or habitat and of associated species and ecosystems; being large enough to ensure the integrity and long-term maintenance of the specified conservation targets; maintaining the values for which they were assigned in perpetuity; operating under the guidance of a management plan and a monitoring and evaluation program supporting adaptive management; and possessing a clear and equitable governance system (Worboys *et al*., 2015, p.17).

The proclamation of protected areas represents one of the conservation interventions that can assist in biodiversity preservation. In addition to facilitating vital ecosystem services, it is estimated that protected areas generate US$ 600 billion a year in direct in-country expenditure and US$250 billion a year in consumer surplus, from only US$8 billion being spent thereon. It is accordingly proposed that some of these

[4] https://www.iucn.org

funds should be reinvesting to maintain protected areas (NABU, 2016). However, even though protected areas provides a platform to secure ecosystem services and generate opportunities for wealth creation such as employment and income (Pullin *et al*., 2013), the risk exists that it may also alter resource use-rights and displace communities (West, Igoe and Brockington, 2006). Conservationists are therefore acknowledging that while these interventions should assist in biodiversity preservation, at the same time it should not be to the detriment of people and should also improve human wellbeing (Campagna and Fernandez, 2007). Robust and comprehensive monitoring and evaluation tools should be implemented to control the adverse social impacts and it is therefore considered essential to ensure greater transparency and accountability, improve learning, and support effective allocation of conservation resources (Grantham *et al*., 2009).

The declaration, regulation and preservation of protected areas in South Africa, is controlled through the National Environmental Management: Protected Areas Act, no. 57 of 2003, which replaced the National Parks Act of 1976. Whereas the repealed Act was confined to national parks, the 'new' Act also applies to other categories of protected areas (Novellie *et al*., 2016).

2.4 SANParks

South African National Parks (SANParks) is a public entity established in terms of the National Environmental Management: Protected Areas Act, 57 of 2003 to conserve, protect, control, and manage national parks and other defined protected areas and their biodiversity. Its mission is *to develop, expand, manage and promote a system of sustainable national parks that represents biodiversity and heritage assets, through innovation and best practice for the just and equitable benefit of current and future generations.* SANParks is acknowledged as the leading conservation agency in South Africa, with a primary mandate to conserve biodiversity and maintain heritage assets thereby providing benefits to society (Foxcroft, van Wilgen, Baard and Cole, 2017). This mandate includes the conservation of functional indigenous South African ecosystems that are closely associated with the country's cultural heritage and history (Ibid.). SANParks delivers on its mandate by managing twenty-one (21) national parks throughout the country (SANParks, 2015). Cumulatively, these parks comprise more than four million hectares, or 3% of South Africa's total land area (Novellie *et al*., 2016, p. 41).

One way of generating much needed revenue is through 'benign' tourism, commonly referred to as ecotourism. This primarily involves the non-consumptive use of wildlife, such as game viewing and photographic excursions. One of the primary benefits flowing from ecotourism is that it generates benefits at the local level which assists to uplift local communities; for example, by generating foreign exchange inflows which can provide income which is required to capitalise on biodiversity and conservation efforts (Lee and du Preez, 2016, p.107). Ecotourism is one of the key reasons why tourists visit South Africa, with tourists wanting to see the Big 5 (lion, buffalo, rhino, elephant and leopard) (International Rhino Coalition, 2014, p.78). The Kruger National Park (KNP) is the largest of the SANParks (Botha, Saayman and Kruger, 2016, p.75) and attracts over 1.4 million visitors a year, making it one of the country's top five tourism destinations (Kruger, Viljoen and Saayman, 2017, p.318). About 80% of the SANParks revenue is generated

by the KNP (Ibid.). The KNP is home to the largest population of rhinos in the world, but also bears the brunt of rhino poaching (International Rhino Coalition, 2014, p.78).

2.5 Public sector governance

Around the world, the public sector uses limited resources to provide public goods and services required by stakeholders (Bolden, Gosling, Adarves-Yorno and Burgoyne, 2008). The public sector should therefore perform optimally to provide the best results by effectively leveraging these limited resources in a cost-effective and efficient manner (Raaum and Morgan, 2009). Traditionally, annual financial statements were the primary tool used to measure performance (Rupsys, 2007). The National Treasury of South Africa released the *Framework for Managing Programme Performance Information* to manage public sector performance that *inter alia* requires the reporting of appropriate performance indicators and measures (South Africa, 2007). The disclosure of performance information should therefore provide details about the extent to which predetermined objectives are achieved. It does not replace the need for financial statements, but should complement information provided therein (South Africa, 2007).

Since public sector funding is obtained from a country's taxpayers, it is obliged to account to the citizens about how these funds have been used to achieve their objectives (Le Roux, Pretorius, Serfontein and Zorenda, 2007). The PFMA requires public sector organisations to account to parliament, and thereby to the citizenry, about how transparently they have managed the revenue, expenditure, assets and liabilities of the affected organisations (South Africa, 1999). Performance management relates to the interrelated processes of planning, monitoring, measurement, review and reporting (Maluleke, 2012). The public sector accordingly uses performance management as a tool to optimally provide public goods and services using the limited resources available (Blackman, Buick, O'Donnell, O'Flynn and West, 2012).

Performance management in the South African public sector is required by the PFMA (South Africa, 1999). Section 27(4) of the PFMA requires public entities to submit their measurable objectives and the draft budget to parliament for approval. Section 40(1)(d) of the PFMA requires the accounting officers of public entities to submit annual reports which include the AFS, to the executive authority. These reports must be audited by the Auditor-General of South Africa, with the resultant audit report being incorporated into the final annual report submitted to parliament (PFMA, 1999, S40 (1)(d)). The annual report must also report on the extent to which predetermined objectives are achieved (PFMA, 1999, S 40(3)(a)). The annual report is therefore the primary tool used by the public sector to report their and financial performance and how this have discharged the respective mandates to the majority of their stakeholders. The level of utilisation of inputs, performance of process activities and the achievement of outputs, outcomes and impacts must be measured and reported on to determine whether the planned level of performance has been achieved (South Africa, 2007).

Legislation and regulations obliges SANParks to account to its principals and accordingly its broader stakeholders, about how it has discharged its biodiversity mandate. Within this context, the scope of this

paper specifically examines SANParks public disclosures relating to the interrelated dimensions of rhino poaching and conservation. The research therefore seeks to establish the extent to which SANParks accounts to their stakeholders about their stewardship of rhino population entrusted to them. Against the backdrop of its mandated responsibilities, and within the context of the reporting requirements for the South African public sector, the study seeks to understand the extent to which SANPArks using publically available reports to disclose the nature and extent of the rhino poaching phenomenon has affected the operations within their protected areas, and accordingly the anti-poaching measures implemented to fight this scourge.

2.6 Supreme Audit Institution

Chapter 9 of the Constitution of the Republic of South Africa establishes the Auditor-General of South Africa (AGSA) as the supreme audit institution of South Africa (South Africa, 1996). As such, it is the only institution that has a legal obligation to audit and report on how the government is spending the monies entrusted to it by South African taxpayers. Its constitutional mandate requires the AGSA to use auditing to build public confidence and strengthen South Africa's democracy by enabling oversight, accountability and governance in the public sector. The AGSA derives its specific mandate from the Public Audit Act (PAA), Act no. 25 of 2004, which requires the AGSA to audit all government departments, public entities, municipalities and public institutions.

Unlike registered auditors in the private sector whose primary responsibilities involve performing audits on annual financial statements, which in terms of section 30(2) of the Companies Act are mandatory for certain types of companies (South Africa, 2008; South Africa, 2006), the AGSA must not only audit and report on the fair presentation of the annual financial statements and the quality of the public entity's financial management, the sections 40(3)(a), 51(1)(a) and 61(1)(b) of the PFMA (South Africa, 1999) and section 18.3.1 of the Treasury Regulations (South Africa, 2005) specifically requires the AGSA to audit the performance information of public entities as well (South Africa, 1999; South Africa, 2004). Moreover, the PAA imposes a duty on the AGSA to do so in a manner that allows the legislature to hold the relevant cabinet ministers to account about how they have dealt with monies that have been entrusted to their respective ministries and departments (South Africa, 2004). Public entities do not therefore only have to disclose the manner in which they have used the funds entrusted to them to discharge their mandated responsibilities, but also to ensure that these non-financial disclosures are also audited.

2.7 Integrating biodiversity preservation and public sector governance

The first part of the literature review above provides a clear overview of the global rhino poaching and conservation dilemma, specifically within a South African context. It explains the important role that protected areas in biodiversity conservation, and identifies SANParks and the KNP as the location of the world's largest populations of rhinos in the wild. The second part continues by introducing public sector accountability and describing the framework that public sector organisations should use when accounting to their stakeholders. To summarise, the paper identifies the scourge of rhino poaching as a major challenge to

the ability of SANParks as the 'owner' of the world's largest population of rhinos in the wild, to effectively discharge its biodiversity preservation mandate. As a public sector organisation, SANParks is accordingly obliged to account to its stakeholders about how it has performed relative to its predetermined objectives. The description in the literature review therefore provides important context for the paper as well as the theoretical framework used.

3. Research approach and method

In recent times, the interrelated phenomena of rhino poaching and accordingly rhino conservation have been extensively researched, primarily by scholars in the natural sciences. This however, represents one of the first papers to explore the rhino poaching and conservation phenomena from a public sector accountability perspective. The objective of the study is to understand whether the exponential increase in rhino poaching is mirrored by a concomitant increase in the extent to which SANParks has disclosed the impact of rhino poaching within the protected areas under its control. Moreover, since SANParks is the public entity entrusted with preservation of biodiversity, a secondary objective is to explore the conservation interventions deployed to counter rhino poaching. Given the increase in rhino poaching and SANParks' biodiversity mandate, a further objective is to understand whether the impact of rhino poaching is considered sufficiently material to be included in the scope of the AGSA's annual regularity audit covering SANParks' performance information.

Since the objective of the paper is to explore and understand the rhino poaching and conservation phenomena, and not to make definitive predictions that apply to the entire population, this paper adopts an interpretative mixed-methods research paradigm. The research population is defined as South African state-owned enterprises with a public sector mandate to preserve biodiversity. Within this context, and given the requirement for public entities to disclose their performance in terms of their mandates the study units of analysis are the annual reports published by SANParks over the ten-year period 2006 to 2015. The period covered by the study has been selected to coincide with the explosion in rhino poaching from 36 in 2005 to a peak of 1,215 in 2014 before marginally declining to 1,175 in 2015.

The study uses Atlas.ti software to analyse the data contained in the annual reports of SANParks to understand whether the increase in rhino poaching activity in South Africa has affected the extent to which rhino poaching and anti-poaching activities were disclosed over the same period. The study is divided into three components, each reported on separately under the empirical findings. The first part of the study analysed the key words related to rhino poaching and conservation, to understand whether the increase in rhino poaching over the ten-year period covered by the study is mirrored by a concomitant increase in the extent to which the key words are used. The second part of the study examined the performance information disclosures, to understand how SANParks uses it annual reports to account to its stakeholders about the manner in which it was delivering on its biodiversity mandate, with a specific focus on rhino poaching and conservation. Finally, since the Auditor-General has an expanded mandate to audit performance information, the audit reports were reviewed to establish whether the SANParks performance information

disclosures were reliable and specifically whether the rhino poaching problem warranted a special mention.

4. Empirical findings

4.1 Annual report key word count from 2006 to 2015

As stated in the research method section, Atlas.ti was used to analyse the words contained in all the annual reports on SANParks for the years ending 2006 and 2015. These words were analysed and grouped to identify key themes relating to the phenomena relating to rhino poaching and conservation covered by this paper. As reflected in table 3 and figure 3, the identified key words were grouped into the following themes: arrest, crime, firearms, horns, poaching and rhino. Identified words associated with "arrest" include apprehend, apprehended, apprehending, arrests, arrested, arresting, detain, detained and detaining; "crime" includes crimes, criminal and criminals; "firearms" include firearm, weapon and weapons; "horns" include horn; poaching includes poach, poached, poacher and poachers; and "rhino" includes rhinos, and rhinoceros.

While figure 3 reveals an increase in the key words identified for this study, the frequency appears to show a significant increase in 2010, spiking in 2011, and reducing thereafter but remaining at levels higher than in 2006 thereafter. The observation that the spike coincides with the increase in rhino poaching activity identified in table 2 and figure 1, suggests that SANParks has indeed found it necessary to expand its disclosures relating to rhino poaching and conservation. In this regard it should be remembered that the annual report for 2011 actually covers the 2010 year when rhino poaching increased by 173%. This observation is aligned to the duty of SANParks to use their annual reports to disclose their performance on the manner in which they are discharging their mandate to their stakeholders, as required by the PFMA. In particular, the spike in the key word themes relating to rhinos, poaching and crime, illustrates the significance of this phenomenon and the realisation by SANParks of the importance of reporting on its related performance.

Table 3: Key words relating to rhino poaching and conservation contained in SANParks annual reports

Key words	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	TOTAL
Arrest	77	111	337	384	154	1,040	1,055	214	410	445	4,227
Crime	47	206	175	80	334	1,793	561	525	560	133	4,414
Firearms	140	-	-	59	407	423	182	225	183	-	1,619
Horns	-	111	100	121	154	332	616	42	-	92	1,568
Poaching	185	343	324	671	907	2,474	1,873	1,852	1,639	1,448	11,816
Rhino	307	648	788	677	1,346	3,053	2,286	1,793	1,465	1,465	14,610
Total	756	1,419	1,724	1,992	3,302	9,215	6,573	4,651	3,583	3,583	38,254

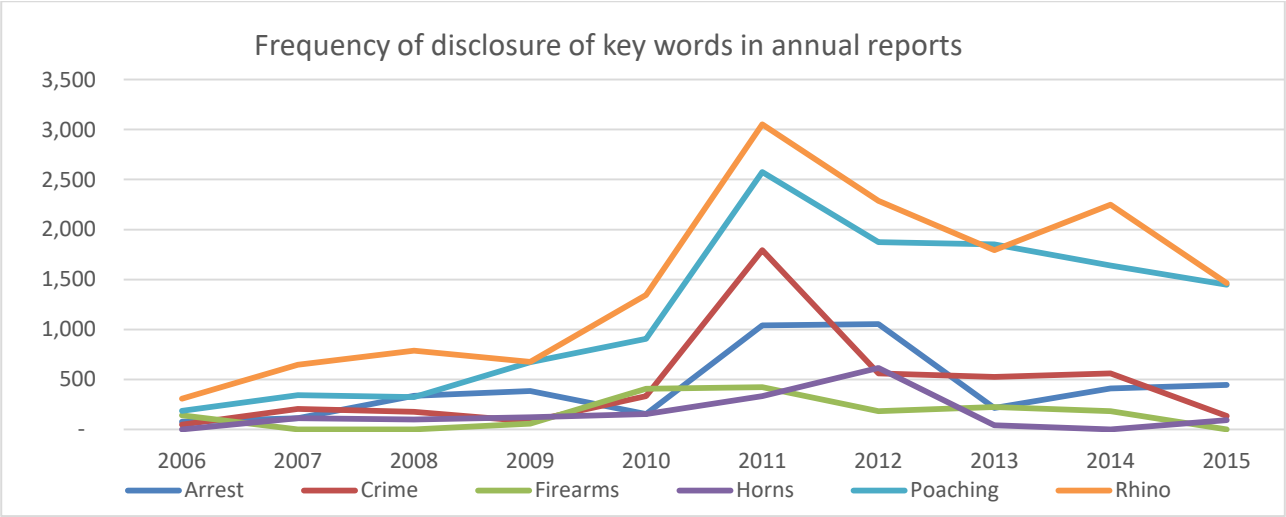

Figure 3: Rhino poaching and conservation key words in SANParks annual reports

As depicted in table 4 and figure 4, the importance of reporting on its performance relative to its responsibility to preserve its rhino population is further highlighted by the analysis of the key words as a percentage of the total words count in the annual reports for the respective years included in the study. Whereas, the identified words only constituted 1.26% in 2006, the frequency with which these words were used has shown a steady increase to represent 5.23% by 2015, but spiking in 2011 to 17.66% illustrating the extent of the rhino poaching problem. Again, the increased use of the key word themes relating to rhino (5.85%), poaching (4.93%) and crime (3.44%) showed significant spikes in 2011. By comparison, the key words rhino only represented 0.51%, poaching 0.31% and crime 0.08% of the total words contained in the 2006 annual report.

Table 4: Rhino poaching and conservation key words in SANParks annual reports (2006 to 2015)

Percentage of total words	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**TOTAL**
Arrest	0.13%	0.16%	0.44%	0.66%	0.26%	1.99%	2.02%	0.40%	0.66%	0.65%	0.69%
Crime	0.08%	0.30%	0.23%	0.14%	0.56%	3.44%	1.08%	0.99%	0.90%	0.19%	0.72%
Firearms	0.23%	0.00%	0.00%	0.10%	0.68%	0.81%	0.35%	0.43%	0.29%	0.00%	0.27%
Horns	0.00%	0.16%	0.13%	0.21%	0.26%	0.64%	1.18%	0.08%	0.00%	0.13%	0.26%
Poaching	0.31%	0.51%	0.43%	1.16%	1.51%	4.93%	3.59%	3.50%	2.62%	2.11%	1.94%
Rhino	0.51%	0.96%	1.04%	1.17%	2.25%	5.85%	4.38%	3.39%	3.59%	2.14%	2.40%
Total	1.26%	2.10%	2.27%	3.43%	5.51%	17.66%	12.60%	8.80%	8.06%	5.23%	6.27%

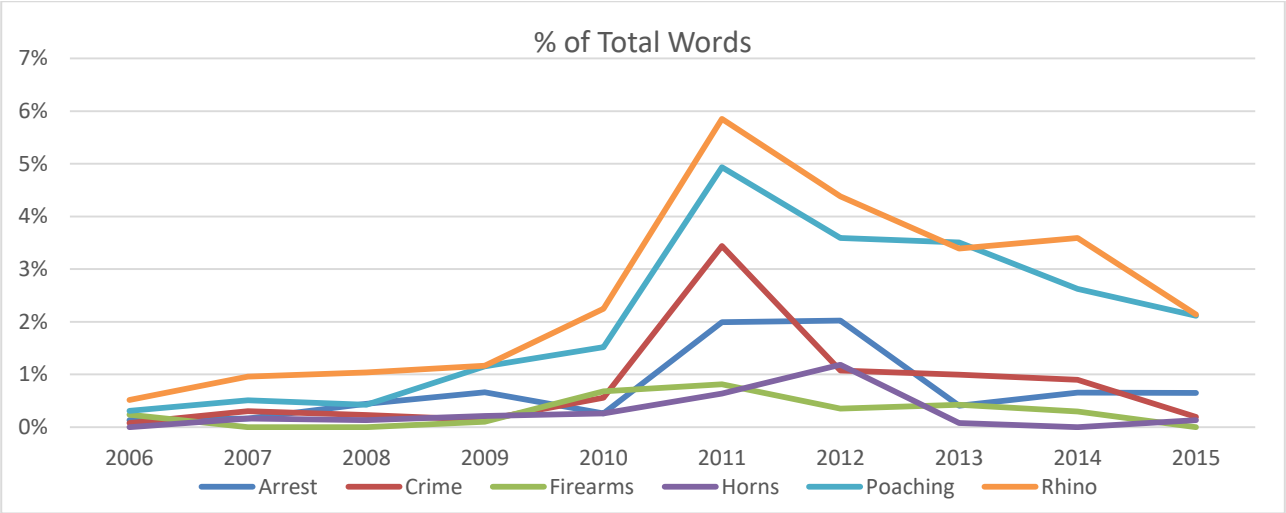

Figure 4: Rhino poaching and conservation key words as a percentage of total words

4.2 Disclosure of rhino-related issues in annual reports from 2006 to 2015

As stated in the theoretical framework in section, in South Africa, the PFMA requires all public entities including SANParks, to report on their performance relative to their approved predetermined objectives. A detailed scrutiny of these "performance reports" for the ten-year period covered by this study reveals that in 2006, 2007 and 2009 the word "rhino" was not referred to at all. In 2008, the only reference to "rhino" was in relation to the performance objective relating to "enhancing SANParks" reputation; in this regard SANParks stated that "several reports on rhino poaching in the KNP also led to a high negative coverage 15% in April 2007", but failed to describe any meaningful intervention to address this matter. Although it falls outside the period covered by this study, it is pertinent to note that SANParks only commenced disclosing its performance information in 2006.

In 2010, the Performance Information narrative, SANParks introduced the rhino poaching problem, under the performance objective "improve parks' safety and security", by reporting that "the reality of poaching, particularly in the Kruger National Park, continued to receive attention." It also announced that the "Anti-Poaching Strategy document" (including rhino) was completed and proposed "implementation of the National Environmental Crime Investigation Unit", which will be headed by SANParks. Aligned to the spike in key words depicted in figures 3 and 4, the extent of disclosure by SANParks of rhino poaching related issues similarly exploded in 2011.

SANParks reached the tipping point of reporting on the impact of rhino poaching related activity in 2011, by comprehensively disclosing its performance objectives relating to "Media Reputation Rating", "Number of Stakeholder Engagement Interventions", "% progress against implementation of Listed Species Management Programme", and "% progress against implementation of Resources Protection Programme". Specific SANParks performance described included proactively engaging media, infrastructural and Public Private Partnership initiatives, participation in the Lead SA Rhino Action Group civil initiative, completion of the 4th KNP white rhino demography survey, completion of the first draft of the SANParks rhino strategy, and

completing 90% of the SANParks Resources Protection programme.

From 2012 to 2014, "Enhancing Organisational Reputation", with a specific performance indicator based on the Media Reputation Rating remained on of the key performance indicators. In this regard, the report narrative identified the KNP as the most impacted area, collaborative initiatives to increase public awareness of the extent of the problem, sponsorships secured as well as the interventions implemented to combat rhino poaching were described. By 2015, rhino poaching and conservation efforts were no longer being reported under the "Enhancing Organisational Reputation" performance indicator. It is suggested that the SANParks decision to remove this rhino poaching metric represents a change in strategic approach, from using rhino-related disclosure to manage legitimacy to deliberately focus on its efforts to conserve its rhino population.

This change in strategic approach appears to emerge from the introduction of "Improving the State of Conservation Estate" as a new strategic performance objective category from 2011 to 2014. In 2015, this category was renamed as "Promoting Effective Management of National Parks". Amongst others, within the context of this paper, this performance objective specifically includes a performance information disclosure category dealing with the monitoring of its progress towards its implementation of its biodiversity improvement, and listed species management programmes. In 2013, indicative of its significance as a component of the SANParks' biodiversity strategy, an additional performance information category "Poaching Incident Rate" was introduced as an integral element within this strategic objective. The detailed performance narrative not only includes disclosure of information relating to rhino poaching statistics and anti-poaching measures, but also multi-stakeholder collaborative and funding initiatives as well as information relating to the apprehension of criminals involved in rhino poaching. Aligned to the literature review finding that rhino horn products are amongst the most expensive goods in the world (Hübschle, 2016; Shepard *et al*., 2017), and the existence a huge value differential between the value/price of live rhinos and their horns, in the annual report of 2012, SANParks comments on "the need for innovative strategic thinking and exploring of several possibilities that will reduce the difference between demand and supply of rhino horn which determines its financial value and hence incentive for poaching", which is exacerbated by the ongoing cost of anti-poaching interventions. In the 2013 annual report, SANParks clarifies that poaching is unacceptable by rewording the performance indicator "% of Acceptable Animal Population Decline due to Poaching" to "Poaching Incidents Rate" and specifically targeting zero growth.

4.3 The Auditor-General's involvement in performance information

The report of the Auditor-General for the year ended 2007 first introduced its responsibilities relating to the audit of performance information by stating that "I conducted my engagement in accordance with section 13 of the Public Audit Act, 2004 (Act No. 25 of 2004) read with General Notice 646 of 2007, issued in Government Gazette No. 29919 of 25 May 2007". Without actually providing an opinion on the veracity of the disclosed performance information for 2007, the Auditor-General nevertheless found that performance disclosures did not include all the predetermined objectives. In 2008 and 2009, the Auditor-General stated that the engagement "included performing procedures of an audit nature to obtain sufficient appropriate

evidence about the performance information and related systems, processes and procedures. Again without providing an opinion about the veracity of the disclosed performance information that "the evidence I have obtained is sufficient and appropriate to report that no significant findings have been identified as a result of my review." Despite referring to its mandated responsibilities relating to performance information, in 2010 the Auditor-General simply referred to having "no matters to report" on SANParks' predetermined objectives. Similarly, in 2011, the Auditor-General stated that "there were no material findings on the annual performance report concerning the presentation, usefulness and reliability of the information".

In 2012 and 2013, but still without providing an audit opinion, the Auditor-General provided additional information relating to its mandated performance information responsibilities, by stating that "I performed procedures to obtain evidence about the usefulness and reliability of the information in the annual performance report..." and continues by disclosing that "the reported performance against predetermined objectives was evaluated against the overall criteria of usefulness and reliability". The Auditor-General advises that "the usefulness of information in the annual performance report relates to whether it is presented in accordance with the National Treasury annual reporting principles and whether the reported performance is consistent with the planned objectives. The usefulness of information further relates to whether indicators and targets are measurable (i.e. well defined, verifiable, specific, measurable and time bound) and relevant as required by the National Treasury Framework for managing programme performance information. The reliability of the information in respect of the selected objectives is assessed to determine whether it adequately reflects the facts (i.e. whether it is valid, accurate and complete)." However, instead of providing an opinion on the veracity of the performance information disclosures, the Auditor-General reports that "there were no material findings on the annual performance report concerning the usefulness and reliability of the information."

Still retaining its explanatory disclosure approach adopted in 2012, by 2014, the Auditor General reported on certain material findings relating to SANParks' performance objectives. These reports include a lack of material findings on certain performance objectives; and an inability to corroborate reported performance information against credible supporting evidence against which, caused by inadequate information systems and poor internal control measures. It is particularly disconcerting that the Auditor-General's report reveals that "the reported performance information of three significantly important targets was not valid, accurate and complete when compared to the source information or evidence provided. This was due to a lack of standard operating procedures or documented system descriptions for the accurate recording of actual achievements, recording and monitoring of performance/monitoring of the completeness of source documentation in support of actual achievements/frequent review of the validity of reported achievements against source documentation." Since the performance objective "Improving Conservation Estate" specifically includes important disclosures relating to rhino poaching, and although no further information is provided about the "three significantly important targets", this may imply that the rhino-related disclosures being investigated are unreliable. In 2015, the Auditor-General continued to report on the lack of proper systems and processes and formal standard operating procedures, and that a significantly important target

could not be verified against the source data or evidence provided. Unfortunately, neither the 2014 nor the 2015 Auditor-General's report disclose for which specific targets they were unable to access reliable corroborating evidence. These material inadequacies have caused the Auditor-General to raised doubts about whether SANParks could realistically deliver on its declared performance objectives and achieve its planned performance targets.

The analysis of the Auditor-General's reports over the ten-year period covered by the study appears to suggest that the auditing of performance information is an evolving field. As the practice has become more established, the Auditor-General appears to have increased the extent of its disclosures relating to SANParks' performance information. Even though none of the rhino-related key were used in the Auditor-General's reports, the inadequate systems, poor state of internal controls, and the adverse findings about the reliability of some of the disclosures appears to reflect the perspective of an independent and objective party that SANParks may actually not be optimally delivering on its mandate.

5. Conclusion

This paper represents one of the early papers examining the emerging phenomenon of "extinction accounting". It adopts an exploratory interpretative research approach to understand the extent to which SANParks, as the state-owned entity with the specific mandate to preserve South Africa's biodiversity, has used its annual reports to illustrate the gravitas of the rhino poaching problem and to account to its stakeholders about the manner in which it has discharged its mandated responsibilities. Since this phenomenon is usually studied within the context of the natural sciences and not within the governance and accountability disciplines, the paper provides the theoretical foundation by comprehensively contextualising and describing the rhino poaching phenomenon. It continues by introducing the role played by SANParks in the preservation of biodiversity, including of the rhino. As a state-owned entity, the paper appropriately describes the legislative and regulatory mandate that SANParks is obliged to comply with, which includes the governance and reporting requirements.

The study uses Atlas.ti to analyse the key words relating to rhino poaching and rhino conservation within SANParks. The study seeks to understand whether the exponential increase in rhino poaching is mirrored by an increase in SANParks' disclosures relating to the impact of rhino poaching at the protected areas under its control. Unsurprisingly, the key word count reflects an increase in the frequency with which these key words have been used over the period from 2006 to 2015. Significantly, the 173% increase in rhino poaching in 2010 (illustrated in figure 1) appears to show a strong association by a 179% increase in the usage of the key words in 2011 (reporting on the 2010 performance, and illustrated by figure 3). Similarly, the key words as a percentage of total words in the annual reports also revealed a significant spike in 2011.

Although rhino poaching related performance disclosures only really emerged in 2010, since then and aligned to the growth in rhino poaching, the nature and extent of rhino poaching related performance disclosures has continued to evolve. Initially, rhino poaching was disclosed part of SANParks legitimisation

efforts in order to enhance its reputation. In 2011, the extent of disclosure expanded to reflect on its stakeholder engagement interventions and its specific biodiversity preservation mandate. By 2015, SANParks rhino poaching disclosures were entirely about its conservation efforts, and no longer linked to reputation management.

The Auditor-General first included the auditing of SANParks' performance information in 2007. Since then, the nature and scope of its audits on performance information, has expanded with the quality of its reports more comprehensively reflecting pertinent information relating to the systemic weaknesses, but also reporting that the reported performance relating to certain targets may be unreliable.

In conclusion, while recognising the crucial role that SANParks plays in combatting rhino poaching within the areas under its control, and acknowledging that the extent to which SANParks has increased its rhino-related to reflect the growth in rhino poaching, the concerns expressed in the Auditor-General's reports suggest that much work remains to be done.

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42.

Applying Wind Sensitive Urban Design for Better Thermal Comfort in Singapore

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Abstract

The urban heat island effect is highly related to urbanization and urban population, which impacts on global warming, air pollution, increased energy usage, etc. For tropical cities, especially totally urbanized Singapore, the increasing urban warming further decreases thermal comfort. Climate sensitive urban design as an important mitigation effort has thus received greater attention in recent years. On this basis, the paper focuses on the wind environment and sustainable urban design. It tries to answer the question of whether air velocity should be considered as an important factor in achieving better thermal comfort in Singapore since, compared to other cities, winds in Singapore are generally light with the mean surface wind speed normally less than 2.5 m/s[1]. Through literature review and re-evaluation of past research, this paper examines the relationship between urban wind environment and thermal comfort and demonstrates the need for and importance of improving the wind circulation by urban design, because even light wind will compensate significantly for an increase in operative temperature. Finally, the paper suggests an approach to wind sensitive urban design in tropical cities that could improve the thermal environment and comfort.

Key words

Wind sensitive urban design, thermal comfort, wind speed, CDF simulation, Singapore

1. Introduction

Global climate change (GCC) and the urban heat island (UHI) are both man-made problems, highly related to urbanization and urban population.[2] The improvement of the urban wind environment could decrease energy used for cooling, CO_2 emissions, and air pollutants, improve the thermal comfort, and mitigate UHI. The importance of air velocity in urban design has been proved by many studies, e.g. Peter Bosselmann, Edward Ng, etc.[3] But in Singapore wind sensitive urban design has not received enough attention yet. Due to the area's light air velocity, most research on mitigation suggestions for Singapore emphasize introducing greenery, cool materials, etc. rather than improving the wind profile. Based on the research conducted in the Cooler Calmer Singapore Impact Project at Singapore-ETH Centre (SEC)[4], this study examines the role of the wind environment in creating better thermal comfort in Singapore and similar tropical humid cities, and suggests that wind sensitive urban design as an important mitigation option which needs to be refocused upon by the government and researchers in order to develop a livable urban environment and reduce urban warming in Singapore.

2. Definition

2.1. Wind environment

The urban wind environment refers to the wind speed and direction in urban area. Because of the difference of wind pressure, heat absorption and topographic conditions between urban and natural areas, the urban microclimate is quite different from the atmospheric environment. Wind behaviors in the city are impacted by many factors that could be summarized, from large to small scale, as follows: atmospheric circulation pattern, certain topographic wind profile, urban morphology and roughness properties of the urban areas, and the surface drag by buildings, trees, grassland and so forth. For setting a base for the urban wind profile, T. R. Oke and Edward Ng suggest distinguishing urban climate layers, including the urban boundary layer (UBL), roughness sublayer (RSL), urban canopy layer (UCL) and podium layer, in which the urban canopy layer and podium layer are the focus of the urban wind environment[5] (figure 1).

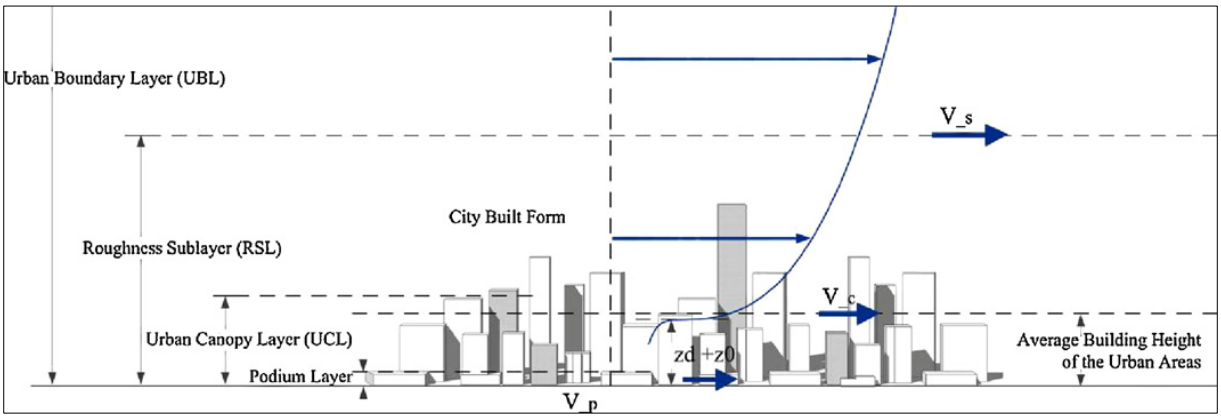

Figure 1 Urban climate layers[6]

2.2 Thermal comfort

Thermal comfort should be defined by two related aspects. First, it has a historical, cultural, and socio-political meaning and played the central role in transforming urban and built space in tropical cities, where "much of the twentieth century was about building cool, comfortable spaces, through increasingly sophisticated forms of mechanical air conditioning"[7]. The representative example is Singapore – often referred to as the air-conditioned nation. Air-conditioning made it feasible to ensure thermal comfort while addressing the modernist architectural doctrine, rather than through ingenious climatically responsive design.

On the other hand, thermal comfort could be examined from a technological perspective. It is influenced by complicated factors, including environmental variables, wind speed, air temperature, mean radiant temperature, as well as the physical and physiological aspects of the human body. But the understanding of thermal comfort is still far from complete comprehension. There are more than 100 indices on thermal comfort, such as physiologically equivalent temperature (PET), standard effective temperature (SET), and so forth. Based on observations and surveys, a localized model of thermal sensation vote (TSV) has been developed for Singapore. The formula is a function of four independent variables: air temperature (T_a), relative humidity (RH), wind speed (V), and mean radiant temperature (T_{mrt}), which is expressed by the following (Eq. 1)[8]:

$$TSV = 0.398T_a + 0.023RH - 0.329V + 0.038T_{mrt} - 14.061 \quad (1)$$

It demonstrates that the relative humidity (RH) has a relatively minor effect, while the air temperature (T_a) and air velocity (V) are the most important variables affecting TSV in outdoor urban spaces in Singapore. Other important indices will be examined in section 5.

2.3 Climate sensitive urban design

Climate sensitive urban design refers to design which is responsive to climate change. The notion can be traced to "Design with Nature", written by Ian L. McHarg in 1969[9]. Compared to the notion of general "sustainable urban design", climate sensitive urban design focuses especially on urban climate, e.g. wind and thermal environment. It is very important to understand its meaning from historical, cultural, and political perspectives. In the colonial times, a tropical climate was regarded as a symbol of an "uncivilized" nation that needed climate responsive design as an approach cultivating the locals. Later, climate sensitive design became a local tradition, representing the national identity under modernization. Hence a number of studies agree that both thermal modernity and natural forces are the prime determinants of architectural and urban space in the tropics[10]. On this basis, the architects and urban designers in Singapore and Malaysia have become national figures for their climatically responsive design in their practice, such as Ken Yeang, Tay Kheng Soon, WOHA, etc.

From a technological perspective, for improving the urban wind environment, Peter Bosselmann summarized the impact of buildings ordination and arrangement on wind

distribution at ground level in 1984, for example, downwash vortex at the foot of a building, corner effect, wake effect, tower among lower building effect, gap effect, pressure connection effect, channel effect, venturi effect, pyramid effect, shelter effect[11] (figure 2). His work demonstrates the significance of urban design on the urban wind profile.

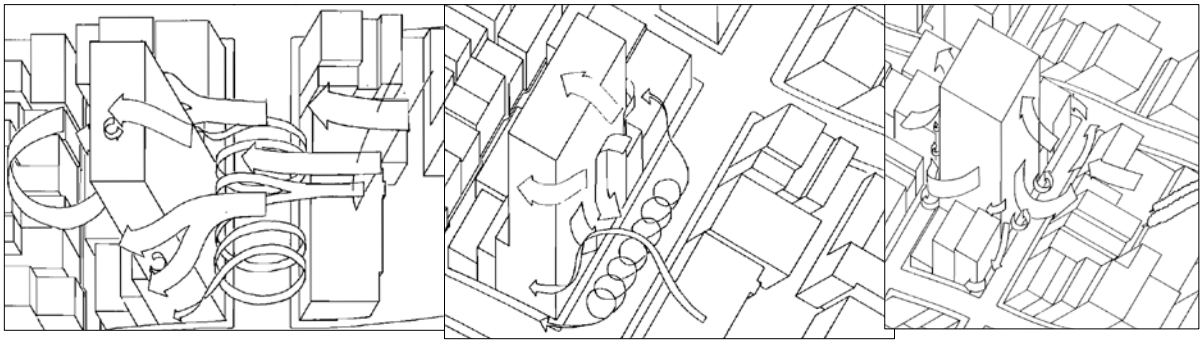

Figure 2 Typical air flow pattern: a single building (left), downwash vortex (middle) and tower among lower building (right)[12]

3. Approaches to studying the wind environment

To mitigate UHI, government agencies and researchers increasingly pay attention to the urban microclimate, including wind environment, thermal environment, noise environment, and so forth. For an urban wind behaviors study, there are three main approaches: on-site measurement, physical model simulation, and computer simulation.

The advantage of the first method is that it is simple and easy to apply and to obtain first-hand data. Other methods need measurement data to set the boundary condition and validate the model. For example, Tan, Wong, and Jusuf conducted a large-scale measurement covering a variety of urban typologies to estimate the mean radiant temperature by air temperature, wind speed, and so on[13]. However, because of the complicated outdoor environment, the observed data is highly constrained by the specific surrounding conditions, so cannot be directly used for other places under different microclimatic environments, and therefore is limited in predicting urban planning results.

The second approach for wind environment studies is wind tunnels. It is beneficial for controlling the experiment conditions, simulating large-scale urban areas, and getting accurate results. The disadvantages are that it is time-consuming and expensive.

Thirdly, the use of CFD (computational fluid dynamics) for urban wind simulation is gaining momentum in scientific circles[14]. A number of tools have been discussed and examined on their accuracy and usage in wind simulation, e.g. scSTREAM, Fluent, CFX, STAR-CD, OpenFORM, ENVI-met, etc. Compared to wind tunnel and full-scale measurements, the benefits are decisive: being readily available, inexpensive, enabling changes easily with no restrictions, and able to analyze complex environmental problems. Therefore, the CFD simulation has a special advantage in the initial stages of urban design and when examining as-yet unbuilt urban projects. The more detailed application of CFD in wind sensitive urban design will be discussed in section 6.

4. Singapore's wind conditions

4.1 Wind speed in Singapore

Changi Climate Station recorded that the mean wind speed was 2.65 m/s from 1982 to 2016 (2.31 m/s in 2016) (figure 3). By calculating the data from all 19 Singapore weather stations in 2016, the city's mean wind speed was calculated as 2.27 m/s[15]. On this basis, it can be concluded that "winds in Singapore are generally light, with the mean surface wind speed normally less than 2.5 m/s except during the presence of a Northeast Monsoon surge when mean speeds of 10m/s or more have been observed."[16] *Even fo*r the prevailing wind, obtained from the National Environmental Agency (NEA) for a period of 18 years, the velocities of the four prevailing wind directions averaged to 2.7m/s (at 15.00m).[17]

However, because the wind speed data is from weather stations, whose instruments are normally 10m above the ground, it is also crucial to know the air velocity at pedestrian level (1.5m). According to measured data conducted by Yang, Wong and Jusuf at 17 different outdoor locations in Singapore, the mean wind speed is 0.97 m/s, the standard deviation is 0.66, while the min wind speed is 0.08 m/s, and the max is 4.49 m/s.[18]

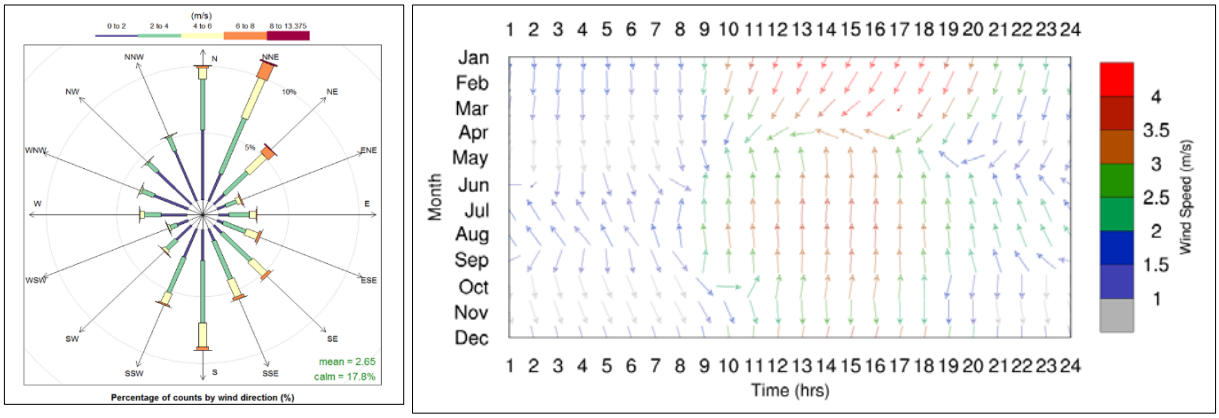

Figure 3 Annual wind rose (m/s) (1982–2016) and hourly variation of surface wind speed (m/s) and direction for each month (1983–2016 average)[19]

4.2 Light wind's impact on thermal environment in Singapore

Although it is believed that the urban wind helps to improve thermal comfort and mitigate UHI, the question is, given the mean wind speed at around 1m/s at pedestrian level, should air velocity be considered as an important factor in achieving better thermal comfort in urban design?

Yang, Wong, and Zhang point out that the perception of wind is highly related to air temperature, so "when the air temperature gets closer to body temperature (37 ºC), heat transfer from the human body to the environment is reduced, and thus even the increase of air movement (speeding up evaporation) would not make people feel comfortable under extremely high temperature and high humidity in a hot and humid climate."[20] However, in Singapore, according to the Changi Climate Station, the mean daily temperature of the whole year is around 26–28 ºC, and the daily temperature range has a minimum usually not falling below 23–25ºC during the night and maximum not rising above 31–33ºC during the day.[21]

Although the higher the PET, the higher the wind speed required to feel comfortable, a wind speed of 1m/s could still improve the thermal comfort in an outdoor area.

Furthermore, Jusuf and Wong developed a STEVE tool (the application of the screening tool for estate environment evaluation), based on measurement data, to simulate the thermal environment in Singapore. Both the tool and their research give the conclusion that, although various wind conditions for the same urban layout iteration could bring down the outdoor average temperature by as much as 0.3 ºC, and maximum temperature as much as 0.77 ºC, "[i]t seems that there is no significant difference regarding the wind condition from one design iteration to another. […] the various design options do not seem to affect the wind condition."[22] The conclusion is quite misleading on applying wind sensitive urban design in Singapore. Firstly, the design scenarios they propose are under certain conditions and quite limited, actually ignoring other possibilities. Secondly, their conclusion is based on the mean wind speed; however, the wind speed is highly variable from one point to just a few meters away in reality. That is why CDF simulation is needed to understand the complex situation of the urban wind profile. Wind sensitive urban design could help to optimize the wind environment, not only improving the wind for the whole urban area, but also mitigating the heat at specific places, such as a widely used public spaces.

Therefore, some research supports the importance of wind-responsive design despite the light wind conditions. Kim and Baik argue that the UHI intensity is strong during clear and windless nights in Seoul, so "for wind speeds greater than about 0.8 m/s, the maximum UHI intensity decreases as the wind speed increases"[23]. Hong Kong in summer has similar urban climate conditions to Singapore. Based on Edward Ng's research, "Urban Climatic Map and Standards for Wind Environment"[24] was published for urban governance and research. In the "Executive Summary", the report proposes the planning and design measures to improve urban wind behaviors, summarizing the design strategies on greenery, ground coverage, proximity to openness and connectivity, building volume, building permeability, building heights. It is believed that "for designers, it is possible to design our outdoor environment to maximize wind speed and minimize solar radiation to achieve comfort in the hot tropical summer months of Hong Kong."[25] (See figure 2.)

5. To what extent does light wind impact on thermal comfort?

This section will clarify to what extent wind at 1m/s could impact on thermal comfort. As mentioned in section 2, there are many indices to measure thermal comfort, in which air velocity plays an important role in affecting TSV in outdoor urban spaces in Singapore. This section continues to explore the other two famous indices – ASHRAE Standard 55 (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) and PET (physiologically equivalent temperature). Although ASHRAE Standard and PET were initially developed for the study of indoor thermal comfort, they have also been widely used for outdoor thermal comfort studies in recent years[26].

5.1 ASHRAE Standard 55

Referring to ASHRAE 55 2013, the maximum comfort operative temperature for the humid tropics is about 27.5°C without any sensible air movement over the human body. Thus, the maximum comfort operative temperature may be increased if wind is introduced. Rohinton Emmanuel summarized that "at an air speed of 1 m/s, the maximum comfort operative temperature may be extended to 30.5°C. That is to say, a 1 m/s air speed may compensate for an increase of about 3°C in operative."[27] (figure 4). Since the mean temperature in Singapore is not above 31–33ºC during the day, a wind speed of 1m/s could increase the thermal comfort range significantly in Singapore.

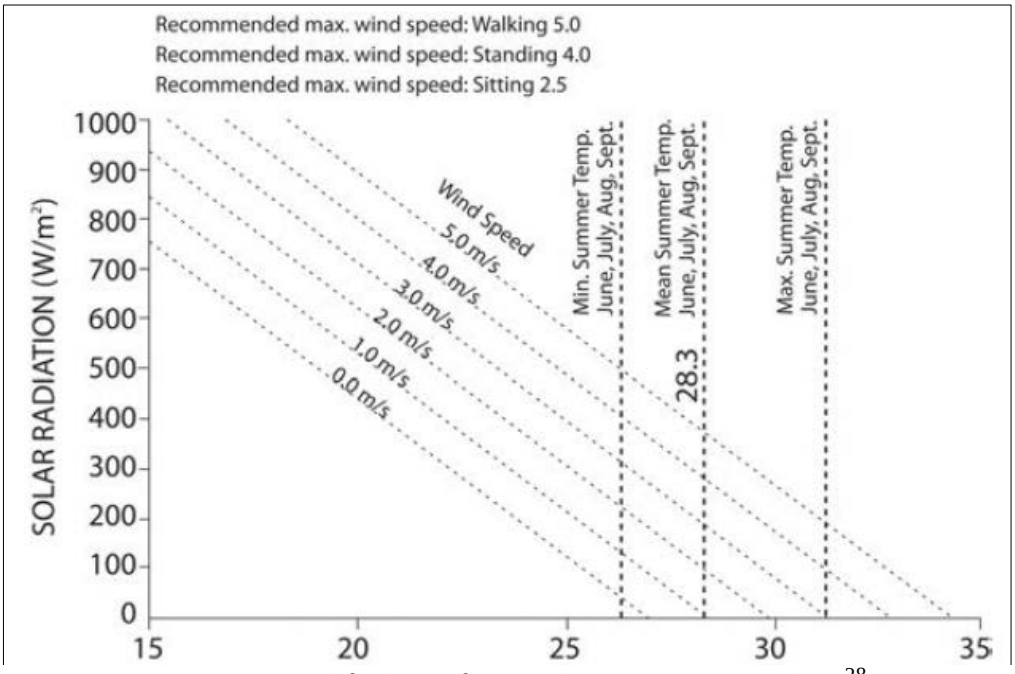

Figure 4 A simplified comfort outdoor temperature chart[28]

5.2 PET

Based on their study in one Singapore urban street, Yang, Wong, and Li believe "a variation of 1 m/s in wind speed only leads to a variation of 1.4°C in PET"[29], which "could be viewed as negligible"[30]. However, based on the PET formulation, the following simplified equation[31] (Eq. 2) is proposed by Rohinton Emmanuel for the typical climatic conditions of the tropics.

$$PET = 1.2\ T_a - 2.2\ V + 0.55\ (T_{mrt} - T_a) \quad (2)$$

PET physiological equivalent temperature in °C
T_a air temperature in °C
T_{mrt} mean radiant temperature in °C
V air speed in m/s

For his study, a 1 m/s difference in air speed will lead to a variation of 2.2 °C in PET. That is to say, a 1m/s increase in wind speed may compensate for a 1.8°C increase in air temperature, which is less than the number obtained by ASHRAE 55 2013 standard, but both

results show the significance of a 1 m/s difference in thermal comfort in tropics. The conclusion is similar when using another index. For example, Vicky Cheng et al. used the thermal sensation (TS) to study the thermal environment of Hong Kong in summer, where the weather is also hot and humid. They conclude that "it can be inferred that the effect of increasing wind speed from 0.3 m/s to 1 m/s is equivalent to a drop of about 1.9°C in air temperature."[32] (figure 5)

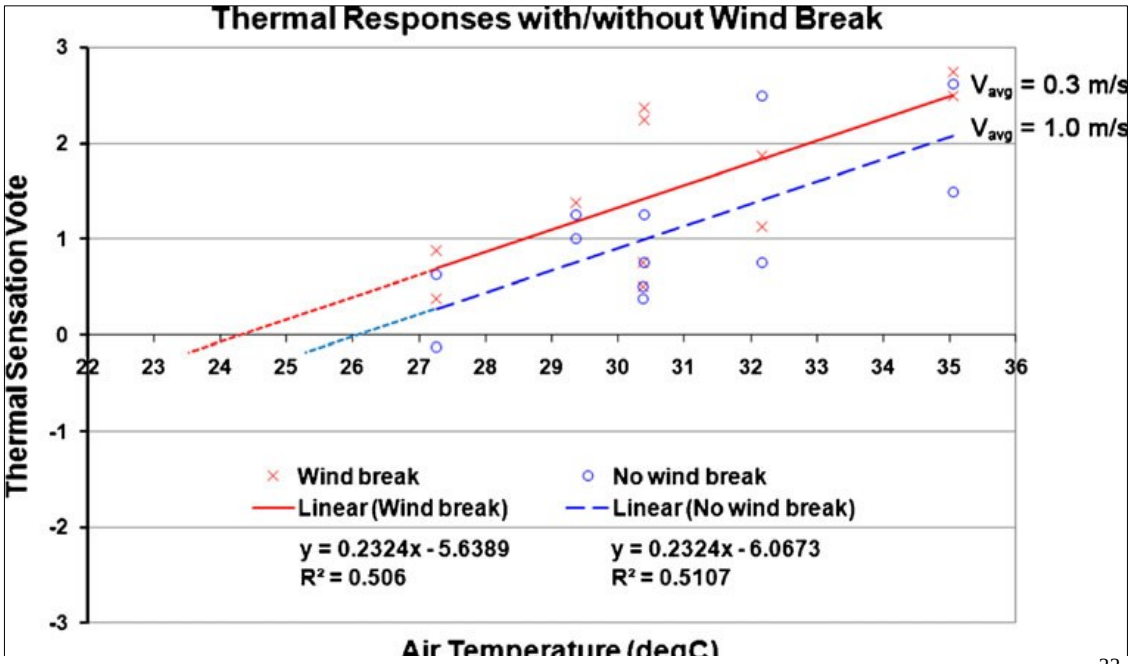

Figure 5 Effects of changing wind conditions on thermal sensation in summer Hong Kong[33]

In conclusion, there is a great improvement in thermal comfort when introducing wind even at around 1m/s. This study doesn't intend to compare the influence of different mitigation strategies, such as greenery, shadow, cool materials, etc., but demonstrates the crucial role of light wind in Singapore and other tropical cities. Furthermore, although the mean wind speed in Singapore is low, it is important to know there will be the stronger wind in particular season and places. For example, the measurement data proved 3m/s mean wind speed around Marina Bay on a typical clear sunny day - 18th of March 2011[34.] Meanwhile, Yang, Zhang and Fu believe the air velocity at 0.6-1 m/s also supplies the comfort feeling if a person standing in the shadow of buildings or trees,[35] which indicates the importance to combine the urban design considering wind and shadow.

6. Wind sensitive urban design for better thermal comfort

Many tropical and sub-tropical cities have already compiled design guideline books on strategies for mitigating UHI and creating a better thermal environment. Wind sensitive urban design should be an important part of this strategy[36]. Besides, as discussed in section 3, more attention has been paid to simulation aided urban design on wind environment at the initial planning stage, especially CFD simulation. For example, the work by Setaih shows the effect of urban design on the wind environment, using ANSYS. Based on the simulation, he tests

small changes by design, resulting in an enhanced wind velocity to a maximum of 1.3 to 2.3 m/s through implementing new high rise buildings (X) and introducing two 45^{o} tall rectangular buildings along the proposed new road.[37] (figure 6)

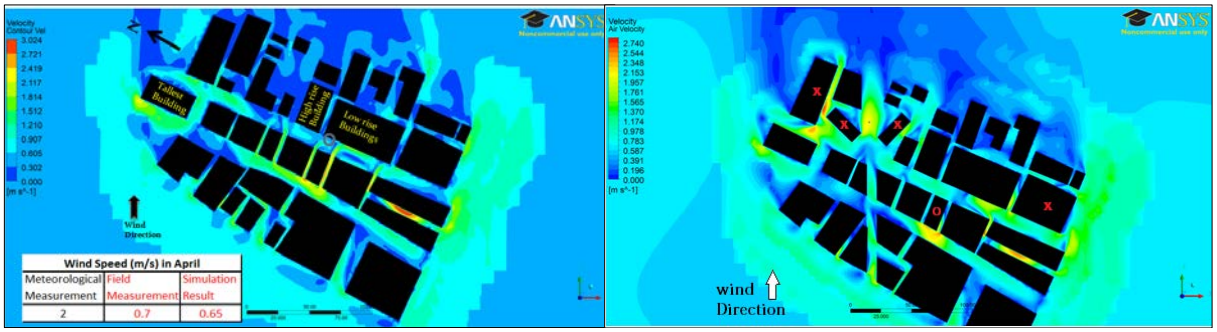

Figure 6 Comparison of the air velocity data between the field measurement, the CFD result of the current situation and the new design.[38]

Another case is a study conducted at Singapore ETH Centre. The Cooler Calmer Singapore Impact Project is an interdisciplinary research project aiming to "contribute to the development of new urban designs that enhance convection and provide enhancements on a pedestrian level for outdoor thermal comfort"[39], and testing the simulation, helping urban designer in practice. The Kent Vale II (figure 7), which has a Green Mark Platinum rating, is studied as an example, not only to help to understand the wind profile of the built environment of an excellent project, but also to explore the possibilities for improving thermal comfort during the design process. OpenFORM is chosen here as the CFD software to simulate the existing case and different design strategies[40].

Take the case of the "void deck" (free ground floor) popular in Singapore as an example. The research tries to clarify whether it is a good climatic responsive design strategy to be promoted in Singapore. Using the NUS meteorological station, on 17th Dec 2012 with the mean wind speed of 1.67m/s, wind direction from NNE and the cutting plane at 2 m above ground, the study compares the thermal environment between existing cases and the new design under the same climatic conditions in order to find out the impact of "void deck". The results shows that the void deck improves the wind not only at the free ground floor, but also the open space at the downwind direction (figure 8). As a consequence, the void deck provides a cooler public space. The comfort zone is much larger than the original design, especially the area with much stronger wind (figure 9). So it demonstrates that wind-responsive design could help to achieve better thermal environments in Singapore.

Figure 7 Kent Vale II and its simplified model

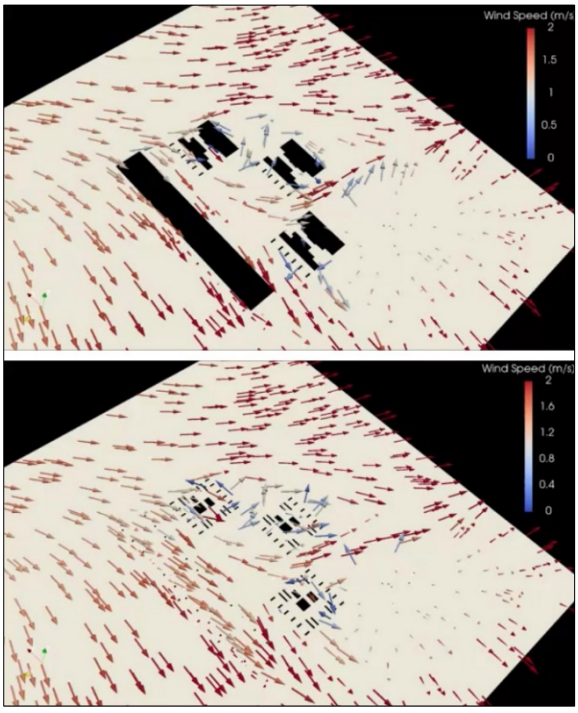

Figure 8 Wind simulation of existing case (above) and new design (bottom) at 15:00[41] 15:00[42]

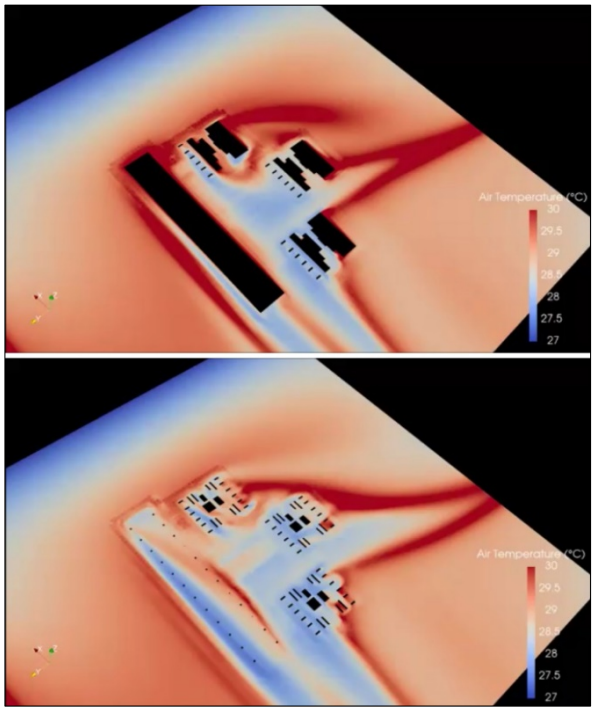

Figure 9 Temperature simulation of existing case (above) and new design (bottom) at

7. Summary

Following a review of the literature on study approaches to urban wind profiles and the debate on light wind's impact on thermal comfort, this paper demonstrates that the wind speed has a positive effect on thermal environment in warm climates. Since "tropical areas are often characterized by low wind speeds, especially when they are affected by the intertropical convergence zone (ITCZ)"[43], it is crucial to understand the importance of improving the wind environment, not only for Singapore but also other cities in hot humid climates, for people's comfort. Wind sensitive urban design based on CFD simulation is, therefore, proposed and recommended for better examination of the wind environment and achieving comfortable and livable city in tropics.

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Building Energy Optimization by Parameterization of Sources and Exchange Surfaces

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Abstract:
Projected trend of human habitat toward town-type structure impacts the global warming issue, along with the energy waste, the reduction of carbon footprint, and the increasing energy consumption, all tightly related to human habitats. Aside massive action to isolate buildings, another possibility discussed in the following is concerning the optimization of several heat sources position inside the convex closed domain representing a building. The problem is to minimize their number to produce prescribed temperature distribution for fixed limit conditions. The effect is the more important as boundary temperature conditions are different. It is found that an affordable real energy saving benefit is expectable with such an approach when adapted to old, large buildings usually difficult to rehabilitate.

1. Introduction

Determining human impact on environment is the biggest challenge of the 21st century. By 2030, it is estimated that the proportion of World population residing in urban areas will grow to reach over 60%, leading to an increasing demand on future energy sources. The global warming issue, with energy waste management, reduction of the carbon footprint and energy consumption increase are all tightly related to human habitats. Nowadays, 40% of world energy consumption is due to buildings. Today about 50% of the world population resides in cities, and is responsible for more than 75% of World energy consumption and 75% of greenhouse gas emission, and projected growth evolution leads to an increasing demand on future energy sources [1]. The significant increase in energy consumption, and especially from intense urbanization in recent period, has urged the needs to moderate it for staying within Climate Protocol constraints. On global scale, analysis has been made of best energy mix in conjunction with other energy demands [2]. Here at more modest single building level, usual possible way is to increase buildings isolation from construction for new ones or by shielding old ones with smart materials. One way to find a solution is to understand the environment where humans live. This is a complex analysis, as there are many physical and societal parameters to take into account. The physics behind this problem has to be considered from a stochastic perspective and where relevant parameters impacting on the development of a realistic and comprehensive model are coming from the exterior, the interior and the domain boundaries.

Outside conditions have an effect on energy consumption of a building. During night time the temperature drops, and energy consumption for lighting and heating increases. As observed [3], the energy usage is affected by the outside climate, which may largely vary within the limits of a single country. In another study [4], the authors focused their work on differences between inner and outer temperatures for a building. The impact of sunlight on temperature inside a house has been studied in [5], with limited impact of heat energy transmitted by light. As the study has been conducted in Denmark, the impact of sun heating could be reduced because of the incidence angle of sun rays.

The typology of a building has a direct impact on heat flows circulation which can be partially or completely monitored by mechanical and/or natural ventilation. Advanced natural ventilation offers many advantages such as no power consumption and/or no reparation needs [6], in which comparison of different buildings using advanced natural ventilation is made with equations for air movement and stack effect. Various types of final energy source can be used to warm-up a building: grid-bound energies (electricity, gas and district heating), stored energies and environment friendly energies (solar, wind or water energy). A boiler can be used in order to convert this energy into usable heat. The heat source distribution can affect the heat transfer into a building. So it should be taken into account that, even if a building is heated to a specific temperature, the heat flow can vary between upper and lower part of the block. An example of heat transfer mechanism is natural convection [7], based on a room model with polystyrene boards. Two opposite walls are heated by vertical heaters, simulating the heat source, and the temperature of the walls is measured. Experiment shows that heat flux increase leads to the growth of heated walls surface temperature and causes an increase of the surface-air temperature difference. The main goal is actually to minimize the excess temperatures and to maximize the heat transfer [8], for instance through predictive optimal control approach [9,10].

However, previous analysis of indoor and outdoor parameters leads to think about the limit between them. The exchange surface includes the external wall, the doors and the windows. The outdoor temperature can have an important impact on indoor temperature and thus, on global energy consumption used to heat or to cool down the building. The issue is to make an

optimal exchange surface reducing as much as possible energy losses. Many parameters of the exchange surface may be used in order to reach different results, and thus to find the best combination of settings. Most studied one is the thickness of thermal isolation or of external walls. The technical optimum thickness of a thermal insulation layer of an external wall is analyzed in [11]. The experiment is performed with a brick wall and polystyrene thermal insulation material. As it is an exchange surface, its behavior involves both indoor and outdoor parameters.
Another interesting and potentially efficient action is to utilize, in existing situation, the freedom left by optimally distributing the heat sources inside the buildings. This is intuitively the more justified as temperature boundary conditions are different. If resulting consumption reduction turns out to be equivalent to the one produced by shielding, even partially, for same cost, the question is open as for the best choice. To bring some elements to this analysis, a simple model with distributed heat sources in a closed parallelepiped domain has been studied here with different types of boundary conditions. Even if relatively crude, it is possible to already figure out the "good" configurations in which the heat flow can be managed to antagonize at best the heat leak without penalizing heat distribution inside the domain.

2. Model, Methods and Simulation

In this part, the model is described and simulated in order to find appropriate solutions to the problem. All parameters used in the model are described, with their chosen different values for simulations with interactive, visual, multi-physics ENERGY2D simulation program modelling the three modes of heat transfer (conduction, convection, and radiation), and their coupling with particle dynamics. This software allows designing computational experiments to test a scientific hypothesis or solving an engineering problem without resorting to complex mathematics. In order to complete the visual result, the user can put different sensors and watch the evolution of temperature and of heat fluxes, and extract the graphs related to simulations for a deeper analysis.
The problem at hand is, for fixed boundary conditions of a given domain, to minimize the number of heat sources within this domain while optimizing their location in order to reach a prescribed value of temperature. The variable parameters are the domain geometry, its thermal characteristics, its borders, the sources and their characteristics, their location and their power. To analyze the problem, different simulations represented by a cross in Table I have been performed with indicated parameters value.

		Domain : 10 * 10				Domain : 10 * 20			
	Number of Sources	1	2	3	4	1	2	3	4
Dirichlet Conditions	0°C RLTB	x	x	x	x	x	x	x	x
	0°C RL, 20°C TB	x	x	x	x	x	x	x	x
	0°C LB, 20°C TR	x	x	x	x	x	x	x	x

Table I. Parameters Value for Simulations
(T top boundary, B bottom boundary, R right boundary, L left boundary)

Every cross corresponds to three (or four) simulations depending on how many different heat sources positions are modelled. For each one, domain and source characteristics are given by Table II.

	Initial Temperature	Conductivity	Specific Heat	Density
Domain Parameters	0°C	.0257W/m°C	1.005J/Kg°C	1.204Kg/m^3
Sources Parameters	30°C	.215W/m°C	89J/Kg°C	2700Kg/ m^3

Table II. Domain and Source Parameters Value

It is important to notice the difference between Dirichlet and Neumann boundary conditions. First ones represent temperature constancy at the boundary, and second ones heat flux constancy. Here Dirichlet boundary conditions are used to simulate the weather by fixing the external temperature.

3. Results

Simulation parameters are bound to the physical parameters giving the heat equation. Two types of problem can be investigated, the evolution of temperature vs time and the energy consumption vs time for fixed sources position. Because of domain geometric symmetry four sources have been considered. It has been observed that thermal losses at the boundary cannot be fought while warming all the domain. For a source close to the boundary, the heat flux is zero because there is no heat exchange, and the temperature in the middle of the domain is very low compared to desired one. Inversely if the source is near the center of the room, the temperature is very high but the flux at the borders is also large because of the losses. For this reason the sources have been located in middle between the boundary and the center of the domain. Three simulations have been selected to cover different parameter effects. For easing the analysis, visualization has been set up.

Simulation 1 : The four sources are at temperature of 30°C, see Table II. Dirichlet boundary conditions are 20°C for TR and 0°C for LB (last line in Table I).

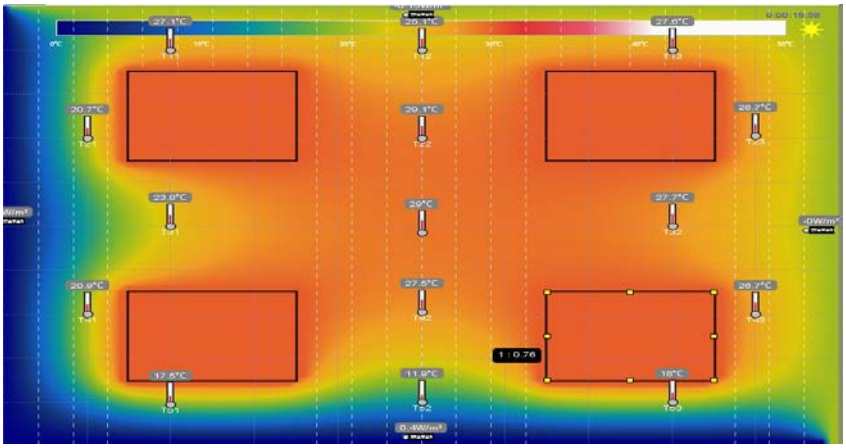

Figure 1. Four Square Sources at 30°C

A common idea is to overheat to make sure that all the domain will be at desired ambient temperature. Fixing sources temperature at 30°C, it could be supposed that this would be adequate for a desired ambient temperature of 20°C. Here the temperature distribution shows that such is not the case, because as already noticed the heat source cannot fight the thermal losses at the boundaries while warming all the domain. The temperature distribution is not uniform, and much too hot in the center of the domain. Moreover, this disposition does not take correctly into account the limit conditions. Indeed, the two Top and Right boundaries being already at 20°C it is unnecessary to put sources near them, and to consume energy for nothing.

To solve this problem, for this domain area with these characteristics, two solutions can be envisioned. The first one is to decrease the temperature of heat sources near these hot walls and the second one is to modify the geometry of the heat sources. These two cases are described below.

Simulation 2 : As in previous simulation, four square sources are used with same Dirichlet boundary limit conditions. However, the three sources near the cold TR boundaries are now at a temperature of 20°C, and the last one is still at 30°C.

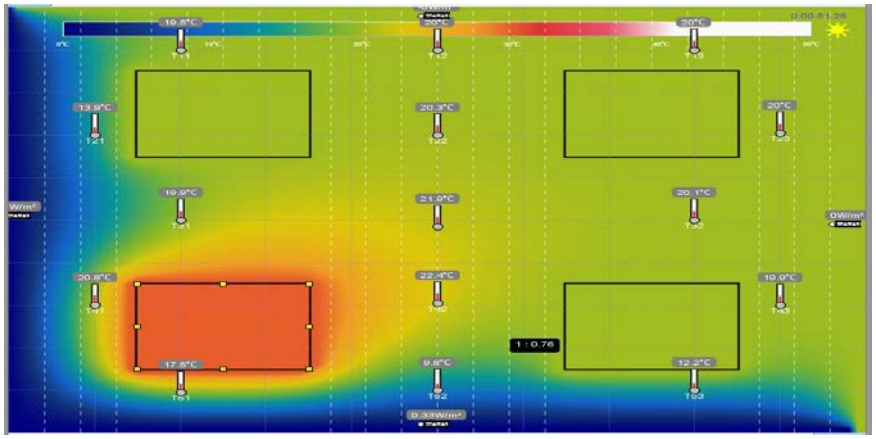

Figure 2. Three Square Sources at 20°C, Last One Maintained at 30°C.

First the temperature in the middle of the domain is now at desired temperature of 20°C. This change induces a lower, less expensive energy consumption (reduced to 75% of previous source) and a more comfortable ambient temperature. Yet two related issues are not correctly solved, as the heat losses at the cold LB boundaries are still high and correspondingly the temperature non-uniformity within the domain is large.

Simulation 3 : As for previous simulations, the same Dirichlet limit conditions are used. Heat sources are at 30°C, but with different geometry. The previous four (2m*1m) sources are replaced by two new (8m*0.5m) ones with exactly the same surface (and same power heat flux release).

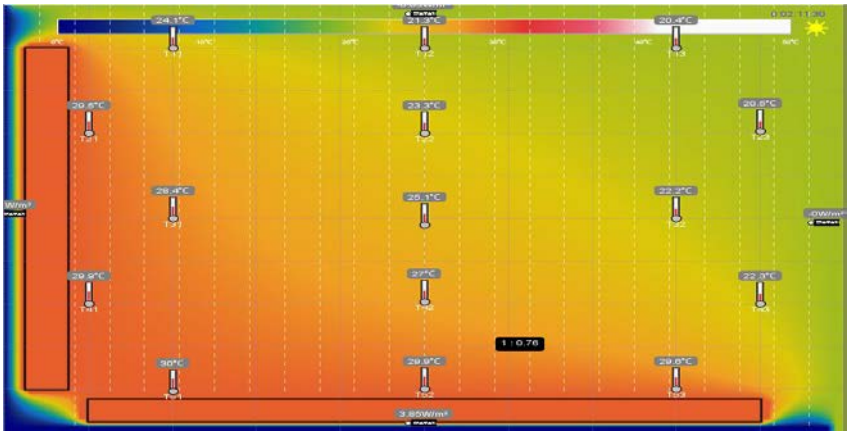

Figure 3. Two Sources at 30°C with a Different Geometry

The modification of heat sources geometry allows a different disposition. Knowing that LB boundaries are at 0°C (initial conditions), the two heat sources are located there. It is seen on Figure 3 that, with only half of heat sources, ie half of the power and so half of initial energy consumption, there are practically no heat losses in the domain and a heating of all the domain. The process can be improved by lowering the heat sources temperature in order to have a uniform ambient temperature around 20°C and to reduce the energy consumption.

4. Discussion and Conclusion

From observation of collected results, it is already possible to note that positioning of heat sources in the domain can have important effects on both the overall energy balance and on temperature homogeneity. Comparison of Figures 1 and 2 shows that first one describes overheating situation without contributing in any way to realize smooth temperature averaging, which is much more efficient surface-wise in the second one despite much smaller energy expense. Moreover, there is no dramatic penalization in the size of inefficiently heated domain. This makes it really important to correctly balance the possible source-sink distribution by including the effect of boundary conditions. In present case as a general rule, it is expectable that if T_{Bmax} and T_{Bmin} are the two Dirichlet conditions, optimal temperature homogeneity will result for heat source given by

$$S \cong K(T_{Bmax} - T_{Bmin}) \quad (1)$$

where K is a normalized conductivity coefficient including a “partitioning” of the domain into two subdomains respectively under the control of each boundary condition. Here Figure 3 shows that heat source efficiency is largely increased when located near the boundary with higher heat exchange with exterior, and the more as the exchange at the other boundary is weaker. The basic reason is in the possibility of adapted balance between the two heat boundary leaks when moving the heat source inside the domain, leading to its optimization when the leaks are equivalent and, at the same time, giving best temperature homogeneity inside the domain. The resulting figures from the approach proposed here are quite interesting as it is verified that up to a factor of two can be gained in the operation. This is especially important in the case of buildings with many adjacent domains (apartments) inside a common

outer boundary, and explains the choice here of a situation with so large difference between the Dirichlet boundary conditions on temperature, which represents precisely the most contrasted (but strictly realistic) case of partly exposed domain. Proposed solution is to be compared with usual one of overall building isolation with homogeneous interior heating, and appears to be rather interesting in terms of installation cost and energy consumption for the group of old and large buildings as it will be discussed elsewhere. Present first cut simulated results do not include more specific effects such as thermal bridges and convective transport phenomena. However they should not modify present conclusions in stationary situation considered here, as long as they can be taken into account by modifying heat transport coefficients.

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Carbon Capture Project in Palm Oil Industry in Malaysia : A review on Policies and Implementation towards Sustainability Performance

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Abstract

The renewable energy development is part of the emerging carbon market in Malaysia which highly potential to achieve both sustainable development and green technology products. As Malaysia is one of the producer of biomass products and biotechnology, the advantages and opportunities in the carbon capture project is expected to not just be benefit economically but environmentally and socially, which means will help to achieve the sustainable development goals. Due to the government target in enhance the consumption of renewable energy and creates a sustainable future, biomass and bioenergy residues can be highly potential in producing renewable energy in different sectors which also has economic, environmental and also social benefits.

This paper facilitates a discussion and assesses the state of knowledge on the palm oil industry and how the palm oil product contributes to sustainability performance in Malaysia. The objective of this paper is to examine the Malaysian context in terms of determining the effectiveness of the application of palm oil industry in carbon capture project implementation context and policies upholding behind this project implementation to reduce the carbon emissions. Data collected from a review of the previous literature from industry perspectives and related government documents is the source for further exploration for data analysis and will constitute the basis of the solution presented in this paper.

Keywords: carbon capture, palm oil, renewable energy, carbon market, sustainability

ECONOMY, ENVIRONMENT AND SOCIO-CULTURAL PHENOMENON: ESD-BASED CURRICULUM IN EARLY CHILDHOOD EDUCATION

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ABSTRACT
Keywords: sustainable development, curriculum contents, ESD in ECE, pillars in education for sustainable development

Assessed the existing Early Childhood Curriculum for S.Y. 2013 – 2014 as a baseline data for crafting Education for Sustainable Development-Based Curriculum in Early Childhood Education was the objective of this study. Specifically, it determined learning content of the existing ECE Curriculum and associated if these contents had the overarching characteristics of the three pillars of ESD and on how they developed the five developmental domains of learning. Moreover, the awareness and preferences of ESD were sought among the three stakeholders

A documentary analysis approach was utilized to evaluate the lesson plans of the kindergarten teachers along with the descriptive survey and narrative-inquiry methods in research to accumulate stories of stakeholders about what curriculum contents have relevance to ESD and should be included in ECE curriculum. This also involved learning contents that the respondents deemed as important areas of competencies in ECE for ESD. The results of both research methods were used as bases in crafting a curriculum framework with the prominence of the three pillars in education for sustainable development.

This study recommends that mapping a clear understanding on the role of ECE in ESD among the administrators, teachers, and the parents is essential in order to raise their awareness, to include learning skills and competencies drawn from content standards which are relevant to the three pillars of ESD. More importantly, trainings for kindergarten teachers with the support of the school administrators will lead to the adaption and use of the output of this study as the basis for an enhanced ECE curriculum guide. Likewise, seminars for parents will definitely heighten the inclusion of ESD in ECE.

INTRODUCTION

In the pursuit of development and improved quality of life, the essential factor of its attainment resides in education. It is through a quality and relevant education that could address the diverse needs of learners and as such upholds social equity. This can only be attained through a curriculum that has global spectrum with locally relevant and culturally appropriate content standards. Hence, could pave locally addressed education with global adherence on the lenses of sustainable education.

The Millennium Development Goal clamored for the involvement of early childhood education as the springboard for sustainability. Both locally and internationally, the role of Early Childhood Education (ECE) in sustainable development is rarely emphasized in most of the academic discussions. In fact, UNESCO in 2009 declared that the participation of ECE in matters of education for sustainable development is seriously under researched.

In the Philippines, early childhood education is enmeshed as a mere stepping stone for the five year-old children to be prepared for regular school. Kindergarten merely serves for learners to have a head start in the five domains of child development. Mainly, to be able to read, write, and do simple arithmetic before the regular school academic program - the first Grade. Ideally as it aimed to develop competencies in the five developmental domains, the role that ECE played in the lenses of sustainability is being hindered.

ECE in ESD though still a developing curriculum yet a new archetype of education that can nurture sustainability which may foster learnings relevant to the demographical needs of the kindergarten learners. More importantly, this is a curriculum that is genuinely concerned with and capable of contributing to a just, peaceful and a sustainable world. In this context, ECE curriculum must be geared towards attaining the goals and principles of the society as it struggled to address the rapid effect of change that is affecting both in local setting and in a global landscape.

Although in the current national curriculum for Kindergarten Education in the Philippines involved lessons pertaining to economy, care for the environment, and lessons articulating socio-cultural phenomenon; yet these contents did not fully cultivate awareness among teachers and the learners about education for sustainable development. ESD had challenged curriculum experts to design learning objectives, contents, and assessment that would adapt to the challenges that beset human life and its condition. Davis in 2008, recognized that young children have capacities to be active agents of change as well as into the future. In this context, the genesis of education for sustainable development must begin from early childhood years. It must be articulated in a manner, which includes KSAVs and that would unfold the core values of sustainability for a sustainable human development.

This study developed an ESD-based curriculum emphasizing on the three pillars of education for sustainable development namely; Economic Dimension, Environmental Awareness and Socio-cultural Phenomenon vis-à-vis the five developmental domains of learning specifically; Cognitive, Physical, Socio-emotional, Aesthetic, and Spiritual Domain.

Furthermore, this ESD-based curriculum for ECE has laid out thematic ESD lessons as replicated in the different sets of flowcharts. Indicated in the flowcharts are the themes in ESD particularly the issues and awareness on: Biodiversity, Climate Change, Poverty Reduction, Gender Equality, Health Promotion, Care for the Environment, Citizenship, Creativity, Individual Improvement, and Social Consciousness and Responsibility vis-à-vis the example lesson guide for each theme in order for the kindergarten teachers to be steered in the inclusion of the cascaded curriculum guide for teachers as well as on how to channel and execute this thematic ESD-based curriculum. More specifically, it contained objectives, learning competencies and content areas, strategies and forms of evaluation and assessment for ECE within the intersecting nature of the three pillars of ESD.

This ESD-Based Early Childhood Curriculum with the emphasis on the three pillars in Economy, Environment, and Socio-cultural Phenomenon would enable the global clamor for ECE to take its vital role in ESD.

STATEMENT OF THE PROBLEM

This study assessed the existing curriculum for S.Y. 2013 – 2014 as basis for crafting Education for Sustainable Development-Based Curriculum in ECE for sustainable development.

Specifically, this study sought to:

1. determine learning content of the existing ECE curriculum that taps the three pillars of education for sustainable development;
   1.1. economy
   1.2. environmental
   1.3. socio-cultural phenomenon
2. identify lessons in the existing curriculum relevant to the three identified pillars of ESD indicative to the development in the following dimensions:
   2.1. cognitive
   2.2. physical
   2.3. aesthetic
   2.4. socio-emotional
   2.5. spiritual
3. find-out the level of awareness of ESD among stakeholders
4. determine the preferences of school administrators, teachers and parents in curriculum content.
5. develop an ESD-based curriculum containing the three pillars in education for sustainable development

METHODOLOGY

RESEARCH DESIGN

This study utilized the descriptive approach in research which employed a descriptive survey that drew out the content preferences of school administrators, preschool teachers, and parents from the identified schools. Included in the survey were their opinion and ideas related to the general principle of ESD which they thought should be included in the existing ECE curriculum.

A documentary analysis approach in research was also utilized in order to evaluate the lesson plans of the kindergarten teachers. This research approach also used the descriptive survey and narrative-inquiry methods, respectively.

The Narrative Inquiry was used to accumulate stories of stakeholders about what curriculum contents have relevance to ESD and should be included in ECE curriculum. This also involved learning contents that the respondents deemed as important areas of competencies in ECE for ESD. The results of both research methods were used as bases in crafting a curriculum framework with the prominence of the three pillars in education for sustainable development.

RESEARCH ENVIRONMENT

The study was conducted in both private and public schools in Cebu City Division. These schools were purposively selected and were considered as established early childhood education providers and practitioners considering the years of their existence as learning institutions.

RESEARCH SUBJECTS AND RESPONDENTS

Using the purposive sampling method, three schools both from private and public in Cebu City were selected. The respondents were two Kindergarten teachers, two parents particularly members of the Parents – Teachers Association and the principal or school administrator.

SOURCES OF DATA

The data were sourced out from the compiled lesson plans for school year 2013 – 2014 of the two kindergarten teachers from the three private schools and the log plans of still two teachers from the other three public schools. For the entire school year there were 38 learning contents accumulated that had economic dimensions, 84 learning contents with Environmental Awareness, and 212 learning contents accumulated with Socio-Cultural Phenomenon.

To identify in the existing curriculum relevant to the three pillars of ESD indicative to the development of the five developmental domains of learning was extracted through multiple response method. Thus, across the domains of development lessons with Economic Dimensions summed up to 52; Environmental Awareness accumulated 140 lessons; while Socio-Cultural Phenomenon totaled 355 lessons.

To find out the level of awareness of ESD the data extracted were from the answers of the administrators, kindergarten teachers, and parents in the formal and informal interviews.

RESEARCH INSTRUMENT

To incorporate the three pillars for sustainable development, this research developed learning contents across the learning areas of development. Specifically, these learning contents included lessons that will draw out knowledge, skills, attitudes, and values reflecting the content skills of ESD. Moreover, to see to it that these contents were constructive, positive, interesting, and suitable for children, three experts in early childhood curriculum validated it to ensure their relevance to the principle and philosophy of ECE in ESD.

The first tool was a checklist-questionnaire on the three pillars of education for sustainable development. Three experts in early childhood curriculum, for triangulation purposes validated the checklist and that they found these items appropriate and relevant. The second tool was a questionnaire, which consisted of open-ended questions to determine the preferences of school administrators, preschool teachers, and parents about what curriculum contents have relevance to ESD and should be included in ECE curriculum.

DATA GATHERING PROCEDURES

The permission to conduct the study was obtained from the office of the administrators of the different school. The researcher prepared two research tools to establish the base line data; requested from the selected schools the two compiled lesson plans of the two kindergarten teachers for the school year 2013 – 2014.

The checklist-questionnaire was used as the tool to determine whether the three pillars in economy, environment, and socio-cultural phenomenon were tapped in the existing ECE curriculum.

In addition, the three identified respondents were interviewed using the second tool in order to determine their preference as to what curriculum content should be included in relation to ESD.

The statistical results of the research tools defined the viability of the learning contents; which was used in the design of the curriculum framework in early childhood education for sustainable development.

STATISTICAL TREATMENT OF DATA

All statistical treatments were computed by a manner in which:

To determine the learning content of the existing ECE curriculum that taps the three pillar of education for sustainable development, the percentile degree was used.

To identify the learning contents in the existing ECE curriculum that were developed for the identified pillars of education to enhance the five developmental domains, the Weighted Mean was utilized.

To draw the data as to what curriculum content the school administrators, kindergarten teachers, and the parents prefer to include in the ECE, the Descriptive Statistics was employed.

RESULTS AND DISCUSSION

In spite of the clamor for the essential role of Early Childhood Education (ECE) in Education for Sustainable Development (ESD) as seen through a full emphasis and relatively holistic inclusion of its three pillars; the great challenge still resided on the employment of the content standards across learning areas, with the intersecting nature of ESD to enhance the five domains of development.

The Learning Content of the Existing ECE Curriculum

This research revealed that the current collective pool of KSAVs which are the primary channels in order to create an extensive awareness of ESD were seemingly obscure.

Based on the result, there are 38 accumulated learning contents in Reading, Language, Math, Science, and Civics. The employed learning contents articulated the mere transfer of long-ago knowledge of the Self, Family, Community and the World. The content standards as reflected in the lesson plans and log plans of the teachers depicted a hallow line of connection with economic dimension. The teachers seemed to may have just carried out what were stipulated in the vertical and horizontal articulation of the school's existing curriculum. This may be so since the inherent idea of the inclusion of the three pillars in the regular curriculum necessitated themes which must also be evident in the textbooks.

It is also revealed that lessons in Language and Math that had economic dimension acquired a very low percentile of 11.0 in favor of the latter and 13.0 percent to the former. Collectively, Civics with 32.0 percent which garnered the total of 12 content standards seemingly had topped as the learning area with the most lessons in economy. Conversely, the result had strengthened the general understanding that learning the lessons pertaining to climate change which greatly affected economic condition of each country, problems that beset the ecosystem and the depletion of natural resources, the increasing concern of pollution, scarcity of food, the value on stewardship and care for material possession must be included in the content areas and learning standards in Civics.

Among the 84 accumulated learning contents only few of the content standards that addressed environmental concerns were employed in Language and Math gaining 4.0 and 5.0 percent respectively. Collectively, Science mounted up to a shared 33 times that the listed content standards as obviously been employed from all the enlisted schools topped 39.0 percent from the total percentile. Content standards in this learning area exhibited environmental issues that recognized the responsibility of the learner to be an effective steward of the natural environment. This stewardship is anchored on the belief that each learner is an important resource in the protection and the preservation of natural resources and the world. As learners, everyone is challenged to create an awareness of shared responsibility to address the growing concern of the environment which is often affected by the increasing innovation and invention brought by modernity.

With 212 total accumulated learning standards; Math, Language, and Science garnered an extremely meager number of content standards of 15, 21, and 27 sharing the percentile of 7.0, 10.0, and 13.0 respectively. The three gained closely a very low percentile compared to Reading which garnered 69 and Civics which summed up to 80 content standards gaining somehow a slightly improved percentile scale of 33.0 and 38.0 Language, Math, and Science seemingly had least content standards that tackled issues pertaining to socio-cultural issues.

In like manner, lessons and content standards in Math were generally employed for the children to acquire basic numeral skills and competencies. Content standards in Science merely focused on the awareness of each learner in relation to his/her body parts including the five senses; the concept of animals and plants as well as the basic concepts of the three states of matter.

Civics and Reading had accumulated high percentiles on the following grounds: first, lessons in Civics would basically drew each learner's response to the kind of community one belongs and its present condition; second, lessons in Reading though mainly centered on phonetic awareness yet still were associated with stories which had morals that would expand the consciousness and awareness of each learner most especially his or her relationship with others, the community, and the world.

It is therefore important to note that the reasons why the learning standards in both Civics and Reading had the dimension of socio-cultural phenomenon was because these were built upon respect for human dignity, the community and the kind of world each one lived. More so, the lessons could lead each learner to understand himself and others. In addition, learning content reflecting the socio-cultural phenomenon established a link from oneself with the wider natural and social environment (UNDESD, 2004).

Very evidently, the three pillars could mostly be employed in Civics as reflected in the following table. Most probably because the underpinning content standards in Civics were generally drawn consciousness on ESD, namely; issues on responsibility to ensure human rights, addressing poverty and social inequality, move for good governance, and the continuous quest to attain the universal right to be equal amidst differences and inequalities (UNESCO, 2009).

Summary of the Learning Contents in ESD

	LEARNING AREAS						
PILLARS OF ESD	**Reading**	**Language**	**Math**	**Science**	**Civics**	**No. of Learning Contents**	**%**
Economy	0.24	0.11	0.13	0.21	0.32	38	11.0
Environment	0.18	0.04	0.05	0.39	0.35	54	25.0
Socio-Cultural Phenomenon	0.33	0.10	0.07	0.13	0.38	212	64.0
Average %	**0.23**	**0.08**	**0.08**	**0.24**	**0.35**	**334**	**100**

Among the five learning areas in the present ECE curriculum, the three pillars of ESD were mostly present in Civics. Reading and Science however, revealed to have the dimension of the three pillars of ESD but the level of their desirability did not reach a considerable percentile. Likewise, the learning skills in Math and Language was just extremely low.

Inasmuch as the present condition of our society clamors for a more relevant curriculum to address the different concerns that beset the country; the moment has ripened for the ECE curriculum planners to respond to the challenge of UNESCO. The inclusion of the content standards with the dimension of the three pillars into the existing curriculum in ECE has become imperative in order to create the enduring characteristics of sustainability. While the role of ECE in ESD is to pave the genesis of a new curriculum that focuses on the

effects of learning to a more sustainable future; ECE as an essential agent to ESD has the vital responsibility to enhancing the abilities of the learners to address the challenges of a sustainable future. It is therefore an opportune time for ECE educators and providers to level up the role of ECE and claim its potential role in ESD (Yan & Fengfeng, China; 2008).

The Lessons with ESD Learning Content that Enhanced the Five Developmental Domains

It is disquieting to know that among the five developmental domains of learning; there were no lessons in **economy** that directly develop the physical domain of the child. The lesson plans/log plans from the six respondent schools revealed that there were only seven (7) content standards recorded that developed the spiritual domain of the learners which garnered 13.0 from the total percentile. Aesthetic and Socio-Emotional domains appeared to have only been developed with 9 and 13 sharing 17.0 percent and 25.0; respectively. The cognitive domain had been developed accumulating 23 content standards sharing 44.0 percent from the total percentile. This percentile sharing is still very minimal. This result strengthened what the Decade of Education for Sustainable Development (DESD) Monitoring and Evaluation had conveyed in 2009 that ESD needed to focus more on the development of knowledge and competencies as requirements to fully develop awareness regarding ESD. The Kosovo research report on Education for Sustainable Development in 2011 also affirmed this observation (Kabashi, 2011).

Socio-emotional development was mostly embodied with environment dimension. Accumulating 40 content standards and sharing the 29.0 percent from the total percentile. It signified that the necessity of employing content standards with environmental concern becomes pressing due to the local and global clamor in preserving the environment. Very closely with a minimal of 4.0 difference, this pillar was secondly represented by spiritual domain with 25.0 percentile sharing. This is for the reason that these two domains were closely related to each other. Environmental awareness was less represented by cognitive, physical, and aesthetic domains.

This observation concurred with Kosovo Research Report on ESD in 2011 stipulating that content standards covering the environmental sphere most likely develop the awareness of man’s responsibility to take care of the environment as much as he is driven by his sense of awe for the wonders of creation.

It revealed that there were a slightly high employment 126 content standards for the entire school year reflecting issues pertaining to socio-emotional domain; garnering 36.0 percent. Cognitive Domain accumulating 99 content standards sharing 28.0 percent for the total percentile noticeably tapped while the other remaining domains, namely; Aesthetic, Physical, and Spiritual were developed not so often.

Carrie Shrier (2014) explained that the reason why socio-emotional development of children had strong link with the socio-cultural setting was because the greater predictor of children’s academic performance was the fact that learning was basically a social process. The manner in which each child learns will always depend on the level of his/her E.Q.

The following table showed that lessons containing economic and environmental issues developed most often the cognitive domain while lessons encompassing socio-cultural phenomenon most likely developed only the socio-emotional domain of the learner.

The cognitive content for Economy and Environmental Pillars collectively emerged to have been consistently developed; leaving Physical, Aesthetic, Socio-Emotional and Spiritual domains less represented. Predominantly, the content standards only enhance the cognitive domain of the kindergarten children.

Summary of ESD Learning Content that Enhanced the Five Development Domains

	DEVELOPMENTAL DOMAINS				
PILLARS	**Cognitive**	**Physical**	**Aesthetic**	**Socio-Emotional**	**Spiritual**
Economy	0.44	0.00	0.17	0.25	0.14
Environment	0.31	0.02	0.13	0.29	0.26
Socio-Cultural Phenomenon	0.28	0.12	0.05	0.36	0.19
AVERAGE %	**34.3**	**4.7**	**11.7**	**30.0**	**19.7**

The Awareness of Parents, Teachers, and School Administrators on the Role of ECE in ESD

Parents from the two private schools have the **awareness** on the role of ECE in ESD. The parents from the other private school seem to have **not** been **aware** of the roles of early childhood education for sustainable development. Moreover, all parents from the three public schools were also **not aware** of the significant role of ECE in ESD.

Based on the informal interview with parents there were three significant issues that surfaced; which can strengthen the role of ECE in the realization of sustainable education.

First, ***improving access and retention in quality basic education*** was evidently repeated by parents for ECE to take its significant role in ESD. In order to make the ECE curriculum sustainable kindergarten children according to the parents "**must be taught skills on how to respond to real life situations and challenges"**. They observed that the present ECE curriculum focuses only on the cognitive development of the learner thereby stressing only on how the kindergarten children perform in the three R's – Reading, wRiting, and aRithmetic. The teachers as observed by parents **"were so focused on teaching the kindergarten academic contents and as a result neglecting the other aspect of child development".** This according to them may only result to learning theories which made their children totally disconnected with the real issues and challenges of life.

The ECE Curriculum, the parents added "**must pave avenue for children to develop competencies on how to value the things they have"**. Lessons must in one way or another address inequity in early life through activities either inside or outside the classroom just like community based learning. Bring the children outside the classroom especially real community situations around the school may inculcate knowledge, ideas and perceptions that at an early age they should appreciate the good opportunities and privileges they have. Thereby making ECE curriculum realistic and learning a real-life based education.

Second, parents believed that ***reorienting the existing educational program or the ECE curriculum in order to address ESD***. They strongly conveyed that the **"ECE Curriculum must pave avenues of recognition and support of individual differences among children in order to meet the existing diverse needs of children"**. Third, the parents strongly recommended that ***the home and the school must work hand-in-hand in reorienting their children to the basic but important attitudes and values that are requisite to the moral and ethical claim of sustainable education***. They believe that at an early age, "**kindergarten children must be taught the value of saving and taking care of what they have"**. The teachers must help them (parents) to inculcate among their children the value of stewardship rather than delving so much on consumerism. Though according to them, **"the advancement of technology is an important milestone for development and inasmuch as school should also adopt to dawning of technology and its important role in teaching-learning process;**

teachers must see to it that children must use technology to facilitate creativity and enhance the importance critical thinking skills". Technology must not enslave the kindergarten children making them sedentary in life. The present society, they added is becoming egoistic. People in the community are becoming individualistic forgetting the important need to belong. The interdependence of elements necessary for the development of strong community must help children acquire the so-called communal responsibility wherein children are not only concerned about their own welfare for must also manifest empathy and concern for others. At an early age, they concluded; "**kindergarten children must be aware of what contribution will they offer for the betterment of the society they belong"**. Thereby making them responsible citizens.

This result which did not attain its desirable level surfaced because kindergarten teachers were mainly concerned in developing the five domains of learning using the regular ECE curriculum stipulated in Republic Act (R.A.) 10157 otherwise known as the Universalization of Kindergarten Curriculum in the Philippines.

Teachers from two private schools and from two public schools were **partially aware** on the role of ECE in ESD. It is interesting to note that two schools both from private and public school manifested a certain **awareness** on the role of ECE in ESD. Both schools shared the totality mean of 2.6.

First, the teachers believed that ***the breadth and the depth of ECE curriculum necessitates integration of skills and competencies across learning areas are essential consideration for early childhood education to create a roadmap to ESD***. Thus, the five developmental domains must cascade learning opportunities that could afford the learners enduring skills relevant to lifelong learning and making the world a better place to live in.

Second, the teachers strongly adhered on the belief that ***coherency and relevance of ECE curriculum whereby content standards do not only delve on the cognitive development of the learner but also the exploration of the other domains taking learning experiences into a wide range of lessons that provide powerful adherence to a strong, firm, and long-lasting effect on the learners***. In addition, the teachers strongly believed that the coherent development of the five developmental domains should not only result acquiring macro and micro skills in Literacy and numeracy but also inculcating the value and importance of growing citizenship and strong sense of responsibility towards themselves and for others.

The research revealed that two administrators with the totality mean of 2.8 percent were **aware** of role of ECE in ESD while four (4) out of six administrators sharing the totality mean of 3.35 have raised **full awareness** regarding the important role of ECE in sustainable development.

Embedding relevant skills to ESD mainly concerned most of the administrators. It was observed that the present ECE curriculum which obviously encompass the five developmental domains requires surfacing within the core understanding of interdependence and linkage between the traditional ECE curriculum and the skills and competencies that characterize the three intersecting pillars of ESD.

Very important prevailing notion that the school administrators particularly singled out was inasmuch as ***ESD could lead the present educational system to a more pronounced lifelong learning, the regular ECE curriculum also necessitated the underpinning scaffold of social equity and justice.*** Being in accord with the timely relevance of ESD, the school administrators believed that for the ECE curriculum to be avenue of ESD, content standards across learning areas must create benefit to the learners in an equitable manner. They further concurred that the ***ECE curriculum must implicate a forward thinking inculcating among***

learners a cautious attitude that the actions and the decision they take; may it be small or big; discreet or pronounced, might have implications in the future.

Setting a new measurement of student performance was another assertion that the administrators made. They conveyed that a new form of assessment should be taken into consideration inasmuch as ECE curriculum will not only be developing skills and competencies in literacy and numeracy but also the learning dimensions that ECE in ESD contain.

The Learning Content Preferences of Parents, Teachers, and School Administrators of ESD

Outlined below are the preferences of the stakeholders in reference to what learning contents are lacking in the existing curriculum to which they thought have significance under the lenses of education for sustainable development. These preferences are discussed based on the following themes:

A. Parents

1. **Real Life Skills**
   a. Exhibit correct ways of saving
   b. Develop sense of independence at an early age
   c. Manifest open-mindedness towards criticism
   d. Accept criticism with willingness to change
   e. Demonstrate honesty and the value of truthfulness
2. **Taking care of things and saving**
   a. Show appreciation on the value of saving
   b. Demonstrate ways on how to take care the things they have; e.g. toys, school materials, clothing, etc.
   c. Exhibit ways on how to Reduce, Reuse, and Recycle in school and at home
3. **Aspects of Child development**
   a. Demonstrate abilities of being independent in doing school work and household chores
   b. Develop sense of maturity towards self and daily encounter with others.
4. **Attitudes and Values**
   a. Demonstrate love and respects towards parents and the elderly
   b. Manifest love and respect towards others in school and in the community
   c. Show empathy towards the needy and the helpless
   d. Exhibit God-like attitude
5. **Contribution to family, the country and the society**
   a. Exhibit understanding about being good Filipino citizen
   b. Acquire sense of responsibility at an early age
   c. Develop skills and abilities to become useful individual members of the family, in school, and in the community he/she belongs

B. Teachers

For ESD to penetrate the existing ECE curriculum the teachers believed that the curriculum must provide acquisition of new knowledge and new skills relevant to sustainability. They further supposed that the learners must be able to demonstrate tangible ways on the following:

1. **Care for the Environment**

a. Let the students observe garbage segregation inside the classroom during clean-up time e.g. after eating and during tidy-up time
b. Demonstrate utmost stewardship of material resources in the classroom such as old crayons, excess pad paper, art paper, colored paper, etc.
c. Value the effect of saving as one way of minimizing wastage of these material resources.
d. Exhibit good understanding of the concept of the three R's (Reduce – Reuse – Recycle) in the daily activities in and outside the classroom.
e. Experience how to plant and take care of plants in a daily basis.

2. Appreciating the beauty and Value of Human Life

a. recognize one's personal responsibilities for humankind in order to live harmoniously with everyone else at home, in school, and in the community where the learner lives.
b. overcome differences in attitudes, values, and personal beliefs brought by socio-cultural upbringing
c. accept ways on how to address obstacles in communication and cooperation either inside and outside the classroom or at home and in the community where each one lives

C. School Administrators

To make the existing ECE curriculum at par with the clamor for the inclusion of ESD, the school administrators (principals) believe that:

1. New paradigm in education

a. ensure abilities for students to act on global issues namely; climate change, human inequalities, and environment degradation
b. demonstrate willingness to innovate by maximizing one's talents and skills as his/her contribution to the quality of human capita of the society.
c. exhibit and promote simple goals of sustainable development such as care for the environments, social awareness and responsibility, etc. in school, at home and in the society.

2. Local and Global Consciousness of Learning

a. manifest the value of saving one's resources and show appreciation on the resources that the learner has
b. acquire knowledge pertaining to technology and innovations such as the use of computer and other technologies.
c. develop good communication skills as his/her armor for self development
d. follow rules and regulations in school, at home, and in the society and exhibit sense of responsibility towards oneself and others
e. manifest good relationship with classmates, members of the family, and people around the community
f. exhibit being good members of the society and good citizen of the country
g. contribute ways on how to address local and global problems that beset the environment e.g. climate change, pollution, and human inequalities

The preferences of the parents, teachers, and school administrators in curriculum content had zeroed in the value and appreciation of saving that each learner must exhibit. They believe that this generation being beset with so much materialism as the by-product of a pluralistic society seemingly were not embracing the consciousness on what would happen to

them in the future. Some parents strongly preferred that lessons on **saving** must constantly be inculcated among the young minds of the kindergarten learners.

It was also clearly manifested in the result of the formal and informal interviews that these three stakeholders do desired that lessons on how to take care of the environment, specifically, the protection and preservation of natural resources must repeatedly be inculcated among the young learners for they are the hope and the sole heir of what lies in the future.

The parents, teachers, and the school administrators with prophetic visioning also commonly believed that amidst the individualistic perception of the young learners in this modern times was the desire to produce not only graduates put persons who would totally be responsible citizens not only of the country but of the world. Thus, they also preferred that lesson pertaining to the value of good citizenship must be included in the curriculum for this will pave total reshaping of what has been regarded as fading traits on patriotism and love country. It was their belief that through the lesson on good citizenship, the spirit of nationalism will be rekindle once again on the consciousness of the young learners as the hope of the sustainable future.

While the hope for good citizenship was the avenue in achieving a sustainable society, the most important key in achieving this clamor was to include in the learning content in ECE curriculum that the kindergarten learners at a very young age must exhibit sense of responsibility towards themselves, the others, and to the society they lived in. In order to attain ESD, the very young learners must be taught to value the sense of community and shared destiny if it is our messianic aspiration to achieve the future of ESD.

CONCLUSIONS AND RECOMMENDATIONS

SUMMARY OF FINDINGS

The inclusion of the learning content of the three pillars – economy, environmental, and socio-cultural phenomenon into the existing ECE curriculum was evident in Civics. The rest of the learning areas have distinct representations. The learning contents in Science had the ***environmental dimensions*** as one of the learning areas of the curriculum, while Reading was dominated with ***socio-cultural phenomenon***. However, these pillars had not clearly occurred in Language and Math. The cognitive domain was predominantly developed by the three pillars. The Physical, Aesthetic, Socio-Emotional and Spiritual domains have not really been developed all throughout the school year.

The awareness and perception of parents from the two private schools have reached the acceptable high level; while the other three public school including one private school were not aware of the role of ECE in ESD. The awareness and perception of teachers have reached an adequate level of awareness while that of the administrators had highly escalated from awareness to full awareness. The content preferences of the parents, teachers, and the administrators generally resided on **Saving**, **Care for the Environment** particularly the protection and preservation of natural resources, the value on **Good Citizenship** and lessons that exhibit **Sense of Responsibility** towards themselves, the others, and to the other people in the society they belong.

CONCLUSIONS

It was predominantly noticeable that the three pillars in Economy, Environment, and Socio-Cultural Phenomenon were not the main concern of the existing ECE curriculum.

However, it is but important to reckon that the existing national program for ECE is designed with an adherence to a developmentally appropriate curriculum wherein holistic development of each kindergarten learner is desired.

It was manifested that the kindergarten teachers needed essential skills in integrating the five learning domains of development into their lesson in order to achieve holistic of the teaching-learning process in ECE.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made:

1. map a clear understanding on the role of ECE in ESD among the administrators, teachers, and the parents through the identification of relevant knowledge, skills, attitudes, and values (KSAVs) which are seen through the peculiar lenses of ESD.

2. raise awareness among the students, parent, teachers, and school administrators/principal of the school through a relevant curriculum mapping with the inclusion of the learning skills and competencies drawn from the content standards which are relevant to the nature of the three pillars.

3. provide trainings among preschool teachers of the distinct pedagogy on the inclusion of ESD in the existing regular ECE curriculum with the support of the school administrators.

4. conduct seminars for parents on the important role of ECE in ESD so as to holistically produce kindergarten children.

5. redirect the teaching-learning process of the kindergarten teachers to the full implementation of the three dimensions of ESD in ECE.

6. strengthen the inclusion of the dimensions of the three pillars of ESD in the integration of their characteristics to enhance the developmental domains of the kindergarten learners.

7. adapt and use the output of this study as the basis for an enhanced ECE curriculum guide.

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LIFE EXPERIENCES: AN INQUIRY OF DIVERSITY OF FLORA AND FAUNA IN SAMPUNONG BULO WILD LIFE SANCTUARY

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Abstract

This qualitative research focused on life experiences of the former forests rangers, DENR – CENRO personnel, municipal environment staff, barangay officials and residents to document the diversity of flora and fauna of Sampunong Bolo Wildlife Sanctuary at Barangay Juaneza, Sara, Iloilo, Philippines. The methods utilized were interview and checklist. In addition, the forest rangers were asked to draw and describe birds found in the sanctuary. The abundance of water source and lush vegetations, as well as fishponds and rice fields in the vicinity, are encouraging for migratory animals to dwell in the territory. This 52 hectares timberland is a paradise for a range of plants and animals species. The sanctuary represents a complete and highly diverse forest ecosystem. Looking from the distance, almost all the respondents believe that there may be unique species waiting to discover in the property. Despite the recent status of the sanctuary, forest rangers as well as environmental personnel in various agencies narrated that the spot was a roosting habitat for two species of migrating herons, such as purple and night Rufus herons. The abundance of fruit bats in the area result to fruit bearing trees because of seed dispersal. Also, cheerful and lively local birds, and elongated and legless snakes were also everywhere. Furthermore, there were almost 17 species of trees in the sanctuary. In the current condition, we are losing the beauty and diversity of the paradise once we treasured. Thus, the local government unit with the help of DENR and other stakeholders must regulate policies as well as programs and projects to help refurbish the biodiversity of the Sampunong Bolo.

Keywords: Diversity, Flora, Fauna, Sanctuary, Wildlife, Migratory, Endemic

Introduction

Hidden within the vicinity of the heart of Municipality of Sara in the 5th District of Iloilo is a nature preserve. This is called Sampunong Bolo Wildlife Sanctuary or formerly known as Sampunong Bolo Birds Sanctuary at Barangay Juaneza is 52 hectares timberland consist the variety of plants and animals species. See Figure 1. The place was named Sampunong Bulo because of the abundance of *Bambusa levis Blanco* or synonyms to *Gigantochloa levis* which is locally called "Bolo". Bolo is a very thin bamboo that grows in the midlands.

The northern part of Iloilo is famous for the vast scenery of marine and upland ecosystems. These natural resources become the subject of different researches of agencies such as education, environment, and others. Specifically, NIPSC as the lone college in the district has conducted various studies on the ecosystem.

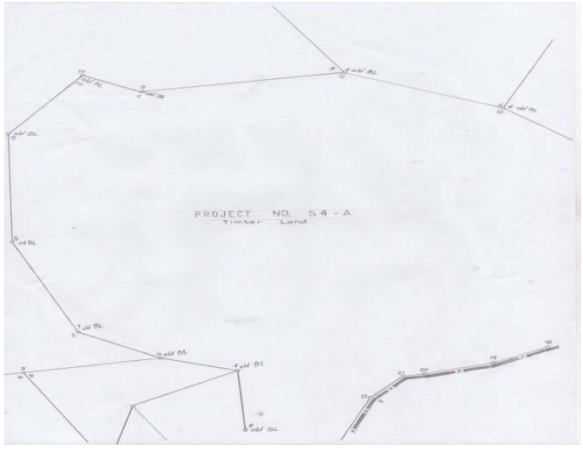

Figure 1. Blueprint of Sampunong Bolo, Brgy. Juaneza, Sara Iloilo.

For instance, Billones, Alpasan, Tupas, and Clarito (2016) studied about the economic valuation of seagrass ecosystem services in Islas de Gigantes, Carles, Iloilo. The result showed with the 7 species of seagrass in 140 hectares has a total economic value of P22,959,256.61. Thus, the local government unit has to maintain the sustainability of the seagrass ecosystem in Islas de Gigantes

According to Bontia, Laguda, Suerte and Clarito (2016) the results of their studies in economic valuation of 9.5 hectares of coral reef in three barangays of Sicogon Island. They have stated that coral reefs are one of the most valuable resources in the island because they provide livelihood to the community.

In Siccogon, there were 318 species of plants were recorded in the study area. These include species of 252 trees which 32 are endemic in Panay, herbs, vines and lianas. About 7 families and 21 species of herpetofauna were also recorded. Six species of frogs, 1 toad, 4 skinks, 6 geckoes, 1 varanid and 3 species snakes were also documented (Pedregosa et al, 2006).

In terms of Sampunong Bolo, there were no papers describing the status of the property. There were studies being formulated in the past years but never documented. These motivated the researchers to facilitate this study to help inform the community of the importance of this haven.

The main purpose of this study was to documents the flora and fauna in Sampunong Bolo Wildlife Sanctuary as the baseline of further study in the future.

Methods

This study was a qualitative research concentrated on the life experiences of the informants. A survey questionnaire and an interview were the main methods of the study. In addition, some informants were asked to describe the birds found through drawings. Informants were former forest rangers, Department of Environment and Natural Resources (DENR) and Community Environment and natural Resources office (CENRO) personnel, municipal environmentalists, barangay officials and residents of Barangay Juaneza, Sara, Iloilo, Philippines.

Results

Remembering the Local a Migratory Birds. Samponong Bolo as bird sanctuary is the home of migrating herons during winter and some local birds.

All the informants exposed;

"The common name of these heron is "*Duag"*. This is the unique features of the sanctuary ten years ago."

Interrupted by CENRO staff during the first interview;

"This haven was famous long ago because of the migratory herons."

According to one of the Forest Ranger;

"They find a safe place to sleep and enter it secretively so that predators don't see. They used the sanctuary as a roosting place. They nest in large colonies in every tall tree in the spot."

Personnel from the Regional Office of DENR divulged;

"As well as the area is hillside and the water reservoir was overflowing. They were resting for almost 6 months from October to March."

Another forest ranger revealed;

"There were two species of heron found migrating and feeding on milkfish and tilapia or even shrimps and crabs from different fishponds in the surrounding area. We can always saw heads and bones of these fishes under the trees when we roamed around the vicinity. This is one of the reasons why fishpond owners and caretakers hated these species of herons."

Opportunistic feeders according to Coral Reef Information System (2014) is a species adapted for consuming variable, unpredictable or transient environments to obtain food.

Confirmed by CENRO personnel who conducted a thorough survey of the area;

"We recorded Rufus night and purple herons as migrating birds in the sanctuary. They wandered due to many fishponds located within the surrounding area of the refuge place."

Also, a personnel from DENR who have an experienced with Sampunong Bolo as surveyor for ten years uttered;

"We often saw an elongated purple heron."

The scientific name of this purple heron is *Ardea pupurea Linn.* The suitable name for vibrant looking heron is Garza imperial (Spanish Name) or translates as the 'imperial heron'.

This bird is a very elongated, narrow-bodied and identified as long thin head and bill long neck measured around 78 – 90 cm. in length; thus, the appearance is so regal. The weight is almost between 525 – 1345 grams. It also has extended toes. The kinked, snake-like neck is coiled into an s-shape when in flight (del Hoyo et al 1996).

Purple heron has a very varied diet consisting of fish, salamanders, frogs, insects, crustaceans, spiders, mollusks, small birds, mammals, snakes and lizards (Robinson 2005). According to del Hoyo et al (1996), they hunt by hiding in vegetation and waiting motionless until prey approaches.

A retired environmentalist exposed;

"The purple heron is medium or dark gray. The head and neck and breast were orange. The legs and feet are brown in front and yellow at the back. In addition, during courtship, the soft parts become orange to red."

See Figure 2.

Figure 2. Illustration of purple heron according to the informant

However, one staff from the Municipal Planning and Development Office of Municipality of Sara exposed;

"The purple heron vanished ten years ago because of human activities, like firing, hunting, and the area were used for housing site of the community. Today, seldom you can see migratory birds in the vicinity."

Also, worker from CENRO explained;

"They are starting they prohibit people from disturbing the habitat. They will soon make it as protected area as well eco-tourism destination."

Based on another official of the barangay;

"We often heard gun shoot in the area, then these birds start to fly in hordes in the sky. They are almost covering the entire sanctuary, herons of various colors. They were disturbed, they hated loud sounds. After this various incidents, little by little the herons begin to vanish. Nowadays, seldom you can see these herons roosting in the big, tall and green trees in the sanctuary."

According to DENR personnel;

"I often saw a nocturnal Rufus night-heron. They are stout, medium-sized with a short neck. Also, they have relatively short, thick beak and easily identified by its black cap and its reddish-brown back, tail, and wings."

In addition, another informant added;

"The under parts of this heron are white, its face and neck are whitish with a reddish-brown wash, and there may be a white line around its eye and the undersides of the wings are white, with cinnamon-brown flight feathers."

See Figure 3.

Based on Hancock and Kushlan (2010), the Rufus night-heron (*Nycticorax caledonicus*) is known as the nankeen night heron. The adult Rufus night-heron is easily identified by its black cap and its reddish-brown back, tail, and wings (Burton and Burton 2002). This bird is largely nocturnal, feeding at night and roosting by day in dense vegetation in large groups (Hancock and Kushlan, 2010).

Figure 3. Illustration of Rufus night heron according to the informant.

This heron feeds on from fish, amphibians, insects, and their larvae, mollusks, and crustaceans such as crayfish, crabs and shrimps as well as the eggs and chicks of other birds, and will even take mice and newly hatched sea turtles or even on refuse at rubbish dumps during daylight hours. But during breeding seasons, they are responsible for collecting enough food for its chick. In addition, this species typically feeds by standing motionless or walking slowly through water before rapidly striking at prey with its beak (Mckilligan 2005).

The breeding of this herons depends on rainfall and availability of food. Thus, they usually run in flocks from October to March in Australia; February to May in the Philippines; and February to June in Java (Kennedy et al 2000).

Further, informants also said;

"The locals hunted for herons as *puluta* or appetizers during drink sessions with friends and relative. They love to eat the meat of these migrating birds; it similar to chicken."

Another species of bird found in the sanctuary is the "*Maya*" or the Black-headed Munia. See Figure 4. This is not actually endemic in the Philippines but also found in

Europe and Asia with the Official name is Eurasian Tree Sparrow or *Passer montanus.* Formerly the national bird of the Philippines is also known in the country as Chestnut Munia (*Lonchura atricapilla* or *Loncura atricapilla jagori*).

Figure 4. Illustration of *Maya* according to the informant.

Revealed by the Forest Ranger;

"They are everywhere in the area; you could even hear them making sounds."

Also, CENRO worker exposed;

"These birds are local in the place. They flocked in the trees during day time. They were flying to search for food."

In addition, residence from the area narrated;

"I saw "*Tulamis*" flying in the sky and often hearing a bubbly call of "*Murugmon*" during might time."

Tulamis is a local name for Yellow-vented Bulbul with a scientific name *Pycnonotus goiavier*. This is a species of bird in the Pycnonotidae family. It has a slight black crest and masks on an otherwise white head. Brown upperparts, pale underparts, yellow vent.

A Barangay official stated;

"Human intervention such as using the area for trekking as a hobby, hunting, and land conversion are the reasons that these animals were disappeared in the sanctuary."

While "*Murogmun*" or the Grass Owl is a medium-sized, ground-dwelling bird (35 cm) with a facial disc typical of the Tyto owls. The upperparts are dark brown, buff, and yellow-orange, with fine silvery spots. Under parts are white with the male, and buffy in the larger female, with sparse dark spots. The long legs are mostly bare and in flight protrude well beyond the tail, distinguishing the Grass Owl from the similar Barn Owl. When roosting the posture is tall and upright.

See Figure 5.

Figure 5. Illustration of the owl according to the informants

Crawling Snakes. The result showed that there were also various species of snakes dwell in the area. Informants enumerated, such as the yellow snake, "*magkal*", and "*dahon-dahon*".

There is no species called yellow snake. This can be applied to several different snake varieties such as, yellow rat snake from the colubrinae family or the ball python from the pythonidae family.

The green tree python is generally lime green in color. However, hatchlings are born orange or yellow. While most darken as they age, some remain yellow their entire lives. One distinct identifying characteristic of this snake is its particular way of resting on a tree branch. It will often coil itself around a tree branch in the shape of a saddle while resting its head in the middle at the hilt.

Barangay Official tells his story and experiences in Samponong Bolo;

"I often saw a reticulated python in the area. But I haven't seen them now."

A Community Environment and Natural Office personnel in San Dionisio declared;

"One residence caught a reticulated python and surrender by a local will always be returned in the sanctuary to increase their population."

Dwelling Bats. The mammalian fauna of the Philippines specifically a large proportion of bats in the order of Chiroptera is considered to be one of the most species-rich in the world (Heaney 1993; Heaney et al. 1998). The threats to these species are a loss of foraging habitat from ongoing destruction and degradation of forests as well as hunting (Mickleburgh et al. 1992; Mendoza & Mallari 1997; Hutson et al. 2001). Prior to 2001, it was thought to be extinct, but its rediscovery brought to attention the urgent conservation actions that had to be taken (http://pbcfi.org.ph., 2014).

See Figure 6.

Figure 6. Illustration of fruit bat according to the informant.

According to the local ranger;

"Fruit bats were everywhere; they have big eyes to help see at night."

A local resident believed;

"This vampire eating fruit is also called flying foxes. These flying little creatures are nestling at big trees in the sanctuary."

These endangered species with a great vision can almost cover the entire sky if there soar in the group (Piccio 2015). This vision in conjunction with their sense of smell helps them to find the source of food as well as from danger situation.

Furthermore, MENRO Coordinator stated;

"They are the one responsible for the two fruit trees growing on the property."

Furthermore, residence affirmed;

"They slept on the trees during day time and sought for food at night time."

Long Swaying Bamboo. Bamboo plays an essential role in the daily life of millions of people in subtropical and tropical regions.

According to one of the barangay official;

"The name of Sampunong Bolo came from one of the species of bamboo found in the area. We could see them everywhere; thus the local called the haven as Sampunong Bolo."

Also, narrated by another official;

"*Bolo"* is commonly used for construction."

Natural Growing Trees. Based on the conversation with the informants, there were various species of trees found in the Sampunong Bolo.

Uttered by an informant;

"Seeing Sampunong Bolo from the distance, you can see lush forests with different organisms residing in the area. There were big and tall trees everywhere. The plants are healthy and it's really convincing for wandering animals to migrate and roost in the sanctuary."

The Forest Ranger also confirmed;

"There were Marang and Star Apple trees in the area; this is due to some bats that are dwelling in the spot. This is because of the seeds are eaten by the bats. Thus, this process is now called seed dispersal."

Seed dispersal is a common movement of seeds away from the parent plant so that there is less competition. This process often occurs in animals that are feeding on fruits. For instance, the succulent fruits which contain seeds with indigestible coats which allow the seeds to pass through the animal undamaged are being released during waste disposal.

Other plants produce their seeds inside fleshy fruits that then get eaten be animals. The fruit is digested by the animal, but the seeds pass through the digestive tract and are dropped in other locations. Some animals bury seeds, like squirrels with acorns, to save for later, but may not return to get the seed. It can grow into a new plant. Plants make seeds that can grow into new plants, but if the seeds just fall to the ground under the parent plant, they might not get enough sun, water or nutrients from the soil. Because plants cannot walk around and take their seeds to other places, they have developed other methods to disperse (move) their seeds. The most common methods are the wind, water, animals, explosion, and fire.

Municipal staff also divulged;

"During the administration of our former municipal mayor, we have tree planting activities in the asylum. We are encouraged to rehabilitate the area to allow the next generation to see the beauty of the sanctuary. This is also to encourage migrating animals to dwell again in the natural ecosystem."

Butt in by a resident;

"Aside from trees, there were plentiful of flowering plants. You can also find fungi and algae in the sanctuary due to the condition of the forest."

Confirmed by a staff of CENRO;

"Yes, we are still in the process of naming all these organisms in the sanctuary. There was a proposal to make it as protected area. But as of the moment, no directive from the regional office regarding this proposal; thus, we are just ready to help Sampunong Bolo in our own capacity."

Discussion

The findings of the study exposed that the spot has rich biodiversity both flora and fauna. The continually high temperature and incessantly high humidity make this diverse flora and fauna possible. The abundance of water supply also helps the organisms survive in the ecological unit.

The 52 hectares timberland revealed that it composed of new and old trees that will provide adequate forest structure and biodiversity. The forest composition has almost 17 species of plants, two of them were due to seed dispersal, others were endemic in the areas and some were planted to rehabilitate the sanctuary by the Local Government Units as well as the Department of Environment and Natural Resources specifically the regional and district offices. Also, the Municipality of Sara together with other stakeholders organized a tree planting activity at the area to assist the rehabilitation of the complex interaction among various components, preservation of its natural balance and care of it to ensure its wellbeing.

Aside from that, there were also various plant species in the area. This needs proper attention to help identify these organisms. There were flowering plants, different fungi, and algae as well as bush and grasses. In this connection, further study is recommended to fully understand the diversity of the sanctuary. This is very important to make awareness and to encourage locals as well as visitors the exquisiteness of the only sanctuary left in the northern part of Iloilo.

There were also migratory species such as herons since fishponds were everywhere within the area but nowadays for almost ten years seldom you can see heron roosting in the trees. The owners of fishponds were so angry since the purple herons feed on fishes and bats for the reason

that fruit trees were also found in the sanctuary. There were different species of colorful insects, unique sound of gecko and quite crawling snakes were also rich in the sanctuary.

This showed that Sampunong Bolo had a great potential as a home of Panay's local flora and fauna. The diversity of area as well as the neighboring ecosystems also encouraged various migratory animals.

But because of human intervention, the property was affected. There were no purple and Rufus night herons found in the sanctuary; they were the subject of hunting by the locals for *puluta* (appetizer) as well as food. However, based on some conversations with the forest rangers it was found that fishpond owners were very upset because the two migratory birds were carnivorous.

Table 1. List of Trees Found in Sampunong Bolo Wildlife Sanctuary

Scientific Name	*Local Name*
Ficus pseudopalma	Niog-Niogan
Pterocymbium tinctorium	Taluto
Nauclea orientalis	Bangkal
Ficus benjamina	Salisi
Caesalpinia sappan	Sibukao
Pterocarpus indicus	Narra
Gmelina arborea	Gmelina
Artocarpos odoratissimus	Marang
Swetenia macrophylla	Mahogany
Paralstonia clusiacea Baill.	Tangitang
Alyxia concatenate (Blanco) Merr	
Pterocymbium tinctorium	Taluto
Nauclea orientalis	Bangkal
Gliricidia maculate (Kunth)	Madre de Cocoa
Chrysophyllum cainito	*Kaymito*
Ficus balete	
Quisqualis indica	*Niyog- niyogan*
Polycias nodesa	Malapapaya
Livistona rotundifolia	Anahaw

Recommendation

The local government unit played a significant role in preserving and protecting the sanctuary. They should create projects and programs, and policies to help rehabilitate as well as guard the spot. They must regulate the visitors and tourists coming to see the beauty of the sanctuary.

Together with other stakeholders such as Department of Environment and Natural Resources (DENR) with close contact with Community Environment Natural Resources Offices and partnership with non-government organizations to share responsibility for enforcement to save the property from damage caused by human intervention as well as natural calamities. DENR and CENRO will continue to give projects such as tree planting and to restore the territory to promote wandering species to reside and to roost in the forest.

Also, the education sectors must be obliged to include in the curriculum of basic education as well the tertiary level to educate the youth of the importance of helping our ecosystem. Sampunong Bolo Wild Life Sanctuary has a great potential to restore its natural beauty and resources.

Furthermore, the diversity of flora and fauna can be the resources of livelihood programs among the locals. The place can be utilized as eco-tourism destination to show to them that this place has great potential for income generating; thus, they need to safeguard all the organisms found in the sanctuary.

The LGU together with the stakeholders must regulate programs or projects on how to prevent herons from feeding on fishpond products, like creating scarecrows or any materials that will fright them from eating milkfish or tilapia.

Signage must also be placed in the sanctuary such as prohibiting hunting; disturbing habitat; or just saying this is a protected area. The penalty will be given to those who are not following policies or ordinance of the municipality regarding Sampunong Bolo Wildlife Sanctuary. In this

way, the people will be educated that the Municipality of Sara is really concerned about the different living things in the ecosystem.

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Making Healthcare Green: The Role of Cloud, Green IT, Data Science, Big Data, and Analytics

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Abstract:
This paper presents practical information on how green healthcare (whose major sub-segment is "hospitals") can contribute to solving the Climate Crisis by adopting Green IT practices. The recent UN Climate Agreement on reducing carbon emissions reached in Paris during December, 2015, helps continue to raise awareness to the need to reduce electricity use through efficiency.

Globally, the healthcare sector is growing in importance and plays a key role in world economics. The healthcare sector makes heavy use of technology, including social media. Technological advances have revolutionized the healthcare industry worldwide – from modern testing techniques to improved surgical equipment, remote health monitoring technologies with the help of modern digital equipment, etc. There are many online healthcare portals. The complexity of the healthcare industry helps account for the large environmental footprint. Healthcare accounts for 8% of the U.S. carbon footprint.

The environmental impact of the healthcare sector has also become an important factor globally and is continuing to draw the attention of government regulators everywhere. The energy use of the healthcare sector is growing due to many factors, including the rapid growth and adoption of Information and Communication Technology (ICT) in healthcare. The new IT technologies and applications used in healthcare include 'cloud computing', 'mMedicine', i.e. 'mobility in Health', eHealth, and tele(health) care for 'remote delivery of healthcare services'. In general, the healthcare industry needs to reap the benefits of emerging technologies such as data science, Big Data, Analytics, mobile computing, and cloud computing to help solve the ever growing operating cost problems.

This paper gives examples of how Data Science, Big Data, Analytics, and Cloud Technology can be used in healthcare to significantly improve a hospital's IT Energy Efficiency along with information on the best ways to improve energy efficiency for healthcare in a cost effective manner.

Keywords- healthcare; data science, Big Data, analytics, carbon footprint; mobile computing; cloud computing; protected health information; Green IT; HIT.

1. Introduction

Climate change is a big issue. It has been discussed and continues to be discussed in major forums across the world. This paper presents practical information on how green healthcare (whose major sub-segment is 'hospitals') can contribute to solving the Climate Crisis by adopting Green IT practices. The paper significantly extends the concepts on the steps needed to make healthcare green discussed in a previous paper [1]. Since the climate crisis and the healthcare crisis are two of the most significant problems for our society, this paper also indicates the ways that green healthcare can help in reducing energy use, costs, and carbon footprint.

Healthcare is growing in importance worldwide and plays a key role in world economics. The healthcare sector makes heavy use of technology including social media. Technological advances have revolutionized the healthcare industry worldwide – from modern testing techniques to improved surgical equipment, remote health monitoring technologies with the help of modern digital equipment, etc. There are many online healthcare portals. The complexity of the healthcare industry helps account for the large environmental footprint. Healthcare accounts for 8% of the U.S. carbon footprint. And the rest of the globe is similar, e.g. the health sector is responsible for 7% of carbon emissions from all buildings in Australia [16].

The energy use of the healthcare sector is growing due to many factors, including the rapid growth and adoption of Information and Communication Technology (ICT) in healthcare. The new IT technologies and applications used in healthcare include 'cloud computing', ‘mMedicine’, i.e. ‘mobility in Health’, eHealth, and tele(health) care for ‘remote delivery of healthcare services’. In general, the healthcare industry needs to reap the benefits of emerging technologies such as data science, Big Data, Analytics, mobile computing and cloud computing, along with the use of Health Information Technology (HIT) to help solve the ever growing operating cost problems. A big challenge facing the healthcare sector is how best to improve the energy efficiency and sustainability of this very complex system. Efforts over the past few years to analyze and create highly efficient data centers presents an excellent opportunity for cost effective Green IT at hospitals. Typical functional area-wise energy consumptions and carbon emissions of a hospital are presented in Table 1.

Functional Area of Use	***Energy Consumption***	***Carbon Emissions***
Ward	1,350	293
Surgery areas	844	268
Back area	619	176
Consulting areas (consulting rooms etc.)	510	166
Administration & Office blocks	474	154
Corridors (24hrs)	349	95

Table 1. Hospital Functional Area-Wise Energy Consumption and Carbon Emission

Note - the carbon emissions were calculated using the following Scope 3 emission factors: 1 Kwh electricity = 1.35 kilograms CO2-e and 1 GJ of gas = 55.7 kilograms CO2-e

Source: Calculating a Hospital’s IT Energy Efficiency and Determining Cost Effective Ways for Improvement, Nina S. Godbole, Dr. John Lamb, CEWIT 2014

The healthcare sector has grown to be quite complex [7], [8]. The sector is in need of a significant increase in green IT operations [9], [10]. The emerging question now is how the sector can benefit from the use of Cloud, Green IT, Data Science, Big Data, and Analytics and this is the focus of this paper.

2. Cloud Computing and Green Healthcare

The most-significant step most organizations can make in moving to green healthcare is to implement virtualization for their Information Technology (IT) data center devices. The IT devices include servers, data storage, and clients (or desktops) used to support the data center. There is also a virtual IT world fast becoming reality - via private cloud computing – for most of our data centers. Although the use of cloud computing in your company's data center for mainstream computing may be off in the future, many steps towards private cloud computing for mainstream computing within your company are currently available. Server clusters are here now and being used in many company data centers. Although cost reduction usually drives the path to virtualization, often the most important reason to use virtualization is IT flexibility. The cost and energy savings due to consolidating hardware and software are very significant benefits and nicely complement the flexibility benefits. The use of virtualization technologies is usually the first and most important step we can take in creating energy efficient and green data centers.

A. Reasons for Creating Virtual Servers

Consider this basic scenario. You're in charge of procuring additional server capacity at your hospital's IT operations. You have two identical servers, each running different Windows applications for your company. The first server – let's call it Server A – is lightly used, reaching a peak of only 5% of its CPU capacity and using only 5% of its internal hard disk. The second server – let's call it Server B – is using all of its CPU (averaging 95% CPU utilization) and has basically run out of hard disk capacity (i.e. the hard disk is 95% full). So you have a real problem with Server B. However, if you consider Server A and Server B together, on average the combined servers are using only 50% of their CPU capacity and 50% of their hard disk capacity. If the two servers were actually virtual servers on a large physical server, the problem would be immediately solved since each server could be quickly allocated the resource each needs. In newer virtual server technologies - e.g. Unix Logical Partitions (LPARS) with micro-partitioning – each virtual server can dynamically (instantaneously) increase the number of CPUs available by utilizing the CPUs currently not in use by other virtual servers on the large physical machine. This idea is that each virtual server gets the resource required based on the virtual server's immediate need.

3. Green IT and Green Healthcare

The dominant Green IT practices in healthcare are:

1. the use of Electronic Medical Records (EMRs)
2. Telemedicine
3. virtualization of servers used in the healthcare sector
4. virtualization of desktops used in healthcare related offices
5. virtual collaboration

In an analysis that was done in 2011, it was estimated that EMRs have the potential to reduce carbon dioxide emissions by as much as 1.7 million tons across the United States. The same study, looked at 8.7 million users to reveal that using an EMR avoided the use of 1,044 tons of paper for medical charts annually. The result was a positive net effect on the environment. It is important to note here, that although the two terms EMR and EHR (Electronic Health Record) are used interchangeably, there is a difference between the two although they both are related. EMR (Electronic Medical

Record) is an application environment constituting the clinical data repository, clinical decision support, controlled medical vocabulary, order entry, computerized provider order entry, pharmacy, and clinical documentation applications. Such an environment supports patient's electronic medical record across in-patient and out-patient departments. Healthcare practitioners use it to document, monitor, and manage health care delivery within a care delivery organization. EHR is a subset of EMR. The two hold a symbiotic relation in that - EHRs are reliant on EMRs being in place, and EMRs will never reach their full potential without interoperable EHRs in place. It is essential to understand this difference between the two.

Telemedicine is not a new practice; it has existed for more than two decades; it is just that its benefits are just now coming to the fore, especially in rural communities. When people can do without driving all over for specialist referrals and similar activities, in addition to bringing down the level of gas emissions, telemedicine can be used to better manage chronic diseases; improve the care of elderly, homebound, and physically challenged patients; and improve community and population health.

4. Data Science and Green Healthcare

One of the complexity dimensions for healthcare is the massiveness of the data generated. In 2012, the estimated size of the data generated by worldwide digital healthcare was 500 petabytes. By 2020, healthcare data is expected to reach 25,000 petabytes [11]. The essential question is 'can Big Data and Data Analytics used by healthcare help it learn from the past to become 'smart' in the future?" There is already a thought on moving from 'treatment-based practices to 'outcome-based' practices. If people do not get the cure in spite of the huge amount of money spent on IT in healthcare, then it is a losing battle for the sector.

A. Data Science & Big Data

The field of 'Data Science' has grown phenomenally during the past few years. Over the past ten years or so, there has been a tremendous increase in the amount of data available for analytical purposes. Figure 1 depicts at a broad level how big data analytics is used in healthcare.

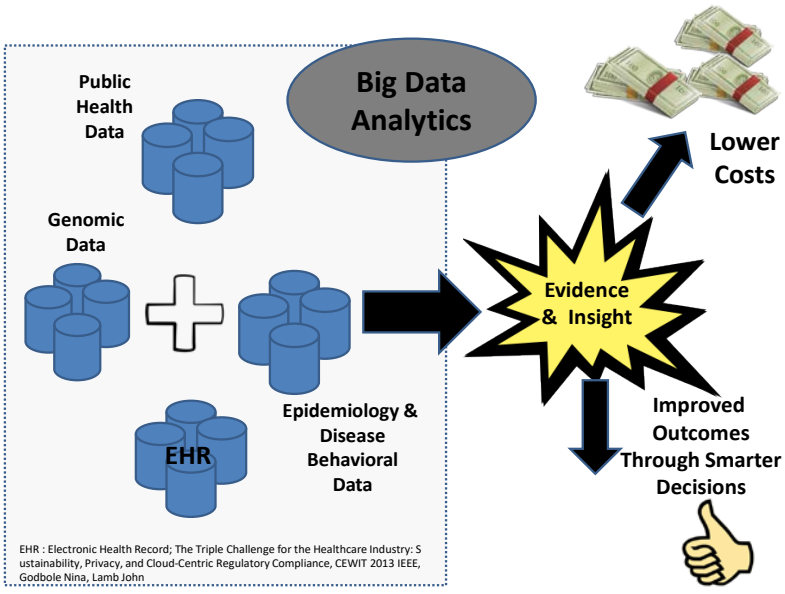

Figure 1. How Healthcare uses Big Data Analytics

According to the IDC definition, Big Data is about a new generation of technologies and architectures designed to extract value economically from very large volumes of a wide variety of data by enabling high-velocity capture, discovery, and/or analysis. Big Data are high-volume, high-velocity, and/or high-variety information assets that make it mandatory to use new forms of processing and technologies to facilitate improved decision making, insight discovery and process optimization. Data Science deals with the mining of knowledge from large volumes of data that are both structured as well as unstructured. In this sense, “data science” can be considered as a continuation of the field of data mining and predictive analytics, also known as knowledge discovery and data mining (KDD). "Unstructured data" can include videos, social media, emails, photos, and other contents generated by users. Big Data are multidisciplinary in nature and that presents many challenges in their handling. While ‘Big Data’ is not new; the tools used to handle it are.

B. The relation between Cloud and Big Data

There is a symbiotic relationship between cloud computing and big data – cloud computing resources are needed to support the storage projects that involved analysis of big data and moving to cloud-based computing becomes a business case for big data. As explained in the previous section, data scientists are required for analysis of big data. Thus, data science is the analytical “glue” for big data and its underlying cloud environment.

C. An Overview of “Analytics" and Healthcare Data Complexity

The main sources and techniques for Big Data in Healthcare are:

1. structured EHR data (electronic health records)
2. clinical notes that are unstructured
3. medical imaging data
4. genetic data
5. other data sources

Other data sources include, for example, Epidemiology & data on diseases’ behavior. Given the complexity of healthcare data (including the fact that it involves “Big Data”), the challenges in analytics include but are not limited to: data search, data capture, data storage, data sharing and data analysis. Another dimension to the complexity of healthcare data analytics comes due to greater impetus and imperatives for adoption of electronic health records technology (EHRs) in hospitals the emerging trend in the medical practice whereby the move is from ad-hoc and subjective decision making to evidenced based medicine [12], [13], [14] (EBM); which is aimed at bringing Big Data to the healthcare consumer; leading organizations such as IBM are playing a lead role in such initiatives. Analysis of health data reveals trends and knowledge, which at times reveals contradictions to medical assumptions, which in turn, causes a shift in ultimate decisions that would better serve both patients and healthcare enterprises. Thus, in the data-driven age of today, healthcare is making a shift from opinion-based decisions to informed decisions based on data and analytics. There are a few more drivers that cause growing complexity and abundance of healthcare data, which have, in turn, in an advanced role of data analytics in healthcare:

1. new technologies such as capturing devices, sensors, and mobile technologies have developed
2. ease of and drop in cost of collection of genomic information
3. rise in digital forms used for patient social communications
4. greater accumulation of medical knowledge and discoveries

5. The Role of Big Data and Analytics in Healthcare

Our literature study on healthcare in which we engaged in as part of our research in the domain is based on more than thirty dimensions of healthcare.

A. Current Challenges in the Healthcare Domain

Research shows that, worldwide, healthcare has three major challenges; Cost, Quality and Reach i.e. (1) How to contain treatment and operative costs, (2) How to improve the quality (improve diagnostics, better outcomes from patient treatments) and (3) How to extend the reach of healthcare services.

B. Using Big Data to the Benefit of Healthcare

A number of possibilities exist for reaping the benefits of 'big data' for healthcare. A major one is about increasing Adoption Rates for Electronic Medical Records. EMR is one of the major challenges in the healthcare domain; there are nine elements of a "usable" EMR; (1) simplicity, (2) naturalness, (3) consistency, (4) feedback, (5) effective use of language, (6) efficient interactions (among the relevant stakeholders), (7) effective information presentation, (8) preservation of context and (9) minimum cognitive load. Potential areas are - exploiting EMR (electronic medical records) for enhancing 'evidence-based medicine practices and exploiting medical data to intervene earlier. Figure 2 presents a schematic view on the role of the data analytics tool in healthcare for patient treatments.

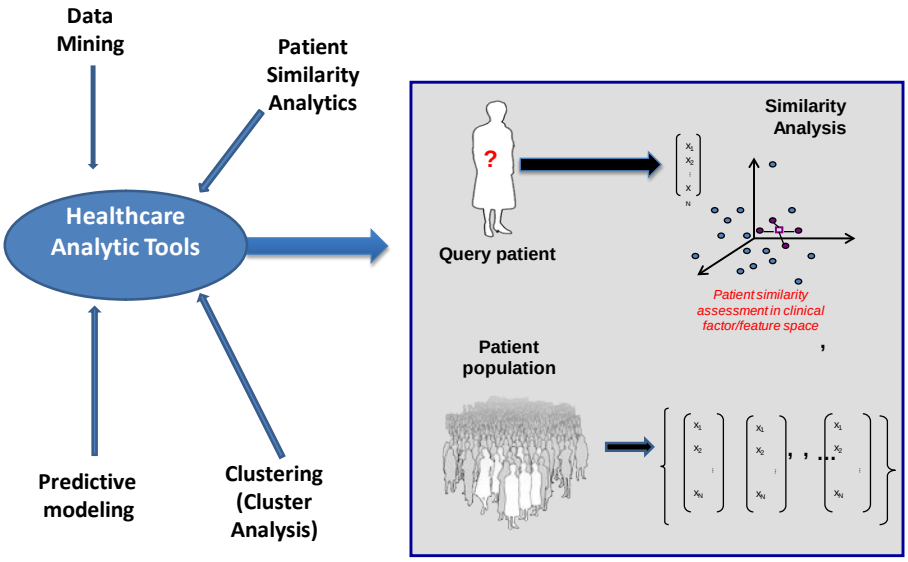

Figure 2. Big Data Analytics in Healthcare

Source: Adopted from 'Visual Analytics for Healthcare: Big Data, Big Decisions', David Gotz Healthcare Analytics Research Group IBM T.J. Watson Research Center

Regarding 'early intervention', a number of challenges exist. Here are some aspects of those challenges – the scale is large: typically, up to 10s of millions of patients, high dimensionality involved: there are thousands of dimensions spanning many years, the reference data required is semi-structured: there are clinical notes which need to be integrated as EHR (electronic health records) and EMR (electronic medical records), medical imaging, and medical codes. In addition, these data are geographically distributed: involving multiple providers and multiple representations.

Over and above this, there are task challenges; there is a need to take critical decisions: else it may literally mean life or death, there are no clear 'right answers': medical evidence is often ambiguous, there is limited time: medical professionals need to manage complexity, multiple granularity, domain experts are humans and as such, they are limited by the best of their abilities. Patients show up in

periodic visits and the data generated is different for each patient. There are uncertainties as well: subjective, data entry errors, bias for billing Incomplete. Often some items could be missing from the medical record – the challenge of there not being integrated EMRs (electronic medical records).

6. Using Green IT and Data Science to Make Healthcare Green

Server virtualization still remains one of the most common ways organizations are going green. Server virtualization in the data centers of the health industry provides an opportunity for reducing the number of physical servers used. This, in turn, brings down physical hardware costs and the data center's carbon footprint. A report by The 451 Group titled “Eco-Efficient IT” [14] found that each server eliminated through virtualization can reduce power consumption in a data center by up to 400 watts, which is the equivalent of about $380 per year, per server.

Desktop virtualization not only lowers energy costs – it can also increase productivity and decrease capital expenses on PC hardware. Information technology supports thin-client computing by centralizing management of all user desktop environments on a single platform. Forrester Research published a report in 2009, based on a research project they had undertaken to compare thin clients to desktops. It was found that thin clients consume between five and 60 watts per device, compared to the 150 to 350 watts used by a desktop PC.

Virtual Collaboration provides a number of opportunities for “greening” healthcare – IT supports Web conferencing, instant messaging. There also are many software applications to promote virtual collaboration. By using virtual meetings and other collaborative efforts, travel and other expenses are cut dramatically. The effective use of virtual collaboration increases efficiency and enables employees to access information and applications anywhere at any time; this collaborates well with the adoption of EMR and EHR in hospitals. As an added benefit, using this technology can increase productivity and teamwork.

Here are some specific ways to use green IT and data science to make healthcare green:

A. Implement Efficient Applications and Deduplicate Data

Software and application efficiency can be very significant for green IT. The author has had recent experience where the procedure for creating a data warehouse report was reduced from eight hours to eight minutes merely by changing the Oracle data warehouse search procedure (e.g. don’t search the entire database each time when only a much smaller search is required). During the eight hours required to create the report, the large server was running at near peak capacity. Sure, that type of significant application inefficiency has been created and fixed many times over the history of programming. But what about the cases where a few application efficiencies will make an application run 20% faster”? That 20% more efficient application will also result in 20% lower energy use. The steps required to improve application efficiency by a few percent are often not easy to determine. However, the added incentive of saving energy – while making the application run faster - is a significant plus.

Data-storage efficiency, such as the use of tiered storage, is also very significant. Data deduplication (often called "intelligent compression" or "single-instance storage") is a method of reducing storage needs by eliminating redundant data. Only one unique instance of the datum is actually retained on storage media, such as disk or tape. Redundant data are replaced with a pointer to the unique data copy. For example, a typical email system may contain 100 instances of the same one-megabyte (MB) file attachment. If the email platform is backed up or archived, all 100 instances are saved, requiring 100 MB storage space. With data deduplication, only one instance of the attachment is

actually stored; each subsequent instance is just referenced back to the single saved copy. In this example, a 100 MB storage demand can be reduced to only one MB.

Data deduplication offers other benefits. Lower storage space requirements will save money on disk expenditures. The more efficient use of disk space also allows for longer disk-retention periods, which provides better recovery time objectives (RTO) for a longer time and reduces the need for tape backups. Data deduplication also reduces the data that must be sent across a WAN for remote backups, replication, and disaster recovery.

Data deduplication uses algorithms to dramatically compress the amount of storage space needed. Many organizations are dealing with increased scrutiny of electronically stored information because of various regulations; this need to preserve records is driving significant growth in demand for storing large sets of data. Depending on the type of information being compressed, deduplication can enable a compression rate of between 3:1 and 10:1, allowing businesses to reduce their need for additional storage equipment and associated tapes and disks. Many businesses are already using the technology.

B. Use Data Analytics to Help Make Healthcare Green

Six Sigma is a set of techniques and tools for process improvement. There techniques, originally developed by Motorola in the 1980s are being used by many industries throughout the world. The Six Sigma steps applicable for Green IT and sustainability [17, 18] are:

1. Define
2. Measure
3. Analyze
4. Improve
5. Control

These five steps are similar to the five step process that IBM has used for several years for creating energy efficient “green” data centers: 1) diagnose, 2) manage & measure, 3) use energy efficient cooling, 4) virtualize, and 5) build new or upgrade facilities when feasible. Details on using the six sigma steps for green IT are given below.

1. Define the Opportunities and Problems (Diagnose)

The step here is to do a data-center energy-efficiency assessment. The assessment should include a list of unused IT equipment that can be turned off. In addition, the diagnostic phase can help encourage organizations to retire unused software applications and focus on adopting more effective software that requires fewer CPU cycles. A typical x86 server consumes between 30% and 40% of its maximum power when idle. IT organizations should turn off servers that don't appear to be performing tasks. If anyone complains, organizations should look into whether the little-used application can be virtualized. Check with your electric utility. Some utilities offer free energy audits.

2. Measure (“you can’t manage what you can’t measure)

Many hardware products have built-in power management features that are never used. Most major vendors have been implementing such features for quite some time. These features include the ability of the CPU to optimize power by dynamically switching among multiple performance states. The CPU will drop its input voltage and frequency based on how many instructions are being run on the chip itself. These types of features can save organizations up to 20% on server power consumption.

3. Analyze IT infrastructure with energy efficient cooling

Many data centers may use hot aisle/cold aisle configurations to improve cooling efficiency, but there are also some small adjustments they can make. Simple "blanking panels" can be installed in server racks that have empty slots. That's a great way to make sure the cold air in the cold aisle doesn't start mixing with the hot air in the hot aisle any sooner than it needs to. Organizations should also seal cable cutouts to minimize airflow bypasses. Data organizations should consider air handlers and chillers that use efficient technologies such as variable frequency drives which adjust how fast the air conditioning system's motors run when cooling needs dip.

4. Improve (virtualize IT devices – use cloud when feasible)

Virtualization continues to be one of the hottest green data center topics. Many current server CPU utilization rates typically hover between 5% and 15%. Direct-attached storage utilization sits between 20% and 40%, with network storage between 60% and 80%. Virtualization can increase hardware utilization by five to 20 times and allows organizations to reduce the number of power-consuming servers. Cloud computing is the “ultimate” in virtualization and we’ll discuss virtualization and cloud computing in more detail later in this paper.

5. Control (continue to measure and manage and upgrade as necessary)

Going Green is easiest if you are building a new data center. First, you make a calculation of your compute requirements for the foreseeable future. Next, you plan a data center for modularity in both its IT elements and its power and cooling. Then you use data center modeling and thermal assessment tools and software – available from vendors such as APC, IBM, HP and Sun – to design the data center. The next step is to procure Green from the beginning – which partly means, buy the latest equipment and technologies such as blade servers and virtualization.

Once you have the equipment, you integrate it into high density modular compute racks, virtualize servers and storage, put in consolidated power supply, choose from a range of modern cooling solutions and, finally, run, monitor and manage the data center dynamics using sensors that feed real-time compute, power and cooling data into modern single-view management software that dynamically allocates resources.

7. Conclusions

The future of the Healthcare Industry is a major concern worldwide. As discussed in this paper, the climate crisis and healthcare crisis are connected. Green healthcare can contribute to solving the climate crisis by adopting green IT practices. Success with healthcare initiatives to reduce cost and improve services will be significantly influenced based on the success of healthcare Green IT initiatives. As discussed in this paper, emerging technologies such as mobile computing and cloud computing hold great promise to reduce costs and significantly improve services in the healthcare industry. The continued significant use of electric energy for the IT infrastructure used to support the healthcare industry has increased pressure on the industry to support green IT initiatives and overall sustainability. Healthcare Green IT efficiency improvements must be made in compliance with the expanding regulations to protect patient privacy [19].

Going forward, we in IT all have a role in helping improve the outlook for healthcare by contributing to IT infrastructure electric energy sustainability, data protection, and the continued improvement in cloud computing for IT cost reduction along with improved data protection.

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Modeling health behaviors in developing countries: Extension of RANAS with Trust to predict toilets' adoption in Burkina Faso?

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Abstract

The prevalence of diarrheal diseases is high in Africa and South-East Asia. Despite the efforts exerted since then, many of these countries have failed to improve their citizens' behavior toward a better hygiene and domestic sanitation in this era of the Sustainable Development Goals (SDGs). In such context, this paper explores the factors predicting the adoption of health-enhancing behaviors using an extended risks, attitudes, norms, ability and self-regulation (RANAS) model with trust as a determinant to explore the predictors of health behaviors, with a focus on toilet adoption in Burkina Faso (West Africa), where more than 30 provinces out of a total of 45. Using Structural Equation Modeling (SEM) with AMOS, the results shows the importance of nurturing, disgust and injunctive norms as motivational factors and the direct effect of intention on behavior adoption. Trust plays a more complex role, which is stressing the behavior while having a positive effect on intention as well as the reverse, intention on trust.

Keywords: Health behavior, RANAS model, Structural Equation Modeling (SEM), Hygiene, Sanitation, Toilet.

Introduction

Poor personal hygiene and human excreta disposal are highly affecting community health in developing countries through fecal-oral channel, especially for children less than five years. Lack of hygiene and sanitation accounts for preventable diseases like diarrhea and/or intestinal helminths (Gleick, 2010; Montgomery & Elimelech, 2007). Among the preventive actions against diarrhea proposed by CDC, access to safe water, improved sanitation and hygiene are of the most effective solutions. Diarrhea is also a major factor in fecal-oral transmission of pathogens (Curtis et. al, 2000), while improving household hygiene behavior such as hand-washing after stools contact (Contzen & Mosler, 2013) and safe disposal of the stools have proved to be effective to prevent diarrhea (Curtis et. al., 2011). To this effect, promotion of toilets is often proposed as solution and promoted among local communities by governments committed to fight diseases related to personal and community hygiene, including diarrhea.

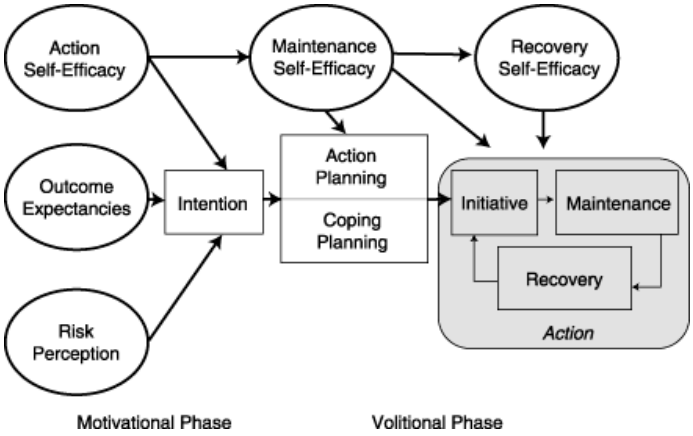
In the specific case of Burkina Faso, this commitment have been held since 1996 with the first strategic plan on sanitation (Ministère de l' Agriculture et de l' Hydraulique du Burkina Faso, 2011). In 2014, only 8.1% of household in the total population had access to sanitation infrastructures among which toilets, according to the national institute of statistics (Institut national de la statistique et de la démographie du Burkina Faso, 2015). Although progresses have been made compared to the 1.8% of 2003, the national policy of hygiene and sanitation have failed achieve changes in personal hygiene and adoption of sanitation by the communities. This paper explores toilet adoption as heath-enhancing behavior, by using RANAS and Trust factors model in a model-generating approach (Joreskog, 1993).

Proposed model and Methods

Among previous Behavioral models such as Theory of Reasoned Action, the gap between intention and action is not explicitly filled, the focus being the intention variances and not the action variance (Schwarzer, 2008), under the assumption that that people's behavior shall always meet their intentions. Health behavioral change models are to include the motivational phase ending with the intention and the volitional one concluded with the behavior performance, thus helping to bridge the intention–behavior gap (Schwarzer, 2008).

HAPA assumes that intention does not always lead to behavior, and sometimes mediators may play an important role (Sutton, 2008). HAPA goes beyond previous models, investigating the intention and post-intention gap by developing two phases of behavioral changes: the motivational phase which leads to the intention formulation, and the volitional phase which leads to the actual behavior (Schwarzer, 2008). These make HAPA increasingly attracted researchers who aim at predicting and explaining health-related behaviors (Sutton, 2008), since it offers an evidence-based model to predict and modify behaviors.

Figure 1: HAPA structured model (source: Schwarzer, 2008:6)



Schwarzer (2008) illustrated the universal applicability of HAPA for diverse health behaviors including physical activity adherence after cardiac rehabilitation, breast self-examination (BSE) for early detection of cancer, seat-belt use of adolescent car passengers, dietary behaviors, or dental flossing. Data derived from diverse samples, ranging from youth to elderly, students, or rehabilitation patients.

HAPA includes three predictors of the behavioral intention (motivational self-efficacy, outcome expectancies, health risk perception) and three predictors of self-reported behavior (intention, recovery self-efficacy, planning (Schwarzer et al., 2007).

RANAS model

Risk, Attitudes, Norms, Abilities, and Self-regulation model (Mosler, 2012) is a comprehensive model integrating developed theories such as the Health Belief Model, the Protection Motivation Theory or the Theory of Planned Behavior (Dreibelbis et al., 2013). RANAS is a five factor blocks model. Risk factors of the five factors model comprise: the perceived health risks and the perceived consequences of morbidity; attitude factors are the beliefs about the benefits and efforts related to the behavior as well as emotions; norm factors stand for social influences; ability factors are the perception about one's personal ability to execute the behavior, and; self-regulation factors have an influence on its maintenance. (Stocker & Mosler, 2015).

According to Inauen, and Mosler (2014), Mosler introduced the RANAS model for hygiene and sanitation in developing countries which clarifies and extends variables of HAPA. Dicko (2016) described the links between RANAS factors and HAPA as shown in the following table:

Table 1: Characteristics of RANAS factors (relatively to HAPA model). Source: Dicko (2016)

Factor	Items	Difference with HAPA

	Mosler (2012); Contzen and Mosler (2013).	Inauen, et al., (2013)
Risk	Perceived susceptibility, perceived severity of contracting a disease, factual knowledge about the possibility of being affected by a potential contamination	In addition to the HAPA's risk perception, RANAS involves perceived severity and factual knowledge
Attitude	Instrumental beliefs about costs and benefits of the targeted behavior, and affective beliefs.	RANAS differentiate attitude factors and norms instead of outcome expectancies of HAPA, and distinguish affective attitudes from instrumental attitudes and descriptive norms from injunctive norms
Norms	Social influences such as descriptive norms (behavior typically performed by others), injunctive norms (behavior typically approved or disapproved by others) and personal norms (personal standards about what should be done)	
Ability	People's perception to perform a behavior (perceived behavioral control) and the confidence in one's ability to organize and manage the targeted behavior (self-efficacy)	Same items as HAPA model, three scales of self-efficacy.
Self-regulation	Help to manage conflicting goals and distracting cues when intending to implement and maintain a certain behavior	Same items as HAPA: action planning and coping planning

Based on the previous studies of HAPA structure (Schwarzer et al, 2007) and the similarities of HAPA and RANAS factors (Dicko, 2016), this study specified the following questions:

Research Question 1*: What are the relationships among RANAS factors toward health-enhancing behaviors adoption?*

Trust Factor

Even though RANAS offers a broader range of factors to understand hygiene and sanitation related behaviors, they do not include interactions with institutions and intermediaries promoting health policies. Trust facilitates collective action, cooperation among people to achieve common goals, while it offers an alternative to the economic individualism driving health policies in the recent decades (Gilson, 2003). In order to understand the relationship of the local people with the national health system aiming at reducing health-compromising behaviors: we added trust as a determinant factor and assessed its relevance to explain the intention step as well as the performance of the behavior.

Why may Trust be an important factor in the specific study of health behavior in Burkina Faso?

In this study, trust is considered as important determinant influencing the adoption of hygiene and sanitation behaviors because it will determine the actual cooperation or rejection of the external actors' and the information shared representing the national policy of hygiene and sanitation.

In Burkina Faso, a study of the German Cooperation GIZ confirmed the decline in utilization of modern care (health centers and district hospitals) between April 1993 and December 1995 with health care providers behaviors not compatible with people's expectations questioning their skills

(Bodart, et al., 2001), it appears interesting in such context that trust between local people and health care providers may affect behaviors as the health care centers are the main providers for hygiene and sanitation information and communicate directly with local people.
This study use Trust to highlight the effect that this interaction may have people's adoption and maintenance of a behavior.

***Research Question 2**: What is the role of trust in intention formation and health-enhancing behavior adoption?*

***Research Question 3**: How a model based on RANAS and Trust factors predict intention formation and toilet adoption?*

Measurements

This research has developed multi-item measures for each construct through the following process. First,a draft of the questionnaire in English was prepared by reviewing the literature on RANAS, HAPA and trust items.
Then, we adopted a final questionnaire of 24 items into eight variables. For RANAS determinants, risk is constructed on three items, attitudes factor by three items, norms factors by three items, ability factors by four items and self-regulation by two items. The trust construct consisted in a three-item factor. Behavioral intention and Behavioral adoption are three for each of both variables. The scale of the RANAS, trust and behavioral items was measured on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Behavioral adoption was also measured by a 5-point Likert scale as frequency of use ranging from never (1) to always (5).
After submission to the ethical committee of the graduate school of International Communication, Media and Tourism Studies of Hokkaido University, the questionnaire was translated into French and into local languages such as Fula, Dioula and Mossi. Based on the translated versions of the questionnaire, a cross-sectional survey was conducted.

Table 2: Questionnaire, Mean and Standard deviation

Factor(s)	Variable (s)	Question (s)	M	SD
Risk	*Risk vulnerability* **	I think there is a possibility for me or my family to get diarrhea or cholera if we don't use a toilet	**4.33**	**1.18**
	Risk severity **	If someone has a diarrhea or cholera, it may have a severe impact on the family	**4.43**	**1.06**
	Risk knowledge **	Having a toilet can reduce the risk of cholera and/or diarrhea in the family	**4.39**	**1.05**
Attitudes	*Attractiveness* *	I feel more attractive when I have a toilet	**4.21**	**1.31**
	Nurturing	It is important to use toilets when taking care of children	**4.58**	**1**
	Disgust	It is dirty and disgusting to not have and use a toilet in every family	**4.47**	**1.02**
Norms	*Descriptive norm* *	Most of people of my village/city and relatives use toilets	**3.5**	**1.44**
	Injunctive norm	Most of people who are important to me think I should use a toilet	**4.25**	**1.13**
	Personal norm *	I feel a strong personal obligation to use a toilet	**4.37**	**1.11**
Intention	*Intention to have toilet*	I intend/intended to have a toilet	**4.34**	**1.12**
	Intention to use toilet	I intend/intended to use regularly a toilet	**4.36**	**1.13**
	Intention to motivate others	I intend/intended to advice all my family and relatives to have and use a toilet	**4.36**	**1.15**
Ability	*Self-efficacy*	It is easy to always use a toilet	**4.09**	**1.25**
	Maintenance Self-efficacy (hindrance) *	It happens that you want to use toilet but are hindered in doing so	**3.42**	**1.57**
	Maintenance Self-efficacy (Water) *	It happens that there is no water available	**3.23**	**1.65**
Self-regulation	*Recovery self-efficacy* *	I can stop using toilets for several days and restart using it again with confidence	**2.08**	**1.6**
	Self-regulation on forgetting *	I sometimes forget to use the toilet	**2.07**	**1.45**
	Control planning *	I have a clear plan to avoid forgetting to use a toilet	**3.77**	**1.51**
Trust	*Trust in Information content*	I use a toilet because I have clear message of advantages of having and using toilets	**3.41**	**1.64**
	Trust in Informant	I use a toilet because that is what the hygiene mediator (development brokers) told us	**2.5**	**1.6**
	Trust in Institution	I use a toilet because the local office of health ask us to do so.	**2.36**	**1.54**
Behavior	*Behavior of having*	I have a toilet	**4.1**	**1.48**
	Behavior of using	I use a toilet	**4.27**	**1.34**
	Behavior of Family members	My family members use a toilet	**4.2**	**1.4**

Notes: *item(s) deleted following the EFA, **items deleted following the Cronbach's alpha assessment.

Data Collection

In October and November 2016 in the western African country of Burkina Faso, with 244 total participants (n=244) included.

A total of 244 participants (n=244) valid responses were collected through random sample survey in Burkina Faso by six different surveyors. Among the respondents, 54% (f=139) are Muslims, 37.3% (f=91) Christians, 4.9% (f=12) Animists and 2.9 % (f=7) didn't wanted to reply to the question related to their religion. 52% (f=129) lives in urban areas, 38.5 % (f=94) in the rural areas and 8.6 % (f=21) are from suburban areas. While 77.9% (f=190) are male, female respondents represent 22.1% (f=54). 43.9% (f=107) are 20 to 30 years old while 32.4% (79) are between 30 and 40years old.

Table 3: educational level of respondents

characteristics		**Frequency (n=244)**	**%**
Education	*University*	**95**	**38.9**
	High School	**44**	**18**
	Junior High School	**18**	**7.4**
	Primary School	**24**	**9.8**
	Not at all	**63**	**25.8**

Although 61.9% (f=151) reported always washing their hands, 30.3% (f=74) occasionally wash hands and 1.6% (f=4) never wash their hands, when 6.1% (f=15) didn't fill this question.

Even if 17.2 (f=42) replied not having toilets, only 28.7 % (f=70) entirely funded their own toilets'. 49.6 % (f=121) of the participants reported being more than 900 m far from a health center and 20.5 % (f=50) located at a distance lower than 300 m from the health center.

Data analysis and results

In this study the model was tested using a two-step analytic procedure, exploratory analysis and structural equation modeling (SEM) using AMOS 23.0. SEM is a statistical method that takes a confirmatory approach of the structural theory, enabling a clearer conceptualization (Byrne, 2016). The causal relationship between the factors has been statistically tested through an exploratory factor analysis (EFA) followed by the development of the path diagram of the factors and an evaluation of the model fit.

EFA serves to determine how the observed variables are linked to the factor, thus determining the

minimal number of factors accounting for co-variances of the study variables (Byrne, 2016). To ensure loading of the items into the eight factors, i.e., the five RANAS factors, Intention, Trust and Behavior previously identified for the study, a principal component analysis with Promax rotation and with a cut-off based on Eigenvalue (Eigenvalue greater than 1) using all the items of RANAS model and trust factor. Dimension reduction resulted in a clearer pattern.

The final pattern matrix is as follows:

Table 4: Pattern Matrix resulting from EFA

Pattern Matrix[a]

	Component				
	1	2	3	4	5
Behavior Using toilets	**.94**				
Behavior of Family members	**.94**				
Behavior Having a toilet	**.94**				
Intention to motivate others		**.82**			
Self-Efficacy Ability		**.74**			
Intention to have toilet		**.69**			
Intention to use toilet		**.67**			
Trust in Informant			**.91**		
Trust in Institutions			**.85**		
Trust in information content			**.69**		
Risk Vulnerability				**.77**	
Risk Severity				**.76**	
Risk Knowledge				**.62**	
Attitudes of Nurturing					**.82**
Attitudes of Disgust					**.71**
Injunctive Norms					**.64**

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

The results of the EFA consist of five factors with 16 items restructuring the component of the variables. While self-efficacy loads on intention formation items, 3 items from norms and attitudes are loading into the same factor.

Validity and reliability

The validity of the measurement model is evaluated by investigating reliability, convergent validity, and discriminant validity. Reliability has been measured on the five factors by using Cronbach's alpha. Cronbach's alpha of a factor should be greater than 0.60. Apart from Risk factor (Cronbach alpha= 0.56), all the four remaining factors were higher than 0.60.

Table 5: Cronbach alpha of the five items after EFA

Risk	"Attitudes & Norms"	Intention	Trust	Behavior
0.56	0.61	0.68	0.75	0.93

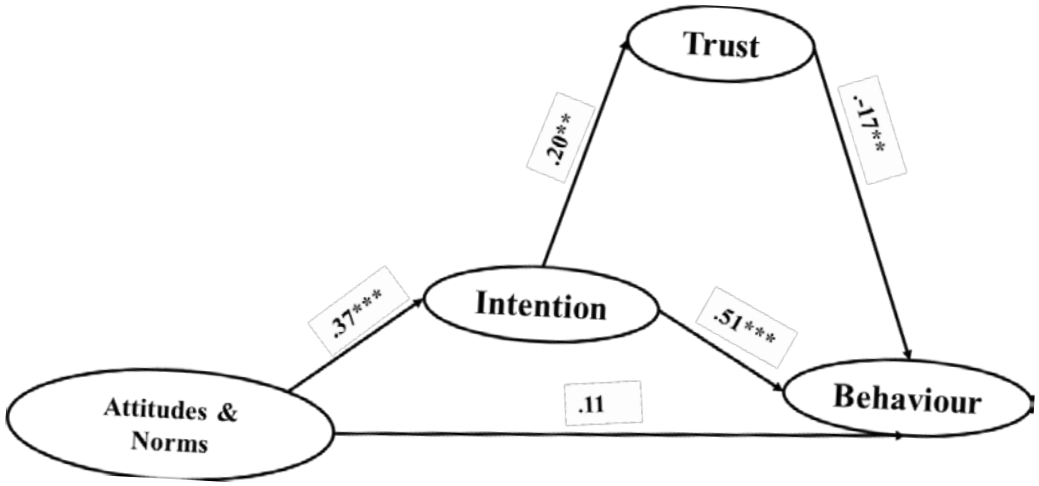
All the four factors met the requirement showing their internal consistency. Convergent validity was examined by composite reliability (CR) and average variance extracted (AVE). Fornell & Larcker (1981) recommended a CR higher than 0.70 and AVE higher than 0.50 for convergent reliability to be met.

Although the significant Cronbach alpha (higher than 0.60), the convergent validity was lower for the "Attitudes & Norms" (CR=0.63 and AVE= 0.38) and intention factors (AVE=0.46). According to Shiu, et al. (2011) even if a pair of constructs has (or has not) failed the Fornell and Larcker test, it does not alter the probability of rejecting the null hypotheses regarding the (lack of) significance of specific regression paths associated with the constructs. So despite the validity issues, we somehow introduced "Attitudes & Norms" factor due to their importance as psychosocial determinants, with utmost care given as to the interpretation of the results arising from their seemingly non-unidimensionality.

Structural model Evaluation

Evaluation of the model-data fit was based on recommended indices: TLI, CFI, Root mean square error of approximation (RMSEA), Chi-Square test (χ^2/df), *Goodness-of-fit statistic (GFI) and the adjusted goodness-of-fit statistic (AGFI).* The following values indicate a good fit of the model to the data: TLI, CFI values ranged from .90 to 1, RMSEA values of .05 or less, χ^2/df between 1 and 2 (Schwarzer et al., 2007) GFI and AGFI of .90 or greater (Hooper & al. 2008). The significance of the hypothesized component ($p < 0.05$) has also been checked.

Figure 2: structural model resulting from this study



***p< .05; **p < .01; ***p < .001**

χ^2/df *is valued at 1.383*, TLI is .98, CFI at .99, GFI at .99, AGFI at .97, RMSEA of .04

The performed structural equation modeling showed a satisfactory model fit. "Attitudes and Norms" factor predicts positive intentions. Intention induces the behavior and effect positive trust. Trust stresses the performance of the behavior.

Discussion

This study is the first to investigate toilets adoption as a health-enhancing behavior using RANAS and Trust factors. This is a first step for a better understanding the health-enhancing behaviors and serve as a tool for an evidence-based intervention. The lack of previous research that models RANAS and Trust construct precluded a comparative approach, although a similar but different model (HAPA model) have been intensively investigated.

In line with Dreibelbis et al. (2013), this study underlined that not all the factors serve effectively to explain the expected behaviors, and that the strength of each factor associated to the expected behavior may change.

This study concludes that risk factor is not a relevant determinant for health-enhancing behaviors adoption, a finding closely relating to the study of Contzen and Mosler (2013) on hygiene promotion in an emergent context. Little support was found for the importance of risk factors in handwashing. Curtis et al. (1997) concluded that the motivations for behavioral changes are not driven by health benefit, as the local perception of illness prevailed even after training the population.

"Attitudes and Norms" factor resulting from this study, characterized by three variables including

nurturing, disgust and injunctive norms, was revealed as the main motivational factor for intention formation. Intention to adopt hygienic behaviors respondents are motivated by nurturing, disgust and injunctive norms. Similar conclusions have been drawn by Curtis et al (1997) on nurturing and injunctive norms, while Scott et al. (2007), using a consumer research approach on hand-washing with soap in Ghana, revealed similar motivations (nurture, disgust and social concerns) for health-enhancing behaviors.

Contrary to expectations, during the selection of the study model, intentions affected behaviors both positively and directly without self-regulation factor (self-regulations on forgetting or planning) as mediator.

The role of trust as mediator between intention and behavior failed to demonstrate that trust affects positively the behavior performance. The implication of the current result is that, despite people placing trust in the information content, the informant and the institutions, they still keep rejecting the promoted behaviors. This could be explained by the fact that people adopt a behavior not because they trust someone else, but mainly because they themselves intended to do so. A double standard is set in terms of trust and the more people trust the less likely they may act. Further investigations are needed to clarify this role of trust.

Implications of this study

Before designing an intervention enabling sustainable change of hygiene behavior among communities, it is important to identify the perceptions of the promoted behaviors (Curtis et al., 1997) and tailor the treatment to the specified group (Schwarzer, 2008). In this specific study, academic implications and practical implications was identified.

Academically this study contributes provide a model for health-enhancing behaviors studies in developing countries, generated from the most promising model (RANAS model) and factor (trust) in public health. This model could be used as a tool for studying health-enhancing behaviors such as handwashing, household waste management. It can also serve for a wider study on toilets adoption.

Findings drawn from this study may also be of practical implications for the national policies promoting behaviors such as the usage of toilets. National policies needs to reinforce intervention strategies by generating intentions. The motivational items of focus should be nurturing (presence of children in the household), attitudes of disgust and injunctive norms as well as trust items. Although the overall aim of the national policies should be promoting toilet adoption and usage, both health-enhancing behaviors, the messages should be directed to foster intention rather than attempting to control behaviors directly. The complex role of trust should be taken carefully into account while promoting hygiene and sanitation in Burkina Faso.

Limitations and Future Research

One of the limitation of this study is the low control over data acquisition, leading to a ceiling effects in some items (see table 2). Further studies are required to improve the data management and use a methodology that takes into account possible ceiling effects. In addition, the role of the reasons behind the stress of trust on behavioral adoption in hygiene promotion in the specific case of Burkina Faso should be clarified by a future study.

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New approaches to environmental conservation: Case of Uluabat Wetland Management Plan of Turkey

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New approaches to environmental conservation: Case of Uluabat Wetland Management Plan of Turkey

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Abstract

Wetlands provide many important use and non-use services for humans. They have been threatened by the high population density and rapid economic development especially in developing world. Conservation and sustainable management of wetlands requires participation of all local stakeholders. There is a similar situation in Uluabat Wetland, which is an important Ramsar site of Turkey. It has been threatened by industrial activities, agricultural chemical use, excessive fishing-hunting and water reservoir projects built on the main inflow to the Uluabat Wetland. Integrated Management Plan including all stakeholders for Uluabat Wetland is important action to conserve it. The aim of this plan was to ensure the integration between conservation and development around the wetland. Wetlands are multi-functional natural resources that provide environmental services such as water purification and regulation of water flows, fishery and other resources for human and non-human use, habitats for plants, animals and micro-organisms, and opportunities for recreational use and tourism. While wetlands continue infinitely to present vital services for humans, they have been threatened by the high population density and rapid economical development especially in the developing world. After the industrial revolution, intensive agricultural methods, rapid industrial activities and increasing human needs started to degrade wetlands like other natural resources. However, since 1971 the functions and values of wetlands have been increasingly recognized at local, regional and international level. In addition, taking economic values of natural resources into account in political decision process has gained importance in both policy-making and environmental researches. This management plan, which has a lot of success, has solved many problems. In this paper, the implementation of the Uluabat Wetland Management Plan and the conditions of a successful environmental management plan will be discussed. The recommendations at the paper can be benefit for policy-makers related with environmental management, NGOs and scholars who want to contribute to environmental management plans in local levels.

Key words: Uluabat, wetlands, management plan, environmental valuation

Introduction

Wetlands are zones of transition between terrestrial and fully aquatic habitats that provide important environmental services, products, and attributes for human health, safety, and welfare. The livelihood of riparian communities near the wetland depends on its functions. In spite of these important functions, many countries have experienced severe wetland losses because of the inevitable development process (Tolba and El-Kholy 1992, Turner 1992). Although there is an increasing recognition of the need to conserve wetlands, losses and degradations have been continuing all over the world.

Current study considers Uluabat Wetland of Turkey. It is located in the northwestern part of the Turkey. It is a large but shallow freshwater lake that covers an area of between 135 and 160 km^2 (approximately 33.000-40.000 acre) and the watershed has an area of 10.555 km^2. Benefits and functions of the Uluabat Wetland can be stated as global, national and local levels. In spite of those important functions, the hydrology of Uluabat Lake has been exposed to significant threats that damage the lake's ecosystem. The growing human population that depends on the lake and lake's

catchment area has put great pressure on this hydrologic system. Unsustainable management of the wetlands and their river basins have led to the disruption of natural hydrologic cycles. In many cases, this has resulted in a greater frequency severity of flooding, drought, and pollution. Also in Uluabat Wetland, human-induced changes in water dynamics are likely to produce negative impacts on the health of the lake's ecosystem. In 1998, World Wildlife Fund (WWF)-Turkey initiated a joint project with the Turkish Ministry of Environment to prepare an Integrated Management Plan for Uluabat Lake (UIWMP). The aim of this plan was to ensure the integration of conservation efforts with the development around the lake according to the wise-use principles of the Ramsar Convention, with the participation of all stakeholders. Current study examines this management plan's ex-post consequences at local, national and global levels.

Experiences from Uluabat Wetland Management Plan

The project was started with a field survey. During the survey period at the region, WWF-Turkey staff and local authority's officials were in close contact with local people to explain what they were planning to do. During the progressing of the project, it was recognized that local people have some doubts and prejudices about planned actions. Indeed, local people wanted to get benefits from all facilitates of the lake without any control and restriction, whereas the plan would bring some measures to the use of the lake. It was a real challenge to remove these prejudices and doubts about the management plan. Basic action plans that appeared disorderly in the project report can be classified into groups related with water quality, water level, and ecological and socioeconomical functions, as shown in Table 1.

Table 1. Action Plans of Uluabat Wetland Management Plan

	Water Quality	Water Level	Ecological Functions	Socio-economic
Short-Term	**New regulations to industrial firms* **Industrial waste water discharge controls*	**Preventing the sedimentation due to inflows (with government)* **Corporation with local water management on wetland water levels*	**Regular controls for fishing and banning wild waterfowl hunting* **Determination of ecologically weak areas* **Construction of natural growing areas for endangered species*	**Mosquito spraying for the settlements near the lake* **Open-air cinema and theatre organizations*
Long-term	**New infrastructure project to wastewater effluent* **Agricultural extension works for farmers to prevent intensive chemical use* **Water quality monitoring program on critical points*	**Risk management*	*Afforestation woks around the lake* *Endangered species population monitoring*	**Definition of cultural and natural tourism infrastructure* **Education studies in primary schools near Uluabat Welands* **Creation alternative livelihood resources*

An economic evaluation study was carried out at the wetland region. It is important indicator in order to understand the values of the wetland for all stakeholders. Use and non-use values of the wetland were surveyed with 126 household living at the region in the year of 2004. It accounts for 2 percent of all population. Survey was conducted by personal visit to all villages and interviews with the randomly selected respondents who were informed by management plan's working group about

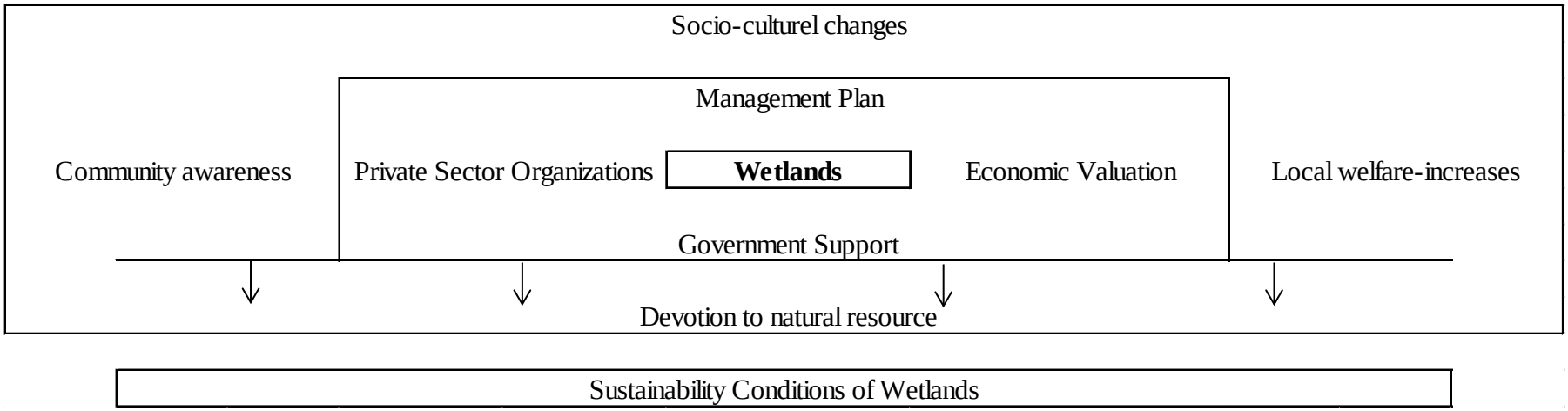
the importance of wetlands to the rural communities. The gross value created by the Uluabat Wetland was approximately 8.100.000 USD/year. The value can be accepted as wetland management plan's action value.

Since the first actions applied, the Uluabat Wetland kept its conservation statue and its values increased due to changing recognition and perceptions of the related population. Experts states that the values of this wetland approximately 10 million USD/Year by 2017 year. Monitoring actions indicates that local species also was conserved and its numbers are increasing at the lake level.

Examination of all historical paths and happens at the wetland show that the sustainability conditions depends on basic and secondary principles. In the first phase, there are four segments providing awareness of the conservation: existence of a management plan, economic valuation, government support and participation of private sector representative. Environmental management plans meets the important gaps on management the natural resources. Many experts from different scientific disciplines may contribute the plan. Briefly, direction of the work can only be defined in this way. After expert work, all stakeholders should be called the design stage of action plans. An economic valuation results can be declare at those meetings, and it forms the base indicator for wetland performance. People will be more willingness to pay for increasing wetland values indeed. Government support and private sector participation are complementary stage of the first phase. Government support may trigger the private sector and the environmental management plan may be well adopted. After first phase passing, wetland values would be increased naturally. Its main effect is observed on local population welfare increases. Socio-cultural changes and community awareness follows the local-welfare increases. Related community shift from resource-consuming type to resource-claiming community. Those changes cause the devotion to natural resource, and after this final segment sustainability conditions for wetland starts.

Some drawbacks may occur because the wetlands are greatly recognized. A Excessive number of visitors can endanger natural life. Thousands of persons flocks the lake especially at festival times, and this causes new types of pollution. In addition different government representatives can claim that the real managers of the lake are themselves. It may trigger to multi-headed management of the natural resource. Another drawback is related with more valuable lands. Demand for lands surrounding the lake is more valuable anymore. Therefore, people can demand for secondary housing because of wetland's increasing popularity. All of this will cause the zone to encounter more pollutants. Legislation can be enacted to overcome this problem. In this regard, housing construction should be prevented in ecologically critical areas.

Figure 1. Experiences from Uluabat Wetland Management Plan



Conclusions

Uluabat is one of the most important wetlands because of not only its regional and local usages but also for its global merits such as being wintering and feeding areas for some endangered species. Uluabat Integrated Wetland Management Plan is important not only for the region but also for Turkey for being a pioneer study in this field. After implementing the action plans successively, many lakes started to carry out similar management plans in Turkey. Consequences of the action plans may provide benefits to lakes suffer from similar issues in the international levels. Every recognized natural resource will deserve to be demanded. Yet, more valuable lands mean new polluter types. Legislations can help to resolve this issue. Stakeholder participation is key factor, and economic evaluation is inevitable part of the sustainability conditions.

Wetland management plans combined with the rural development projects can give better results in developing countries such as Turkey. Action plans prepared in that form would increase the public participation and sustainability of that plan. Lower education and household income levels have increased the importance of rural development near the lake. Consequently, the management plan supported by rural development project would provide local residents to have a positive approach to the action plans that will be applied to wetlands.

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Performance of Local Government Unit of Malay, Aklan, Philippines in the Delivery of Environmental Management Programs

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Abstract

A study was conducted to evaluate the performance in the delivery of environmental management programs of the local government of Malay, Aklan, Philippines. The samples were determined adopting the Multi-Stage Random Probability Sampling technique. The targeted 150 respondents were proportionately allocated in each barangay based on the 2015 Census Population and Housing Data from the Philippine Statistical Authority. The qualified sample respondents were selected using the Kish Grid. Female respondents were targeted for even numbered questionnaires while male respondents were targeted for odd numbers. The four major core concepts namely awareness, availment, satisfaction and need for action were used in measuring the rating of the respondents and presented in frequency and percentage distributions. The reasons for their response were likewise gathered.

The study concluded that most of the respondents were highly aware of the environmental management particularly the clean-up programs/projects and solid waste management. They were less aware on programs to control air pollution and waste water management. There were a high number of respondents who availed environmental management on solid waste management. Programs to control air pollution is least availed by the respondents in the environmental management area. Overall, majority of the respondents were satisfied of the environmental management programs rendered by the LGU and therefore needs less action. It is recommended that the LGU must enhance air pollution control program. Interventions must be made to encourage people's participation in this program most especially to those who dispose their garbage by burning them. Seminars about proper waste disposal will probably help resolve this problem.

Keywords: environmental management, awareness, availment, satisfaction, need for action

I. BACKGROUND OF THE STUDY

The performance of the Local Government Unit of Malay, Aklan in the delivery of environmental management programs was measured adopting the Citizens' Satisfaction Index System (CSIS). CSIS was designed as a system of mechanisms aimed to generate citizens' feedback on local government's performance on service delivery and the citizens' general satisfaction. The CSIS served as tool for drawing in applicable information in measuring citizen satisfaction that can be utilized for agenda-setting of economic and human development plans and goals of LGU's. Moreover, it is a source of information that identifies strengths, gaps, difficulties, constraints and possible improvements on the delivery of environmental management programs. By virtue of DILG Memorandum Circular 2016-57, the CSIS was pilot tested to 31 municipalities in the country to equip the tools and procedures for wider implementation in the succeeding years. Local resource institutes are involved to gather data and interpret the results for research and development purposes.

As a feedback mechanism, the citizens, being the intended recipients and end-users of public services, are in the best position to determine whether or not the services are delivered according to their needs and to the extent that they fulfil their day-to-day and long-term human development requirements. Through CSIS, the gathering of their sentiments, opinions and insights according to their perceptions and assessment as consumers of local public services is a logical method of shaping what local governments need to do to ensure welfare of citizens, without neglect to statutory requirements expected from them, The CSIS have numerous uses for various stakeholders pursuing relevant contribution to attain socio-economic development goals both in the local and national arena.

II. OBJECTIVES/STATEMENT OF THE PROBLEM

General objective

This study was conducted to evaluate the performance of Local Government Unit of Malay, Aklan, Philippines in the delivery of environmental management programs.

Specifically, this study aimed to answer the following questions:

1. What is the respondent's rating and its reasons in the delivery of the following environmental management programs:
    a. community-based greening projects,
    b. air pollution control program,
    c. solid waste management,
    d. waste water management, and
    e. clean-up programs/projects?
2. What are the respondent's experiences on solid waste management as to
    a. how they dispose their garbage,
    b. who collect their garbage,
    c. whether or not they practice waste segregation, and
    d. regularity of garbage collection?
3. What is the overall assessment of the core concepts per program?
4. What is the overall satisfaction rating of the respondents on environmental management?
5. What is the overall need for action rating of the respondents on environmental management?
6. What are the recommendations from citizens on environmental management programs?

III. SIGNIFICANCE OF THE STUDY

Findings of the study will provide LGU's a guide in developing well-informed policies and management decisions in their mandate of providing environmental management programs. It can capture the pulse of the people towards achieving responsiveness to broader parts of the populace. The data can help strengthen decisions on policies and programs that focus on issues perceived to be areas for improvement and those that strongly drive citizen satisfaction. Thus, outcome will provide recommendations to LGU's in crafting a Citizen-driven Priority Action Plan (CPAP) that aimed to prioritize interventions that address the areas for improvement relevant to the delivery of public services. With a knowledge based on citizen-driven assessment of environmental management, the DILG can provide more well-informed oversight supervision and technical-administrative support to the LGU's.

The National Government agencies and legislature may likewise target specific service areas noted to be weak and needs complementation from the national programs. Civil Society organizations may also gain insights on which areas they can refocus their efforts for complementation in the delivery of basic environmental management programs. Finally, the CSIS data can also be a starting point for academic institutions in performing their research and extension functions.

IV. SCOPE AND LIMITATIONS

This study focused on the performance of the Local Government of Malay, Aklan in the delivery of environmental management programs. Data gathered were respondents' perceptions and experiences on community-based greening projects, air pollution control program, solid waste management, waste water management, and clean-up programs/projects. The multi-stage probability sampling was utilized to come up with 150 sample-respondents. The four core concepts used to rate the delivery of environmental management programs was limited to awareness, availment, satisfaction and need for action. Data were analyzed and described using the descriptive statistics specifically frequency, ranking and percentage.

V. REVIEW OF RELATED LITERATURE

Basic Information about the LGU

The municipality of Malay was created in the province of Capiz on June 15, 1949, from the barrio of Malay and surrounding barrios which were then part of Buruanga. On April 25, 1956, the municipality of Malay became a part of the newly created province of Aklan, along with several other municipalities. Currently, Malay is a first-class municipality in the province of Aklan, Philippines. Based on the 2015 census, Malay, Aklan has 52,973 population with a density of 800 inhabitants per square kilometre or 2,100 inhabitants per square mile. Conversion to cityhood commenced through Resolution no. 066, series of 2010 re: Creating an ADHOC Committee and Technical Working Group to conduct initial study and evaluation for the proposed cityhood of the Municipality of Malay, Aklan. (Approved SB, DTD. 11-30-10).

Malay is politically subdivided into 17 barangays. There are four barangays that fall under the urban classification namely Poblacion, Catiklan, Balabag and Manoc. The barangays classified in the rural areas include Argao, Balusbos, Cabulihan, Cogon, CubayNorte, Cubay Sur, Dumlog, Motag, Naasug, Nabaoy, Napaan, Sambiray and Yapak.

The world-renowned resort island of Boracay is part of the municipality comprising the barangays of Manoc-manoc, Balabag and Yapak.

Because of its robust tourism industry, the municipality is now considered as having the strongest economy in all the municipalities in the Western Visayas Region and the richest municipality of Aklan in terms of income and annual budget. The tourism industry of Boracaybecame the catalyst of its economic growth that brought many investors to come and helped transform the municipality into a cosmopolitan area.

Service Delivery Profile

Banks. As of 2016, there are ten (10) banks in the municipality of Malay operated by six (6) commercial banking corporations.

Transportation. By air, Malay has one airport, officially named Godofredo P. Ramos Airport but more popularly known as Caticlan Airport. Only small aircraft are allowed to land on the 810 m (2,660 ft) runway. Most airlines have also restricted weight allowance since the airplanes are small. Nearby Kalibo International Airport with its 2,300 m (7,500 ft) runway is able to accommodate larger aircraft. By sea, the Caticlan Jetty Port, one of the ports along the Strong Republic Nautical Highway, serves as a gateway to Boracay Island and Roxas, Oriental Mindoro. By land, various means of transportation are available such as tricycle, multi-cabs, bus, vans and jeepney.

Schools. The public schools in Malay are Balabag Elementary School, Boracay National High School, Malay National High School, Malay Elementary School, Caticlan Elementary School CaticlanConferey School, Sambiray Primary School, Napaan Primary School, Argao Elementary School, Cubay Elementary School, Nabaoy Elementary School, Naasug Primary School, Dumlog/Kabulihan Primary School and Lamberto H. Tirol National High School. The private schools in Malay namely Mountain of God Academy, Inc., River of Knowledge Foundation, Inc., Mission of Love Integrated School, Inc., Caticlan Academy Foundation, Inc., Boracay European International School, NVC International School, Boracay Island Global Academy, Paradise English Boracay Language Institute, Canadian Tourism & Hospitality Institute and Goshen School of Technology and Humanities, Inc.

Health. The municipality of Malay is being served by three (3) hospitals. One of which is private, and two are owned by the government. The following are the hospitals: Don Circiaco Tirol Memorial Hospital, Malay Municipal Hospital, Aklan Baptist Hospital and the proposed St. Luke's Medical Center Boracay.

VI. METHODOLOGY

A. The Respondents

The target respondents of the study were 150 voting age adults (18 years and above) residing in the different barangays of Malay for not less than six months. The greatest number of respondents (40) came from barangay Manoc-Manoc since it is the most populated barangay. Eight sample spots were generated from this barangay. Thirty-five respondents came from barangay Balabag (7 sample spots), twenty-five from barangay Caticlan (5 sample spots), fifteen from barangay Yapak (3 sample spots), and five respondents each from barangays Argao, Balusbus, Cubay Sur, Nabaoy, Poblacion, San Viray, and Motag. No

respondents were included in the survey from the six least populated barangays namely Cabulihan, Cogon, Cubay Norte, Dumlog, Naasug and Napaan.

B. Sampling Procedures

The town of Malay, Aklan has a total population of 52,973 and it is impossible to interview everyone, thus, multi-stage probability sampling was utilized to come up with 150 sample-respondents. Multi-stage probability sampling uses several stages or phases in getting the sample at random from the population. This method is an extension or a multiple application of the stratified random sampling technique. The following stages were done in sampling:

Stage 1. The targeted 150 respondents were proportionately allocated in each barangay based on the 2015 Census Population and Housing data from the Philippine Statistical Authority. In each barangay the Field Supervisor identified sample spots such as church/chapel, school, health center and/or radio station.

Stage 2. Sample households in each sample spot were selected by determining the sample spot which was the starting point. From the sample spot going to the right, the first sample household is determined by counting as many (households) as indicated by the random start (RS). An interval of one house from the first household after a random start was made to select the other households.

Stage 3. Qualified sample respondents in each household were selected using the Kish Grid. Female respondents were targeted for even-numbered questionnaires and male respondents for odd-numbered questionnaires.

C. Data Processing

The respondents' answers were converted into an electronic data using Microsoft Excel and SPSS to prepare them for analysis. Data cleaning was done to double check possible errors or inconsistencies in the data which the Field Interviewers may have overlooked.

Coding. The questionnaire was drafted in such a way that it is "Codebook-ready." The numbers already assigned in each answer or option were used as codes. If an answer mentioned by a respondent is not yet in the list/does not have an existing code, the assigned for "Others" which is "99" was first used. A new code was created when in answer was mentioned by at least ten (10) respondents. If the last code in the questionnaire is 10, then the new code will be 11.

Processing Quantitative Data. Prior to data analysis and report preparation, frequency distribution tables were first generated from the cleaned raw data. Frequency distribution tables were only generated from questions with quantitative responses. Open-ended questions which required respondents to give reasons/explanations were processed in a different manner.

Processing Qualitative Data. The following steps were used in processing raw verbatim data: (1) Create a separate codebook for qualitative responses. (2) Enter all of the verbatim responses under each variable. (3) Sort all the verbatim answers alphabetically for each open-ended question. (4) Read at least 20% of the verbatim responses for each open-ended question to be coded. (5) Write the recurring themes in a separate sheet or portion of the same sheet. (6) Assign a number, letter or code per theme. (7) Create another column beside the original open-ended question. This column will contain all the recoded verbatim answers. (8) Read each verbatim responses and assign a code to each answer. (9) Go through the entire

list of themes and look for sub-codes. Repeat step 8. (10) Group the responses by theme. (11) Count the frequency of the themes or codes.

D. Data Analysis

The core concepts used in measuring satisfaction are as follows: 1.) Awareness refers to the respondent's presence of knowledge to the service being offered by the local government unit. Before delving with satisfaction, there is a need in the first place to know if they are aware that the service is being provided by their local government unit. 2.) Availment refers to the contact of the respondent to local government through programs, projects and services being implemented or offered. This may suggest the demand or utilization of public services by the citizens. For service indicator level assessments, only those who said they were aware of the service will be asked with the availment questions. 3.) Satisfaction refers to the citizen's contentment with their experience in availing or contact with the local government's services. In some cases this can also reflect the citizen's fulfilment of expectations with the services they were able to experience. For service indicator level assessments, only those who have availed of the particular service are asked with the satisfaction question. On the service area level, satisfaction is gathered regardless of their awareness and availment of any of the service indicators. 4.) Need for Action refers to the citizen's assessment on whether or not a particular service requires specific and decisive actions for improvement or reform. This concept is paired with satisfaction to provide readers an additional dimension that could help refine prioritization of services for further development and reform.

Percentage Scores. Percentage scores were computed to compare and contrast the concepts between the different services within one or across service areas. The table below shows the derivation of the scores per concept.

Derivation of Percentage Scores per Core Concept for Service Indicators

Score	Dividend	Base/Divisor	Formula
Awareness Score	No. of those who were aware of the service	N = 150, all respondents	Aware / 150
Availment Score	No. of those who have availed of the service	No. of those who were aware of the service	Availed / Aware
Satisfaction Score	No. of those who said they were satisfied	No. of those who have availed of the service	Satisfied / Availed
Need for Action Score	No. of those who said service needs appropriate action	No. of those who have availed of the service	Needs action / Availed

The Overall Satisfaction and Overall Need for Action Percentage Scores were derived by dividing the number of those who said yes to the question by the total number of respondents who answered the question. The quotients were then multiplied by 100 to express in terms of percentages.

Adjectival Ratings. Percentage scores were converted to adjectival ratings (i.e. from ratio to ordinal level of measurement) to simplify prioritization process. Categorization was based on passing the test of 50%+MoE (margin of error). A cutoff was computed for every indicator which was determined by the base.

$$Cutoff = 0.5 + |MoE|$$
$$Cutoff = 0.5 + \left|\frac{0.98}{\sqrt{n}}\right|$$

Following the above, the percentage score being tested should be equal or greater than the cutoff in order to pass this test. Therefore, the following condition was derived:

$$Percentage\ Score \geq 0.5 + |MoE|$$
$$Percentage\ Score \geq 0.5 + \left|\frac{0.98}{\sqrt{n}}\right|$$

Adjectival Ratings for the Percentage Scores and their Cut-offs and Interpretations

Adjectival Rating	Condition	Interpretation
High	Equal or more than 50% + MoE	More respondents…
Low	Less than 50% + MoE	Few respondents…

VII. RESULTS AND DISCUSSION

A. Community-based greening projects

1. Awareness

The respondents were highly aware of the community-based greening projects of LGU Malay. This could be attributed to the findings that there were 99 or 66.0% of the respondents who were aware of the projects while 51 or 34.0% were not aware.

Table VII.A.1. Percentage Score for Awareness on Community-based greening projects

Awareness	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Community-based greening projects	99	66.0	51	34.0	**66%**

2. Availment

a. Percentage Score

The respondents had high availment as regards the community-based greening projects as mentioned by 69 or 69.7%, while only 30 or 30.3 percent did not avail of the said project.

Table VII.A.2.a. Percentage Score for Availment of Community-based greening projects

Availment	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Community-based greening projects	69	69.7	30	30.3	**70%**

b. Reasons for Non-Availment

Of the 30 respondents who did not avail of the community- based greening projects, 14 or 43.3% said they were not interested. According to 13 or 36.7%, only 4Ps recipients participated in this project and the barangay must do its part as observed by seven or 20.0% of the respondents.

Table VII.A.2.b. Reasons for Non-Availment of Community-based greening projects

Reason	Frequency (n = 30)	Percent
Not interested	14	43.3
Only 4P's participates	13	36.7
The barangay must do its part	7	20.0

3. Satisfaction

a. Percentage Score

The satisfaction to community-based greening projects was rated high by the respondents. This is in consonance with the findings that 64 or 92.8% answered yes when asked if they were satisfied of the project.

Table VII.A.3.a. Percentage Score for Satisfaction to Community-based greening projects

Satisfaction	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Community-based greening projects	64	92.8	5	7.2	**93%**

b. Reasons for Satisfaction

The reasons for satisfaction with the community-based greening projects as revealed by the 64 respondents were the following: beneficial to the environment as felt by 39 or 60.9%; tree planting was the reason of 13 or 20.3%; the projects were properly implemented as indicated by seven or 10.9 % percent, and five or 7.8% reported that the project provides safety/prevents flood.

Table VII.A.3.b. Reasons for Satisfaction with Community-based greening projects

Reason	Frequency (n = 64)	Percent
Beneficial to the environment	39	60.9
Tree planting activities are held	13	20.3
Properly implemented	7	10.9
Provides safety/prevents flood	5	7.8

c. Reasons for Dissatisfaction

According to the five respondents, their reasons for their dissatisfaction of the community-based greening projects were: the barangay folks do not participate in the project as cited by three or 60.0% and two or 40% answered that the project was only in the mainland.

Table VII.A.3.c. Reasons for Dissatisfaction with Community-based greening projects

Reason	Frequency
Not participating	3
Only in mainland	2

4. Need for Action

The data regarding the response as to whether or not the community-based greening projects need appropriate action reflect that 24 or 34.8% answered “yes” and 45 or 65.2% replied “no.” These findings resulted to the low rating which means that the said project do not need appropriate action.

Table VII.A.4. Percentage Score for Need for Action on Community-based greening projects

Need for Action	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Community-based greening projects	24	34.8	45	65.2	**35%**

B. Air Pollution Control Program

1. Awareness

Awareness on air pollution control program was rated low by the respondents. The result is supported by the data generated that greater number of respondents, 91 or 60.7% were not aware while 59 or 39.3% were aware of the program.

Table VII.B.1. Percentage Score for Awareness on Air Pollution Control Program

Awareness	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Air Pollution Control Program	59	39.3	91	60.7	**39%**

2. Availment

a. Percentage Score

From the respondents who indicated awareness of the air pollution control program, 50 or 84.7% availed while nine or 15.3% did not avail of the program.

Table VII.B.2.a. Availment of Air Pollution Control Program

Availment	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Air Pollution Control Program	50	84.7	9	15.3	**85%**

b. Reasons for Non-Availment

The respondents cited two reasons for the non-availment of the air pollution control program. The first reason as noted by six or 66.7%, the program was not implemented in the area while three or 33.3% mentioned that the laws were not followed.

Table VII.B.2.b. Reasons for Non-Availment of Air Pollution Control Program

Reason	Frequency (n = 9)	Percent

Not implemented in the area	6	66.7
Laws are not followed	3	33.3

3. Satisfaction

a. Percentage Score

The satisfaction rating to air pollution control program was high as evidenced by greater number of respondents, 45 or 90.0% who answered "yes" that they were satisfied, and only five or 10 % replied "no."

Table VII.B.3.a. Percentage Score for Satisfaction to Air Pollution Control Program

Satisfaction	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Air Pollution Control Program	45	90.0	5	10.0	**90%**

b. Reasons for Satisfaction

Of the 45 respondents who were satisfied of the air control program reasoned out that there is clean and safe air (20 or 44.4%); the program was beneficial to 13 or 28.9%, and six or 13.3% said that the program ensures cleanliness.

Table VII.B.3.b. Reasons for Satisfaction with Air Pollution Control Program

Reason	Frequency (n = 45)	Percent
Clean and safe air	20	44.4
Beneficial	13	28.9
Ensures cleanliness	6	13.3
Smoking is prohibited	4	8.9
Incineration of garbage is prohibited	2	4.4

c. Reasons for Dissatisfaction

As observed by the respondents relative to the implementation of the air pollution control program, the reasons for the dissatisfaction of five respondents were: no regulation imposed according to three or 60.0% and two or 40.0% cited the place is still polluted.

Table VII.B.3.c. Reasons for Dissatisfaction with Air Pollution Control Program

Reason	Frequency
No regulation imposed	3
Still polluted	2

4. Need for Action

The response as to whether or not the air pollution control program, needs appropriate action was rated by the respondents as low which means that the program does not need appropriate action. This is reflected in the data wherein greater number of respondents, 33 or 66.0%, replied "no" and only 17 or 34.0% answered "yes."

Table VII.B.4. Percentage Score for Need for Action on Air Pollution Control Program

Need for Action	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Air Pollution Control Program	17	34.0	33	66.0	**34%**

C. Solid Waste Management

1. Awareness

The respondents were highly aware of the solid waste management program of the local government of Malay. The results could be further justified through the "yes" response of 127 or 84.7% of the respondents when asked about their awareness of the program.

Table VII.C.1. Percentage Score for Awareness on Solid Waste Management

Awareness	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Solid Waste Management	127	84.7	23	15.3	**85%**

2. Availment

a. Percentage Score

As regards the data on the solid waste management availment, 124 or 97.6% of the respondents availed of the program and only three or 2.4% did not avail. On the overall, a high rating on the availment of solid waste management was attained.

Table VII.C.2.a. Percentage Score for Availment of Solid Waste Management

Availment	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Solid Waste Management	124	97.6	3	2.4	**98%**

b. Reasons for Non-Availment

The three respondents who did not avail of the solid waste management program mentioned two reasons for non-availment. First, there was no garbage collector as reported by two or 66.7% of the respondents and only one or 33.3 % observed that not all garbage is collected.

Table VII.C.2.b. Reasons for Non-Availment of Solid Waste Management

Reason	Frequency (n = 3)	Percent
No garbage collector	2	66.7
Not all garbage is collected	1	33.3

3. Satisfaction

a. Percentage Score

From the respondents who availed of the solid waste management program, 122 or 98.4% were satisfied while only two or 1.6 % were not satisfied. As a result, a high satisfaction rating was achieved.

Table VII.C.3.a. Percentage Score for Satisfaction to Solid Waste Management

Satisfaction	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Solid Waste Management	122	98.4	2	1.6	**98%**

b. Reasons for Satisfaction

The reasons for satisfaction with solid waste management as indicated by the respondents include: proper collection of garbage as noted by 43 or 35.2%; everyone participates as revealed by 28 or 23.0%; segregation of wastes is practiced according to 26 or 21.3%; collection of garbage was done regularly as reported by 21 or 17.2% and only four or 3.3% cited clean surroundings.

Table VII.C.3.b. Reasons for Satisfaction with Solid Waste Management

Reason	Frequency (n = 122)	Percent
Proper collection of garbage	43	35.2
Everyone participates	28	23.0
Segregation is practiced	26	21.3
Regular collection of garbage	21	17.2
Clean surroundings	4	3.3

c. Reasons for Dissatisfaction

On the contrary, the only reason for dissatisfaction with solid waste management as revealed by two of the respondents was irregularity/late collection of garbage.

Table VII.C.3.c. Reasons for Dissatisfaction with Solid Waste Management

Reason	Frequency
Irregularity/Late collection	*2*

4. Need for Action

The results as to whether or not the solid waste management needs appropriate action attained a low rating from the respondents. This could be explained by the findings that greater number of respondents, 96 or 77.4% responded “no” when asked whether or not the program needs appropriate action, and 28 or 22.6% replied “yes.”

Table VII.C.4. Percentage Score for Need for Action on Solid Waste Management

Need for Action	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Solid Waste Management	28	22.6	96	77.4	**23%**

5. Experience with Solid Waste Management

a. Distribution of Respondents According to How They Dispose Their Garbage

The data shows that majority, 148 or 81.8% of the respondents were responsible of their garbage and aware of proper waste disposal. Only few of them were burying or even burning the garbage which is must not be tolerated. The government should further push their environmental programs to totally eradicate improper ways of disposing wastes.

Table VII.C.5.a. Distribution of Respondents According to How They Dispose Their Garbage

Garbage Disposal*	Frequency (n = 181)	Percent
Collect	148	81.8
Burn	15	8.3
Bury	18	9.9

**Multiple Response*

b. Respondents' Response as to Who Collects Their Garbage

Of the garbage collected, 103 or 63.6% said that the garbage was collected by the municipal garbage collector, 57 or 35.2% percent stated that the barangay collects the garbage and only 2 or 1.2% cited that private garbage collector, MRF, picks up the garbage.

Table VII.C.5.b. Respondents' Response as to Who Collects Their Garbage

Collector*	Frequency (n = 162)	Percent
Municipality	103	63.6
Barangay	57	35.2
Private collector	2	1.2

**Multiple Response*

c. Respondents' Response as to Whether or Not They Practice Waste Segregation

The result shows that majority, 140 or 96.6% of the respondents practiced waste segregation, while only 3.4% or 5 respondents did not.

Table VII.C.5.c. Respondents' Response as to Whether or Not They Practice Waste Segregation

Response	Frequency (n = 150)	Percent
Yes	140	96.6
No	5	3.4

d. Response on Regularity of Garbage Collection

The data reveal that most respondents, 76 or 52.4% stated that their garbage were collected every day. Thirty-two or 22.1% cited that garbage collection in their barangay was done three times a week. Least respondents said that their garbage were collected once a week.

Table VII.C.5.d. Response on Regularity of Garbage Collection

Response	Frequency (n = 145)	Percent
Everyday	76	52.4

3x a week	32	22.1
2x a week	13	9.0
Once a week	24	16.6

D. Waste Water Management

1. Awareness

Based on the data obtained on the awareness of respondents on waste water management program, 83 or 55.3% were aware, and 67 or 44.7% were not aware.

Table VII.D.1. Percentage Score for Awareness on Waste Water Management

Awareness	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Waste Water Management	83	55.3	67	44.7	**55%**

2. Availment

a. Percentage Score

Three-fourths of the respondents, 66 or 79.5%, availed of the waste water management program and only 17 or 20.5% did not avail. Correspondingly, a high rating was attained in support to the positive response of the sampled household heads on their availment of the said program.

Table VII.D.2.a. Percentage Score for Availment of Waste Water Management

Availment	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Waste Water Management	66	79.5	17	20.5	**80%**

b. Reasons for Non-Availment

Three reasons were identified by 17 respondents for their non-availment of waste water management. Majority (10 or 58.8%) revealed that water was not potable/ safe; five or 29.4% cited the need for improvement/action and two or 11.8% mentioned that the program was not implemented.

Table VII.D.2.b. Reasons for Non-Availment of Waste Water Management

Reason	Frequency (n = 17)	Percent
Water is not potable/safe	10	58.8
Needs improvement/action	5	29.4
Not implemented	2	11.8

3. Satisfaction

a. Percentage Score

The satisfaction rating was high relative to the respondents reply on the satisfaction to waste water management. This could be attributed to the findings that

60 or 90.0% answered “yes,” meaning that they were satisfied and only six or 9.1% said “no,” which means that they were not satisfied.

Table VII.D.3.a. Percentage Score for Satisfaction to Waste Water Management

Satisfaction	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Waste Water Management	60	90.9	6	9.1	**91%**

b. Reasons for Satisfaction

Of the 60 respondents who were satisfied of the waste water management program of the LGU- Malay, 22 or 35.0% reasoned out that the project was well maintained; 19 or 28.3% mentioned proper drainage/sewage system, 15 or 20.0% said that the program was beneficial, nine or 11.7% replied that the water is safe and four or 5.0% cited that the program was implemented.

Table VII.D.3.b. Reasons for Satisfaction with Waste Water Management

Reason	Frequency (n = 60)	Percent
Maintained	22	35.0
Proper drainage/sewage system	19	28.3
Beneficial	15	20.0
Water is safe	9	11.7
Implemented	4	5.0

c. Reasons for Dissatisfaction

The reasons why the six respondents were not satisfied with the waste water management program of the LGU were follows: poor maintenance as cited by three or 50.0%; floods easily as mentioned by two or 33.3% and people are not obeying laws as noted by one or 16.7% of the respondent.

Table VII.D.3.c. Reasons for Dissatisfaction with Waste Water Management

Reason	Frequency
Poor maintenance	3
Floods easily	2
People are not obeying laws	1

4. Need for Action

The response of the respondents as to whether or not the waste water management program needs appropriate action revealed low rating. This could be explained by the data which shows that 22 or 33.3% answered “yes,” while more than half (44 or 66.7%) replied “no.”

Table VII.D.4. Percentage Score for Need for Action on Waste Water Management

Need for Action	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Waste Water Management	22	33.3	44	66.7	**33%**

E. Clean-up Programs/Projects

1. Awareness

Based on the findings, 103 or 68.7% of the respondents were aware of the clean-up projects while 47 or 31.3% were not aware. The overall awareness rating was high.

Table VII.E.1. Percentage Score for Awareness on Clean-up Programs/Projects

Awareness	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Clean-up Programs/Projects	103	68.7	47	31.3	**69%**

2. Availment

a. Percentage Score

The availment of the clean-up project as reflected in the data show a high availment rating. The data further revealed that 88 or 85.4% said "yes" that they availed and only 15 or 14.6% mentioned that they did not avail of any clean-up programs/projects of the LGU.

Table VII.E.2.a. Percentage Score for Availment of Clean-up Programs/Projects

Availment	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Clean-up Programs/Projects	88	85.4	15	14.6	**85%**

b. Reasons for Non-Availment

From the 15 respondents who did not avail of the program, six or 40.0% indicated that they did not participate in the clean-up program, five or 33.3% stated that not all areas are equipped with drainage system, and four or 26.7% noted that the program was only done in the mainland.

Table VII.E.2.b. Reasons for Non-Availment of Clean-up Programs/Projects

Reason	Frequency (n = 15)	Percent
Not participating	6	40.0
Not all area is equipped with drainage system	5	33.3
Only in mainland	4	26.7

3. Satisfaction

a. Percentage Score

The satisfaction rating for the clean-up programs was high. The rating could be explained by the data showing that almost all of the respondents who availed of the program, 85 or 96.6%, revealed that they were satisfied while only three or 3.4% were not satisfied.

Table VII.E.3.a. Percentage Score for Satisfaction to Clean-up Programs/Projects

Satisfaction	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Clean-up Programs/Projects	85	96.6	3	3.4	**97%**

b. Reasons for Satisfaction

Respondents who were satisfied of the clean-up programs justified that the surroundings were clean as cited by 42 or 49.4%; clean-up drives were held as reported by 21 or 24.7%; prevents sickness such as dengue for 16 or 18.8%; and everyone participates as observed by six or 7.1% of the respondents.

Table VII.E.3.b. Reasons for Satisfaction with Clean-up Programs/Projects

Reason	Frequency (n = 85)	Percent
Clean surroundings	42	49.4
Clean-up drives are held	21	24.7
Prevents sickness such as dengue	16	18.8
Everyone participates	6	7.1

c. Reasons for Dissatisfaction

The only reason for dissatisfaction with the implementation of the clean-up programs as cited by three of the respondents was that the program implementation was not held regularly.

Table VII.E.3.c. Reasons for Dissatisfaction with Clean-up Programs/Projects

Reason	Frequency
Not held regularly	3

4. Need for Action

The citizens' response was low when asked whether or not the clean-up program needs appropriate action. This is in agreement with more than majority of the respondents, 65 or 73%, who replied "no," which means that the project needs no appropriate action.

Table VII.E.4. Percentage Score for Need for Action on Clean-up Programs/Projects

Need for Action	Yes		No		Percentage Score
	Frequency	Percent	Frequency	Percent	
Project/Program Clean-up Programs/Projects	23	26.1	65	73.9	**26%**

F. Overall Service Area Assessment

1. Comparative Results

a. Awareness

Among the five environmental programs and services, majority, 127, of the respondents were aware of the solid management programs followed by 103 respondents, who knew about clean-up programs and projects. A high number, 99, were aware of community-based greening projects and 83 were knowledgeable about waste water management. The least 59, knew of air pollution control program.

Table VII.F.1.a. Awareness on Environmental Management Projects/Programs

Project/Program	Yes	No	Awareness			
			Total Number of Respondents	Percentage Score	Cutoff	Adjectival Rating
Community-based greening projects	99	51	150	66%	58%	High
Air Pollution Control Program	59	91	150	39%	58%	Low
Solid Waste Management	127	23	150	85%	58%	High
Waste Water Management	83	67	150	55%	58%	Low
Clean-up Programs/Projects	103	47	150	69%	58%	High

High awareness on the three programs of environmental management was noted, namely, solid waste management (85%), clean-up programs (69%) and community-based greening projects (66%). On the other hand, low awareness was noted on two other programs which are waste water management (55%) and air pollution control program (39%).

b. Availment

Almost all of the respondents aware, 124 out of 127, practiced solid waste management programs. Eighty-eight of 103 partakes in clean-up programs/projects, 69 of 99 participated in community-based greening projects and 66 of 83 practiced waste water management. The least 50 respondents participated in air pollution and control program.

Table VII.F.1.b. Availment of Environmental Management Projects/Programs

Project/Program	Yes	No	Availment			
			Total Number of Respondents	Percentage Score	Cutoff	Adjectival Rating
Community-based greening projects	69	30	99	70%	60%	High
Air Pollution Control Program	50	9	59	85%	63%	High
Solid Waste Management	124	3	127	98%	59%	High

Waste Water Management	66	17	83	80%	61%	High
Clean-up Programs/Projects	88	15	103	85%	60%	High

Results on environmental management programs showed high availment rating. Majority, 98%, practiced solid waste management programs, 85% each participated in air pollution control program and clean-up programs. Eighty percent practiced waste water management while 70% participated in community-based greening projects.

c. Satisfaction

Based on the survey, majority of the environmental programs implemented by the local government of Malay satisfied the respondents who availed the programs and services. Continued interventions and measures will make the programs and services even more satisfactory.

Table VII.F.1.c. Satisfaction with Environmental Management Projects/Programs

Project/Program	Yes	No	Satisfaction			
			Total Number of Respondents	Percentage Score	Cutoff	Adjectival Rating
Community-based greening projects	64	5	69	93%	62%	High
Air Pollution Control Program	45	5	50	90%	64%	High
Solid Waste Management	122	2	124	98%	59%	High
Waste Water Management	60	6	66	91%	62%	High
Clean-up Programs/Projects	85	3	88	97%	61%	High

The data indicated that majority of the respondents were satisfied on environmental management services. Solid waste management (98%) and clean-up projects (97%) are the programs to which most respondents were satisfied with. Other programs were evaluated to have relative satisfaction rating.

d. Need for Action

Almost three-fourths of the respondents on every services who were able to avail said that the programs on environmental management demands less action. However, additional efforts for the betterment of the programs would make the services even more efficient.

Table VII.F.1.d. Need for Action on Environmental Management Projects/Programs

Project/Program	Yes	No	Need for Action			
			Total Number of Respondents	Percentage Score	Cutoff	Adjectival Rating
Community-based greening projects	24	45	69	35%	62%	Low

Air Pollution Control Program	17	33	50	34%	64%	Low
Solid Waste Management	28	96	124	23%	59%	Low
Waste Water Management	22	44	66	33%	62%	Low
Clean-up Programs/Projects	23	65	88	26%	61%	Low

According to the respondents who said to have availed the environmental management program and services, most of the programs needed less action. Continued monitoring and making additional efforts would further improve the services rendered to the public.

2. Overall Satisfaction Rating

Majority, 116 or 77.3 percent agreed local government has done its duty to protect the environment through its programs and services.

Table VII.F.2. Overall Satisfaction with Regards to Environmental Management Programs/ Projects

Response	Frequency (n = 150)	Percent	Adjectival Rating
Satisfied	116	77.3	High
Not satisfied	34	22.7	

3. Overall Needs for Action

Sixty percent of the respondents reported that the local government should take actions to improve environmental programs to help the environment.

Table VII.F.3. Overall Response as to Whether or Not the Environmental Management Programs/Projects Need Appropriate Action from the Local Government

Response	Frequency (n = 150)	Percent	Adjectival Rating
Need appropriate action	90	60.0	High
Do not need appropriate action	60	40.0	

4. Recommendations from Citizens

From the 150 respondents of the study, the top five recommendations given for environmental management programs were as follows: develop waste management programs and strictly implement waste segregation as pointed out by 19 each or 12.7% of the respondents; sustain those beneficial environmental programs as cited by 16 or 10.7%, and 15 or 10.0% answered organized clean and green projects.

Table 10f.v. Recommendations from Citizens on Environmental Management

Recommendations	Frequency (n = 150)	Percent
Develop waste management programs	19	12.7
Strictly implement waste segregation	19	12.7
Sustain those beneficial environmental programs	16	10.7
Organize Clean and Green projects	15	10.0
Reforestation	12	8.0
Stop building constructions	9	6.0

Improve programs and services	9	6.0
Encourage public participation on the services and programs of the LGU	9	6.0
Proper implementation of environmental programs and services	5	3.3
Hire more employees	4	2.7
Make interventions to conserve the island	4	2.7
Take actions to control air pollution	4	2.7
Limit construction of commercial buildings to control wastes	4	2.7
Construct proper drainage	4	2.7
Stop further release of new building permits to avoid environmental damage	3	2.0
Resolve environmental problems	3	2.0
Collect garbage regularly	3	2.0
Entail discipline to the public	2	1.3
Develop environmental ordinance in the area	2	1.3
Prohibit building construction near the shore	2	1.3
Ensure that no siltation will occur in Argao coastline	1	0.7
Plant mangroves	1	0.7

VIII. CONCLUSIONS

The citizens' satisfaction on environmental management programs is satisfactory. This indicates that the citizen's rating with the LGU's environment related programs/services generated good reactions. On-going intervention and additional effort toward improvement are still necessary. The LGU must enhance interventions for air pollution control and waste water management.

Respondents were mostly aware of the environmental management particularly the Clean-up programs/Projects and Solid Waste Management. They were less aware on programs to control air pollution and waste water management. Therefore, the LGU should improve public awareness along these programs.

There were a high number of respondents who availed environmental management on solid waste management. Programs to control air pollution is least availed by the respondents in the environmental management area. Thus, the local government should ensure that its constituents take their active part in the environmental management programs, thereby, generating positive feedbacks from the citizens.

IX. REOMMENDATIONS

The results of the study revealed that intervention and effort to further enhance the local government programs to achieve innovation and quality service in the Malay, Aklan are very much needed.

Enhance air pollution control program. Interventions must be made to encourage people's participation in this program most especially to those who dispose their garbage by burning them. Seminars about proper waste disposal will probably help resolve this problem.

X. REFERENCES

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Progress and Challenges in Health Care Waste Management in Lao PDR

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ABSTRACT:

In support of the Ministry of Health's objectives, the World Health Organization has supported a program of technical assistance aimed at improving health care waste management in Lao PDR at central, provincial and district level. During the period 2015-2016, national health care waste management regulations were revised, health care waste management practices were assessed in two central and four provincial hospitals, and two model ward pilots were established. Detailed waste characterization studies were conducted in the central hospitals.

The revised national regulations will require all hospitals and health centers to develop and implement health care waste management plans and will, for the first time, require central and provincial hospitals to treat infectious waste onsite using non-burn technologies. Successful implementation of effective waste segregation, collection and transport practices will be essential under this scenario. Assessments of current waste management practices in central and provincial hospitals helped increase understanding of challenges that need to be overcome while the implementation of model ward projects has demonstrated best practices and provided models for replication and scale up. The waste characterization studies yielded better understanding of the economic implications of waste segregation and pointed out potential opportunities for cost recovery through recycling. They also underscored the importance of conducting such studies onsite prior to selection and procurement of waste management equipment and the potential for seriously miscalculating waste quantities when using text book waste generation rates.

This paper will be of interest to health authorities involved with health care waste management, hospital and health center administrators and health care workers, waste management specialists, waste system operators, environmental and other regulatory authorities, and consultants active in the field of waste management.

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Pro-Poor Tourism: A Catalyst to Diversify Livelihood Options for the Impoverished Community in Barangay Sabang, Baler

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ABSTRACT

This study attempts to show as to how tourism, focusing on the Pro-poor approach, serves as a catalyst to diversify the livelihood options for the impoverished community in Barangay Sabang, Baler which has been experiencing an undeniable growth in their economy because of the tourism industry; however, the local community of Barangay Sabang, especially those who are living below the poverty line, remains uninvolved with tourism thus the underlying benefits and opportunities of the industry do not reach them.

The study underlies the local and international studies that illustrate Pro-poor tourism in various perspectives, how the PPT approach varies with the other alternative forms of tourism development, and studies on how poverty was reduced because of tourism. Furthermore, this study rests on the Social-exchange theory by Homans (1958) which explains that if the local residents realize the socio-economic augmentations brought by tourism through the programs incorporating the PPT approach, then it is more likely that they would accept and support the said programs. This theory is the basis of the researchers in creating and recommending programs for the impoverished community.

The study used the quantitative research method, making use of survey questionnaires to extract the actual data from the respondents in the research locale. The researchers also created possible programs and activities for the impoverished community in Barangay Sabang which utilizes the Pro-poor tourism approach with the aim of giving benefits for the poor by providing them other livelihood options related to the tourism industry.

Keywords*: Pro-Poor Tourism, Impoverished, Livelihood Options*

CHAPTER 1
THE PROBLEM AND ITS BACKGROUND
1.1 INTRODUCTION

Tourism is a multi-dimensional industry where each sector plays a vital role in making tourism activities successful. According to an article released by the United Nations World Tourism Organization (2015), tourism is also a service-oriented and labor-intensive industry; therefore, it requires greater manpower and labor force, making it one of the largest producers of job opportunities among all other industries, as well as being one of the major contributors in the economy's inclusive growth. Over the past six decades, the industry has been recognized as one of the largest and fastest growing economic sector in the world, having an increase of 4.6% in International Tourist arrivals in 2015 to 1,184 million and generated an international export earnings of USD 1.5 trillion on the same year. (UNWTO, 2015).

Tourism in almost all countries with distinct characteristics and ethos, promotes friendship in diversity and creates transnational harmony. Tourism is also regarded as a tool or mechanism from which countries, states, cities, provinces, and local communities derive their economic wealth (Andalecio, 2015).

Positive economic outcomes that benefit local people are dynamic manifestations, such as divergence of the local industry base, upturn in public employment, and greater incomes, increase of government's income and internal revenue allotment, and business revenue growth (Murla, 2011).

The tourism industry like transport and trade is an essential element or part of planning for development in third world or developing countries. In fact, tourism industry has been a relief and augmentation for dormant industries and traditional agriculture which creates inter-sectoral linkages. Furthermore, tourism itself is seen to be an effective economic development in rural areas (Ghimire, 2001 as cited in Andalecio, 2015).

Rural Poverty

According to the International Fund for Agricultural Development (IFAD), the population has reached a total number of 102,250,133 as of the year 2016 wherein more than half of the total population lives in rural areas and overall, the 25% of the Philippine population is considered poor. In most cases, the major source of income and subsistence for poor people residing in rural areas depend in agricultural activities like farming and fishing. In general, unemployment, illiteracy, and poverty issues are higher among indigenous people and those who are living on upland areas. In the Philippine setting, the cause of poverty vary from island to another, but usually some of the factors that trigger agricultural productivity decline are practices that are not sustainable, and small holder farming operations that are no longer profitable. The following occurrences have led to the depletion of fishing waters and deforestation (IFAD, 2016).

Defining Pro-Poor Tourism

Pro-Poor Tourism (PPT), coined by UK Department for International Development (DFID) and defined by Chok, Macbeth & Warren (2007) as an approach that provides an in-depth understanding of tourism's potential to reduce poverty. Pro-Poor Tourism is defined as a tourism approach that, "generates net benefits for the poor" (PPT Partnership, 2004; Tokalch, Pearlman & King, 2012). This approach entails that tourism *can* and *should* provide contribution to the pro-poor economic growth, enabling the impoverished communities to participate actively, and have access to the benefits brought by tourism in the economy (PPT Partnership, 2004b).

Pro-Poor Tourism in the ASEAN Countries

Meanwhile, in other ASEAN countries such as Cambodia, Thailand, Laos and Vietnam, their governments have recognized the potential of tourism in enhancing livelihood programs for the poor through local participation, leading to constant development of Pro-Poor Tourism strategies that would provide direct impacts of tourism economic benefits in alleviating poverty. The countries' Pro-Poor Tourism strategies are shown to be effective and efficient as illustrated:

Table 1.1 Sample list of Pro-Poor Tourism Projects in Other Countries (Tolkach et al., 2012)

Country	Project
Cambodia	Integration of the environment information system for increased efficiency of environmental protection and encouragement of sustainable tourism practices within one province
Thailand	A community-based tour operator benefitting the local community through its business practices, mainly supply chain linkages. It has succeeded in attracting tourists and using local knowledge for development of a successful tourism product.
Lao PDR	Country-wide community-based ecotourism initiative involving the development of infrastructure, tour packages, micro-businesses, and accommodation in order to alleviate poverty and preserve the environment
Lao PDR, Vietnam & Cambodia	A region-wide initiative to develop tourism outside of urban areas through the development of infrastructure, tour packages, training and capacity building of the local population
Thailand	Disaster relief and development projects initiative, which included community-based tourism development, environmental education and the establishment of a community center

Tourism in the Philippine Context

In relation to the Philippines, according to the National Tourism Development Plan 2016-2022 of Department of Tourism, the industry has brought a total of Php 308,171,000,000 of inbound and domestic revenues from the country's top markets as of the year 2015. Thus, the overall economic development of the country is evident. However, despite of the growing economy of the Philippines brought by the thriving tourism industry, it remains a challenge for the government to formulate strategies that would lower down the case of poverty in the country.

According to the year-end report of the Department of Tourism (2015) released last June 2016, in 2015, 4.99 million were employed in tourism related activities. A total of 137 trainings were conducted by the Philippine Department of Tourism that benefitted a total of 5,867 industry professionals: front liners, tour guides and tourist police. There were also seminars that discussed effective customer service, crisis management and tourist safety, *kulinarya* for community-based tourism, how to handle persons with disabilities (PWD), personality development, tourism awareness, food and beverage handling, tourism enterprise innovation and self reinvention. There was an accumulated 1.8 million jobs generated in the passenger transportation sector, followed by the food and beverage sector with 1.7 million. Moreover, 12.7% of the total employment in the country was accounted under the tourism industry.

Tourism Development in Baler

The tourism industry in Baler, according to Aurora[.ph] which is the official tourism website of the province, mainly focuses on three kinds of attractions which are historical sites, cultural and religious events, and nature areas and beaches. Various attractions such as the historical house of the Quezons, Baler Catholic Church, Sabang Beach, Cemento Beach and Reef, Digisit Beach and Dimadimalangat Islet can be found in Baler, which is also one of

the premier sites for Surfing Activities in the Philippines. The locals' sources of economic growth are fishing, hunting and farming. Their products include coconut, rice, fish, citrus, processed food, sabutan, forest-based wood/non-wood products and livestock.

Baler, the capital town of Aurora, has been experiencing an apparent growth in their tourism industry wherein based on the recent taxable real-property assessment conducted in the town by the Municipal Assessor's Office (2014), results showed that the huge accumulated tourism income has contributed to the increase in tourism tax revenue by a total of 818%. Moreover, as said by the Town Assessor, Ramil M. Porqueriño, Baler's real-property tax as of the year 2015, had reached a total of Php 237,490,860. Compared to the previous year's Php 29,031,820.

In terms of tourism arrivals in the province, records from the Provincial Tourism Office (PTO) showed that the number of tourist arrivals from 2015 reached a total of 778,917. Riza P. Del Rosario, the Municipal Tourism Officer of Baler, stated that this tourist influx was greatly influenced by one of the top tourist attractions in the area, the Sabang Beach, which is very ideal for surfing. The said beach is primarily located in the coastline of Barangay Sabang, making it the most visited barangay in the municipality. The major establishments and commercial spaces, most especially the accommodation sector, are mostly situated in Barangay Sabang: Costa Pacifica is the most popular one.

Tourism in Sabang

As stated in an article released by the Business Mirror [.com.ph], the opening of Costa Pacifica in 2012, a three-star hotel, in Barangay Sabang is one of the major reasons that led to the continuous increase in tourism influx in the barangay, making it as one of the main instruments to market the destination. Consequently, the number of business establishments related to the tourism industry increased as well. According to the Philippine Statistics Authority [PSA] (2015), Barangay Sabang as of the year 2015, already has a total number of 23 establishments which mainly consist of accommodation, and food and beverages service activities. These establishments are said to have generated a total number of 159 employments.

However, despite the evident growth of the tourism industry in the research locale, the other members of the community remain uninvolved with the tourism activities; thus, the underlying benefits and opportunities brought by the industry do not reach the locals. Furhermore, even though the tourism industry continuously grows and develops within the locale, the poverty rate in Baler, Aurora, specifically in Barangay Sabang remains stagnant and is still somehow increasing in percentage.

Figure 1.1 Poverty Estimates of Baler in the year 2006, 2009 and 2012 (PSA)

Province	Municipality	Poverty Incidences			Coefficient of Variation			90% Confidence Interval					
								2006		2009		2012	
		2006	2009	2012	2006	2009	2012	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
Aurora	Baler	11.6	9.6	10.0	22.2	23.4	16.3	7.4	15.8	5.9	13.2	7.3	12.7

1.2 STATEMENT OF THE PROBLEM

In this light, this research seeks to answer the following question: "How can Pro-Poor Tourism, utilized as an approach, aid in diversifying the livelihood options of the impoverished community in Barangay Sabang, Baler" to be supported by the following sub-questions:

1. How can the local residents of Barangay Sabang, Baler be described in terms of their demographic and job profiles?

2. What are the perspectives of the local residents of Barangay Sabang, Baler in regard to the tourism industry in terms of its social aspects?
3. What are the perceived economic benefits of applying the Pro-Poor Tourism approach in the expansion of the livelihood options for the impoverished community in Barangay Sabang, Baler?
4. How willing is the local government in incorporating the Pro-Poor Tourism approach in helping the impoverished with the existing tourism programs in Barangay Sabang, Baler?
5. What programs in an action plan that incorporates Pro-Poor Tourism approach could be developed to attain inclusive growth in Barangay Sabang, Baler?

1.3 OBJECTIVES OF THE STUDY

This study aims to:

1. Describe the local residents of Barangay Sabang, Baler in terms of their demographic and job profile.
2. Know the perspective of the local residents of Barangay Sabang, Baler in regard to the tourism industry in terms of its social aspects.
3. Identify the perceived economic benefits of applying the Pro-Poor Tourism approach to expand the livelihood options for the impoverished community in Barangay Sabang, Baler.
4. Identify the willingness of the local government in incorporating existing tourism programs in Barangay. Sabang, Baler with Pro-Poor Tourism in order to meet its objectives in helping the impoverished.
5. Develop an action plan that incorporates Pro-Poor Tourism approach in order to attain inclusive growth in Barangay Sabang, Baler.

1.4 HYPOTHESIS

One of the study's main objectives is to know the different perspectives of the local residents of Barangay Sabang regarding the social and economic aspects of tourism within their community. In this light, the researchers have formulated a hypothesis that will be tested and may be proven true or not based on the results of data to be gathered from the respondents. The hypothesis of the study goes as:

"The socio-economic perspective of the local residents of Barangay Sabang, Baler, especially the impoverished community, is negative. Thus, they view the Pro-poor Tourism approach will be an ineffective strategy to diversify their livelihood opportunities."

1.5 SIGNIFICANCE OF THE STUDY

The study aims to utilize the Pro-Poor Tourism approach to diversify the livelihood options for the impoverished community in Barangay Sabang, Baler. With such, this segment aims to explain as to how the study can or may be beneficial for the following sectors as listed below:

Contribution to the Local Government

The study have suggested various strategies and suggestions under pro-poor tourism approach that can be used to guide the government in creating programs and formulating and implementing policies that would make the tourism industry as one of the means to address poverty through expanding tourism livelihood opportunities for the poor.

Relevance to the Impoverished Community of Barangay Sabang

The expected outcome of the study is to make tourism work for the poor. The study is focused but not limited to expanding livelihood opportunities for the poor and developing

pro-poor strategies and policies. There are also suggested activities such as capacity building workshops for the impoverished community of Barangay Sabang who are interested to develop and utilize their skills in the field of tourism and;

Academic Contribution

The study has proposed various strategies and policies to increase the benefits for the poor through unlocking tourism opportunities for them. This study served as a related literature and can be use as guide of the future researchers who want to tackle pro-poor tourism.

1.6 SCOPE AND LIMITATIONS

The scope area of the study is Barangay Sabang, Baler in which the local residents are the respondents and the primary source of information of the research, including those who are currently employed in the establishments related to the tourism industry such as hotels, restaurants and souvenir shops. The researchers have also gathered supporting data from the local government of the research locale through interviews.

The study is limited to the statistical data collected by the researchers from the Philippine Statistics Authority (PSA) that was published last 2016 for the year 2012 for the provincial and municipal level poverty estimates, and the year 2015 for the employment rate, population and number of households. Hence, the gathered data from PSA is the most updated. On the other hand, to be able to address the said limitation, the researchers went to obtain the most updated population count from PSA dated last 2016, but only for the Barangay Sabang level. The information gathered was as of February 2017, so any developments after this date are not included in this study.

1.7 DEFINITION OF TERMS

Entrepreneurial Development. Further progressions and enhancements of business establishments with the objective to earn more income. (Singh, 2012)

Inclusive Growth. The growth in the economy creating opportunities for the various sectors involving the four major actors in tourism namely, private sector, local government, tourists and the host community. (Tolkach et al., 2012)

Land Use Planning. The process of evaluating and assessing lands to become a basis for decisions involving land disposition and utilization. This includes the environmental effects of land use and its impact on the local community. (Andalecio, 2015)

Livelihood Options. Means of earning income in order to support the individual basic needs. In terms of the study's research locale, the main source of livelihood revolves around fishing, hunting and farming. (Singh, 2012)

Poverty Threshold Parameter. The determinant used to identify whether a family is living below the poverty line based on their monthly income. (PSA, 2016)

Pro-Poor Tourism. An approach that has provided an in-depth understanding of tourism's potential to reduce poverty by generating net benefits for the poor. (PPT Partnership, 2004)

Rural Tourism. A form of tourism that takes place in rural areas or settlements that provides employment and income to the local population. (Andalecio, 2015)

Vulnerable Groups. Groups that experience a higher risk of poverty and social exclusion than the general population. (PSA, 2016)

CHAPTER 2
REVIEW OF RELATED LITERATURE AND STUDIES
2.1 LITERATURE REVIEW
2.1.1 Pro-Poor Tourism in Various Perspectives

Pro-Poor Tourism is known as a tourism approach that mainly focuses on 'generating net benefits for the poor' (Pro-Poor Tourism [PPT] Partnership, (2004); & Tokalch et al., (2012). It also began from the perspective that tourism could help influence the increase of pro-poor economic growth; a growth that paves the way for the poor to be decisive in participating and profiting from the economic activity (PPT Partnership, 2004).

Pro-Poor Tourism is guided by various underlying principles. Chok, Macbeth & Warren (2007) has shown concern on poverty as multi-dimensional because it outstretches income generation to be able to extend the range of livelihood impacts taken from tourism. Similarly, Harrison (2008) agreed that the main purpose of tourism is to lessen poverty, although it was not really a new concept. It was also understood on the initial emphasis on tourism as a reason for more job opportunities and economic growth, which involve the progress of better strategies and policies focused on the idea of basic needs, and has always been existent from academic literatures on tourism and development.

Pro-Poor Tourism is based on the major concern of giving care and concern to the poor; it then became associated with the community-based tourism (Harrison, 2008). Wehkamp (2007) also stated that community-based tourism stands as a sub-group of Pro-poor Tourism. Explained with the two concepts by Twinning-Ward (2007), Pro-poor tourism is a new avenue to the planning and management of tourism that positions the people living in poverty at the center of the agenda; whereas, community-based tourism is a type of sustainable development that enhances pro-poor tourism plans in a community setting. Additionally, community-based tourism was also an effective intermediary in the growth of ecotourism during 1990s and is presently being suggested as a form of pro-poor tourism Goodwin (2009).

Conversely, community-based tourism does not have the chance to purely concentrate on the very poorest of the society. Ashley, Roe, & Goodwin (2001) stated that, "as long as poor people reap net benefits, tourism can be classified as 'pro-poor' (even if richer people benefit more than poorer people)." The UK Department for International Development [DFID] (1999) gave caution regarding the anticipation that all poor people will get advantages equally because it was conceded that others will lose.

In addition, Pro-Poor Tourism is regarded as not a befitting strategy for reaching the poorest, but it is accepted as people who are living higher the poverty line in certain tourist destinations may also receive major advantages from tourism. Thus, reaching out to the poor can result directly in helping the better-off clients or employers. (Pro-poor Tourism Partnership, 2007 as cited in Harrison, 2008).

Pro-Poor Tourism varies in definition, comparison and advantage depending on the resources and respondents. It will always be dependent on how they stand with their thoughts to make such knowledge reliable and dependable. To further improve the reliability organization of the study, a certain guideline and arranged objectives may help in the creation of consistent set standards resulting to a proposed conceptual framework (Reasons for a Conceptual Framework, 2016).

2.1.2 Defined Alternative Forms of Tourism Development

The PPT approach frequently overlaps other Alternative Forms of Tourism Development such as *sustainable tourism, ecotourism and community based tourism*. In this light, the researchers mentioned its definitions first to give clarifications to the readers that they are not synonymous to each other. The underlying difference among these approaches

can be seen through the target final outcomes of the projects or programs and the main drive of the strategies that would be used.

2.1.2.1 Sustainable Tourism

Sustainable Tourism, as defined by United Nations World Tourism Organization (2005) Sustainable Development of Tourism is:

> "Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities."

It requires the informed participation of all relevant stakeholders, as well as strong political leadership to ensure wide participation and consensus building. Achieving sustainable tourism is a continuous process and it requires constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary.

On the other hand, the International Council on Monuments and Sites (ICOMOS) stated that *sustainable tourism* refers to a level of tourism activity that can be maintained over the long term, because it results in a net benefit for the social, economic, natural and cultural environments of the area in which it takes place.

The 1987 Brundtland Commission Report (WCED 1987) has been generally acknowledged for introducing the concept of sustainability. It is defined as, "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." Taking off from the basic principles of the Brundtland report, the global tourism industry has adopted the following definition of sustainable tourism development:

> "Sustainable tourism development meets the needs of present tourists and host regions while protecting and enhancing opportunity for the future. It is envisaged as leading to management of all resources in such a way that economic, social, and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity, and life support systems" (WTTC 1998).

2.1.2.2 Ecotourism

The Tourism International Ecotourism Society (1990) defined ecotourism as, *"Responsible travel to natural areas that conserves the environment and improves the well-being of local people."*

On the other hand, Ceballos-Lascurain's definition of ecotourism in 1993 eventually became the official definition adopted by the IUCN in 1996:

> "Ecotourism is a form of sustainable tourism—all forms of tourism can become more sustainable but not all forms of tourism can be ecotourism. Ecotourism is environmentally responsible travel and visitation to relatively undisturbed natural areas, in order to enjoy, study and appreciate nature (and any accompanying cultural features—both past and present), that promotes conservation, has low visitor impact, and provides for beneficially active socio-economic involvement of local populations."

According to the UNWTO's (2005) definition, ecotourism refers to forms of tourism which have the following characteristics:

> "1) All nature-based forms of tourism in which the main motivation of the tourists is the observation and appreciation of nature as well as the traditional cultures prevailing in natural area; 2) It contains educational and interpretation features; 3) It is generally, but not exclusively organized by specialized tour operators for small groups. Service provider partners at the destinations tend to be small locally owned businesses; 4) It

minimizes negative impacts upon the natural and socio-cultural environment; 5) It supports the maintenance of natural areas which are used as ecotourism attractions by: Generating economic benefits for host communities, organizations and authorities managing natural areas with conservation purposes; Providing alternative employment and income opportunities for local communities and; Increasing awareness towards the conservation of natural and cultural assets, both among locals and tourists."

The definitions of ecotourism from the TIES, IUCN and WTO shared a common definition---appreciating, conserving, and ensuring the welfare of nature which at the same time improving the standard of living of the host community by generating socio-economic benefits.

2.1.2.3 Community-Based Tourism (CBT)

There has been a struggle in finding a common definition for CBT, but most of the definitions given out by different agencies and NGOs (such as World Bank) supports this type of Alternative form of tourism development. Community-Based Tourism is a type of tourism wherein there is an active involvement of the local residents in this activity, by directly providing the tourists' needs such as accommodation and the like, promoting a sustainable one by making the tourist experience the destination as it is. Community-Based Tourism often took place in the rural areas where the whole community benefits from it as a whole.

2.1.3 Pro-poor Tourism vs. Other Alternative Forms of Tourism

After having researched and understood the definition and concepts of the other alternative forms of tourism, the researchers made a comparison between the aforementioned types of tourism and Pro-poor tourism. The comparison shows the differences of the objectives and implications of such as shown in the table below:

Table 2.1 A Comparison between Other Alternative Forms of Tourism and Pro-poor Tourism

SUSTAINABLE TOURISM	PRO-POOR TOURISM
Requires several elements such as maintenance of the quality of the current destinations through environment preservation and generating socio-economic benefits through tourism by encouraging local participation.	The main focus of the strategies is poverty alleviation though environmental preservation and local participation play a vital role in the whole process.

COMMUNITY-BASED TOURISM	PRO-POOR TOURISM
Promotes local empowerment by increasing the general level of local participation and involvement.	The approach goes beyond the general community. It is more specific as it focuses on the poor community.

ECOTOURISM	PRO-POOR TOURISM
Concerned at the well-being and economic growth of the local community but the main thrust is the welfare and preservation of the natural environment.	The main thrust of the strategies is to unlock tourism opportunities for the poor so as to deliver economic gain and improved their standard of living. Environmental preservation is just part of the strategy.

2.1.4 Pro-poor Tourism in the International Context

Pro-poor Tourism has already been employed as an approach in some other international countries through the use of the different PPT strategies to alleviate poverty in their rural areas; thus, helping the impoverished communities to gain benefits and opportunities that tourism could bring. It also paves the way to diversifying their livelihood options to gain more income. Singh (2012) stated that there are in fact many types of PPT strategies that may range from the increase of local employment to establishing methods for consultation. She also mentioned how these strategies should be emphasized to make real progress in alleviating poverty. Singh (2012) added that the PPT strategies should then increase the economic benefits by boosting the local employment, wages and local enterprise opportunities, and create collective sources of incomes and revenue shares. It should also be able to enhance non-financial livelihood impacts by training and building the capacity of the locals in terms of tourism, mitigating the environmental impacts of the industry, addressing the competing use of the natural resources, improving the social and cultural impacts of tourism, and increasing the access of the locals to several infrastructures and services. Lastly, the PPT strategies should also enhance participation and partnership by creating more supportive policies or planning frameworks for the impoverished, increasing the participation of the poor in tourism decision-making, and building pro-poor partnerships with several private sectors that will surely extend the flow of information regarding tourism to the impoverished.

In relation to this, Tolkach et al. (2012) are one of the many researchers of Pro-poor Tourism approach who identified some of the different countries that utilize PPT projects and strategies. In order to do so, Tolkach et al. (2012) contacted potential participants from several countries with existing PPT projects that have been completed or are still being implemented. Results revealed that some of the various countries with PPT projects are as follows: Madagascar, Nepal, Cambodia, South Africa, Albania, Lao, Thailand and India. The responses also reported the different PPT projects that were established in their area to boost poverty alleviation showed that the said countries mostly used community-based tourism development as their strategy. It involves managing a protected area with the objective of creating a supplementary income for the local residents (mainly farmers), establishing traditional style accommodation and tours that will benefit the locals through income generation, building small resorts or camps that will employ local residents, making use of tour operators that will benefit the local community through its business practices and developing infrastructures, tour packages, accommodation and micro-businesses to alleviate poverty.

On the other hand, in terms of developing micro-businesses for poverty alleviation, Islam and Carlsen (2012) further emphasized PPT in their study. The research aimed to expand the knowledge and understanding between the connection of tourism micro enterprise development and alleviating poverty in the case of the rural areas in Bangladesh, stating that the establishment of tourism micro enterprises is another strategy for the rural and impoverished people to have an opportunity to be involved in tourism and be able to gain benefits from it. The important role of the government, National Tourism Organizations (NTOs) and NGOs are also mentioned in the study stating that the joint effort of the said organizations to work with the tourism micro-enterprises would then result to tourism development; thus, addressing the rural poverty problem in Bangladesh.

Mutana, Chipfuva, & Muchenje (2013) had a similar study with Islam and Carlsen (2012) because their research also explored the contribution of the different tourism operators in developing Pro-poor Tourism in Zimbabwe, emphasizing the need of the said tourism operators to incorporate various Pro-poor strategies and initiatives in their business operations. The findings of Mutana et al.'s (2013) study disclosed the commitment of several

tourism operators in Zimbabwe towards the PPT approach, evidenced by their education funding initiatives as they paid for the primary school children's school fees coming from impoverished families in the poor rural areas in Zimbabwe. They also encouraged tourists to donate and to volunteer. Lastly, the surveyed tourism operators in the study indicated that they also conducted village tours in impoverished communities with the aim of employing the locals so as to generate income.

Furthermore, Srisantisuk (2015) was able to identify two specific PPT development and strategies in Thailand namely the *Village-based Tourism Program and the "One Tambon One Product" Program.* The *Village-Based Tourism Program* of Thailand aims to increase the income of the impoverished villagers. It gives priority in the participation of the community in managing and planning tourism in the area, and helps them develop their own tourism products. Other objectives of the said programs also include the achievement of an equitable income distribution within the villages and the properl management of natural resources and the environment of the selected project areas. On the other hand, *One Tambon One Product* (originally called as One Village One Product) aims to enable the community to create, develop and market their very own local products based on their local expertise in order to improve and diversify the livelihood options of the impoverished people in the selected communities.

Conversely, there are also existing studies that critiques the effectiveness and reliability of PPT. From the analysis of Spenceley and Meyer (2012), formulated in different theories and practices in the tourism development targeting poverty alleviation in Less Economically Developed Communities (LEDCs), it was stated that the government, development agencies, and NGOs invest for tourism projects that advocate the reduction of poverty with the belief that the tourism industry can provide livelihood opportunities and promote income for the poor. They mentioned that there is one possible method to redistribute wealth from the rich to poor, and it is through tourism in rural areas. It was also elaborated that a tourist will surely spend their money for their travel, and therefore, in a tourism destination, the poor has the potential to provide what a tourist needs, and to provide the needs of the poor, they must be trained to be employed even in small-scale businesses or have a livelihood that supports the needs and wants of tourists. Lastly, Spenceley and Meyer (2012) argued that even if the government, development agencies, including the private sector, and NGOs use the PPT approach for the poor, LEDCs are unlikely to benefit if they lack sufficient understanding on how tourism industry works.

Poverty is a natural and an unblocked problem carried out by modernization, thus, problems in poverty can be lessened if *modernization* had made progress, and in this process (pertaining to modernization); the tourism industry promotes economic growth because it generates employment opportunities (Ćetin and Ozgur, 2013). Moreover, supporting Spenceley and Meyer (2012), Ćetin and Ozgur (2013) also mentioned that the government, development agencies, and NGOs are interested to use the PPT approach for the same reason that it provides opportunities, and will help the economy of impoverished communities. However, they said that these stakeholders only make use of the PPT for self-interest because PPT leans on the neo-liberal logic which means that no government intervention uses the concept *free market*. The aim that PPT approach is designed to alleviate poverty is neglected. Agencies such as World Tourism Organization and World Bank used *community based tourism* and *sustainable tourism* in their programs to reduce poverty, but only addressing at a local level that it loses its focus on the possible changes at a national and international level. Ćetin and Ozgur (2013) also questioned the inexistence of statements of positive outcome brought by the PPT approach and its proven strategies.

Pro-poor tourism has been regarded in different perspectives: one is in the economic field, where it is viewed as an approach that generates employments and builds an *open*

market to marginalized areas (Feng, 1999; Zhou 2002, as cited by Huang & Shu, 2014). Conversely, Huang and Shu (2014) argued that modernization leads to the fast development of the tourism industry; however, it may negatively affect the communities' living cost because the local residents and the tourist share the same resources in the community. The perception and willingness of local residents especially in the marginalized area must be consulted, and the government must establish policies and regulations to ensure that the state of the poor people will be considered (Huang and Shu, 2014). Additionally, Huang and Shu (2014) concluded that the government has the power to provide opportunities, protect the environment, and help its own residents to cope with the development.

Gasćon (2015) defined PPT as a *development methodology* projected to combat poverty through tourism by proposing various actions to generate income through employment or creation of small scale business. In the case of Amantani Island in Peru, PPT approach leads to more unequal distribution, even if the tourism industry may increase in terms of the net income as a whole community, because of the resource control, and how it is spent and managed by stakeholders, specifically the government (Gasćon, 2015). Pro-poor tourism only advocates to give opportunities for the poor to gain an increase in monetary income, but this does not mean there will be equity. Pro-poor tourism approach will work even if richer people will benefit more than the marginalized (Gasćon, 2015). He also said that if PPT is capable of scrutinizing whether the development brought by tourism really combats poverty and its causes, or the approach is just to increase poverty.

Like other critiques mentioned, Saayman and Giampiccoli (2016) opposed that PPT is an approach that focuses on mitigating poverty through the facilitation of development, specifically; PPT is an alternative form of tourism development. Additionally, Ćetin and Ozgur's (2013) agreed that PPT is a context supported by the neo-liberal system, and it does not promote great possibilities in changing the state of the poor, thus, increases inequality gap. Pro-poor tourism strategies are also unenforceable, and rely on the concept of *Corporate Social Responsibility*, because in a neo-liberal system government, the government must not interfere in creating policies and regulations. These are instead, entrusted to the private-sector, opposing Huang and Shu's (2014) conclusion that the government should be the controller. Saayman and Giampiccoli (2016) also concluded in their assessment that PPT approach forces to take Community Based Tourism as a guide within the parameter of their actions. However, even if PPT is an alternative form of tourism development, they said that it should not be seen as a solution to eradicate poverty and develop the economic community of the impoverished.

2.1.5 Poverty reduction through Tourism in the Philippines

2.1.5.1 The Millennium Development Goals

In September 2000, the biggest assembly of world leaders known as the Millennium Summit took place in history. The assembly led to the Millennium Declaration of the formulation of the Millennium Development Goals (MDGs). Each participating nations, including the Philippines committed itself to a global partnership that would result to the reduction of extreme poverty incidents by conducting a series of time-framed targets which are proposed to finish in 2015. The Millennium Development Goals are composed of eight interrelated and concrete goals, wherein the number one goal is to eradicate extreme hunger and poverty. In the Philippine context, MDGs have been closely incorporated in the national development plans, as well as to the programs of the local government units, civil society organizations, and other relevant organizations that are concerned with community development.

2.1.5.2 One-Step-Project

The Department of Tourism in partnership with the United States Agency for International Development (USAID) and the Department of Social Welfare and Development (DSWD) have signed a Memorandum of Understanding (MOU) last August 05,2013 to make the One-Step-Project Official. Under the occurrence of the said partnership, the Sustainable Livelihood Program of the DSWD will be incorporated to the National Tourism Development Plan to come up with into an eco-tourism community-driven development plan that would ensure and promote inclusive economic growth. The One-Step Project is a program that aims to uplift the standard of living of the poor through tourism direct interventions. It focuses on unlocking job opportunities through community-based projects, improvement of infrastructure as well as public-private sector engagement.One of the strategies of this project is to involve the communities most especially the poor at the very start of the development process. The beneficiaries include but not limited to the members of the DSWD's Pantawid Pamilyang Pilipino Program also known as 4Ps. The One-step project will also assess poor households that possessed a greater potential for success most especially those who are living in the tourism clusters that cater to more than 21 million tourists from both domestic and international. After the assessment, the poor household will be enrolled in tourism enterprises as part of either a supplier community or a destination community. In relation to the said project, according to the 2015 year-end report of the DOT (Moving Tourism To the Next Level, (DOT,2016)) there are 19 new tourism-related projects costing Php 18.2 billion are in the making. The said projects include five resorts and eight hotels. Once the said projects are operational, it will generate 1,370 employment opportunities. And to further raise inclusive growth and sustainable development, the DOT conducted the National Homestay Program including Baler, Siquijor and Kiangan as the pilot areas.

2.1.5.3 National Ecotourism Strategy (NES) and Action Plan (2013-2022)

The current National Ecotourism Strategy (NES) of the Philippines that was published in February 2014 have recognized ecotourism as one of the means to the fulfillment of the UN's Millennium Development Goals to reduce the incidents of poverty. The United Nation has a resolution entitled: *"Promotion of ecotourism for poverty eradication and environment protection"* and the newly updated NES serves as a response and adherence to the resolution. The formulated strategies are in line with one of the goals of NES which is to develop a competitive ecotourism product, and to market it afterwards in order to maximize the economic benefits for the locals. According to the NES, the development of ecotourism products will not only contribute to the preservation of the biodiversity, but would also benefit host communities by providing them another source of income through ecotourism products and activities instead of continuously involving themselves to the practice of illegal natural resources extraction such as mining and illegal logging. One of the key imperatives that were stated in the NES is the dissemination of tourism benefits especially to the rural areas to generate more employment opportunities, alleviate poverty, and attain sustainable development in the tourism sector as well.

2.1.5.3. Mt.Pinatubo Ecotourism "Kabuhayan sa Turismo" Project

The location of this project is in Sta. Juliana village in Capas, Tarlac. Sta. Juliana became prominent way back in June 1991 when the eruption of Mt.Pinatubo occurred. There were about 3,000 native inhabitants in the area known as Aetas. The lahar flowed toward the O'Donnell River jeopardizing the lives of the local populace. Due to that incident, all residents were forced to vacate the inflicted area. The Sta. Juliana village have become the least priority in terms of infrastructure development, and were deprived from social and economic assistance. In April 2000, the sudden influx of tourists had been observed from the village. It led the DOT Region III to spearhead tourism development in the area to generate

income for the villagers of Sta. Juliana. Being a community that is merely dependent for farming as a livelihood, the locals considered tourism as an alternate source for their sustenance. Moreover, the villagers later on formed a council called the Sta. Juliana Tourism Council, Inc. The Kabuhayan sa Turismo Project have brought direct economic benefits from tourism to a total of 500 residents or 100 local Aeta families. It created livelihood opportunities such as providing service as tour guides, porters and mountain rangers. Other benefits include road infrastructure development and community water system supply. There are also other private institutions that donated computers and uniforms to the local public elementary schools. Series of seminar and workshop were also conducted to keep the local residents aware about the benefits and opportunities that tourism could bring them, and to be able to maintain the quality of services and tourists experience under this project. The DOT Region III and the National Commission on Indigenous People created a Memorandum of Agreement stipulating that the government would permit the Kabuhayan sa Turismo Project and the principal beneficiaries of the project will be all native Aetas residing within the area. Currently, the project is already under the Local Government Unit, according to the Regional Director of DOT Region III, Sta. Juliana community has a continuous growing tourism industry. There are already tourist's accommodations, ATVs (All Terrain Vehicles), pay parking, and food and beverage present in the village. The area is currently hosting around 100 tourists or trekkers every day. Though the project is categorized under ecotourism, the approach and strategies used were in line with pro-poor tourism because the main advocacy of the project is to improve the standard of living of the Aetas, and reduce poverty. The preservation of the environment is just a secondary effect.

2.1.6 Conclusion

To surmise the critiques in relation this study, the impacts and effectiveness of Pro-poor tourism approach is still uncertain because of the absence of studies produced after the applications of PPT. Furthermore, since the Pro-poor tourism is based on the neo-liberal system, it is still debatable if the creation of policies and regulations concerning the shape of the impoverished community in the tourism industry is handed over to the government or private-sector. Pro-poor tourism's effectiveness is also still controversial because the approach is not proven if it really alleviates poverty, or it merely increases marginalization.

2. 2 THEORETICAL FRAMEWORK

The researchers aim to examine the awareness of local communities, LGUs and NGOs in terms of the Pro-Poor Tourism approach, and on how beneficial it is in the chosen local community of Barangay Sabang in Baler, Aurora. In this light, the theory of Social Exchange was set as basis for this study's theoretical framework.

According to Homans (1968), Social Exchange intends to suggest that a social behavior is the outcome of an exchange process with the purpose of maximizing the benefits and minimizing the cost. Based on this theory, people tend to weigh the possible advantages and threats from social relationships that when threats outweigh the number of benefits and advantages taken then people will possibly decline or end the relationship.

In relation to the context of the study, social exchange tries to connect how local residents will respond to the possible outcomes they can gain from the growing tourism industry in their community. Like for instance, when majority of the community are receiving benefits, advantages and positive effects like in the economic aspect of tourism such as gaining enough income from livelihood and employment, it will result to locals supporting the tourism industry and will be more willing to participate. In contrary, if they see tourism as a threat and disadvantage then there is a high possibility for them to turn down and disapproved it.

The success of the research is also dependent on the level of awareness of the local community from the benefits and advantages the locals can acquire by means of being involved in the said industry. Furthermore, in the Social Exchange Theory, the research will either be accepted by the research local if they will benefit from it, or will be disregarded if results are not beneficial. The exchange will be existent between the researchers and the local community.

2. 3 CONCEPTUAL FRAMEWORK

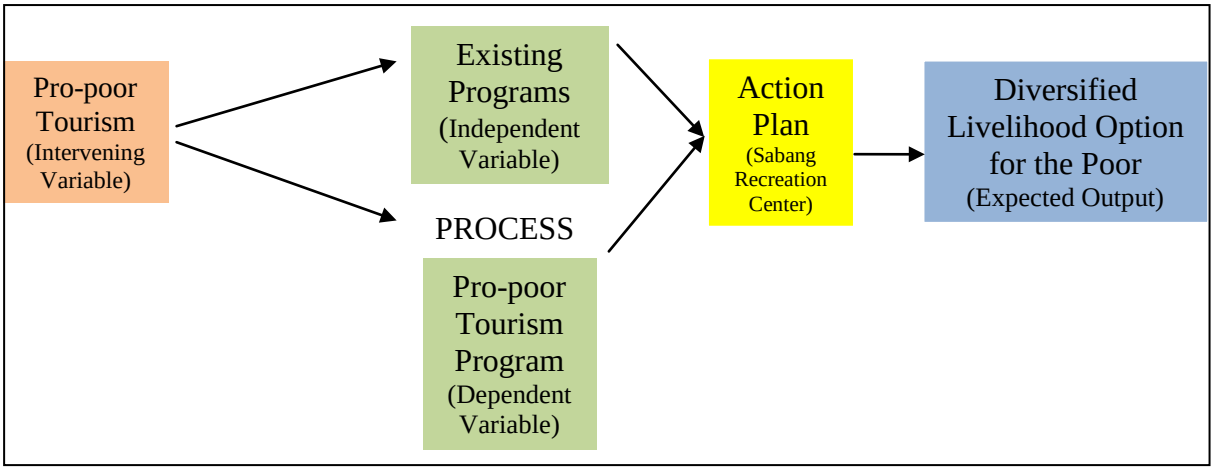


Figure 2.1Pro-Poor Tourism in Diversifying Livelihood Options for the Poor

The conceptual framework of the study shows the intervention of the Pro-poor Tourism approach to the already existing tourism-related programs provided by the local government of Barangay Sabang, Baler alongside the researchers' proposed Pro-poor tourism programs.These programs are used by the researchers as their basis to come up with an action plan wherein the main thrust of which is to diversify the livelihood options of the impoverished community in the barangay.

Within the process of the study, the researchers made use of the Quantitative research method wherein the conducted survey to the local residents served as the primary source of data needed for the study. Purposive sampling technique was used wherein the survey was conducted per household and only those who are aged 18 and above, who can and who are able to work legally and gain income, were qualified to answer the said survey. The researchers also made use of semi-structured interview questions to obtain supporting data from the governing bodies of Barangay Sabang, which is the local government unit, embodied by the Barangay captain, as well as the Tourism Officer of Baler.

To discuss how the variables affect each other, the arrow directing towards the action plan (Sabang Recreation Center) that will lead to the diversification of livelihood options for the poor from the Pro-poor Tourism approach indicates the possible direct effects of the PPT approach as to whether it will improve the standards of living of the impoverished people in Barangay Sabang, thus reducing the poverty incidences in the area. On the other hand, the arrow directing to the PPT approach variable from the Diversified livelihood options for the poor variable that shows whether the said effects of the PPT approach will result to positive outcomes by identifying if it will really alleviate poverty in the research locale by increasing the livelihood opportunities of the local residents or; have negative outcomes, if results show that the approach is not effective at all, only increasing the poverty incidences in Barangay Sabang.

CHAPTER 3
RESEARCH METHODOLOGY

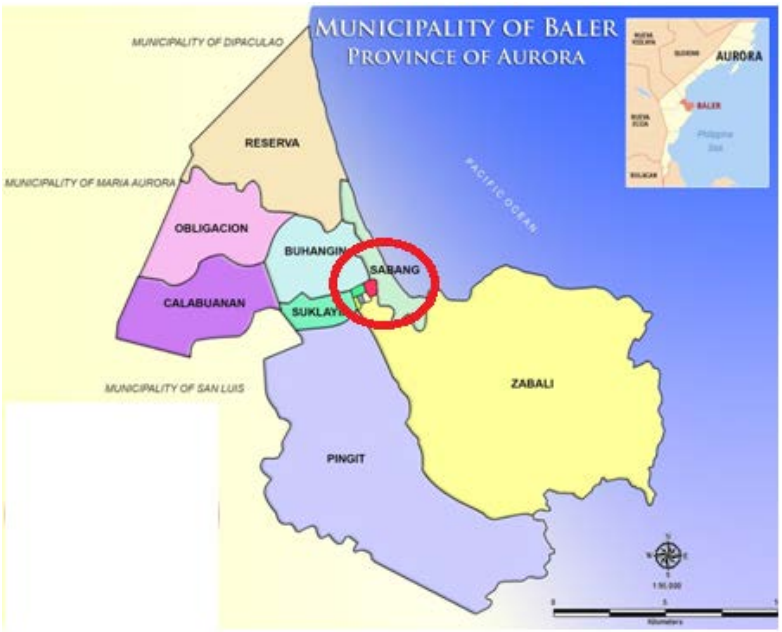
This chapter explains the research design and methods, the sampling techniques and instruments, as well as the data gathering procedures and statistical treatment of the data used in the study. The research locale and the respondents of the study were also discussed in this chapter.

3.1 RESEARCH DESIGN

The researchers used the quantitative research method for this study. The primary information obtained and gathered by the researchers is based on the statistical analysis of the survey questionnaires and of the semi-structured interviews. The gathered data are quantifiable and are also supported by secondary information coming from the semi-structured interviews with the Barangay Captain of Sabang as well as the Municipal Tourism Officer of Baler; thus, it can preempt biased results and implications and would be able to produce an extensive analysis and conclusion.

Furthermore, the research falls under exploratory study. The extracted results of the survey regarding the different perspectives of the respondents along with the information gained through the interview with Sabang's Barangay Captain and the Municipal Tourism Officer of Baler regarding the tourism development within their community have guided the researchers to come up with various strategies and programs that could be implemented in their barangay hence making Pro-Poor Tourism as an avenue to diversify livelihood options for the impoverished community. The study takes a look at the possible implications of incorporating the pro-poor approach in the growing tourism industry.

3.2 RESEARCH LOCALE



Baler lies between the Sierra Madre Mountain ranges and the Pacific Ocean making it a calamity-prone area. It is the capital town of Aurora where tourism industry is continuously thriving. Baler is most popular in surfing both domestically and internationally.

In 2013, the municipality was identified by the Philippine Travel Agencies Association [PTAA] (2013) as one of the emerging destinations in the country. The Philippine Department of Tourism also initiated the National Homestay Program in 2015, and identified Baler as one of the pilot areas. The program aims to orient households on how to provide high quality visitor experience and at the same time promote inclusive growth.

Moreover, the municipal tourism officer added that the most visited place in Baler is Barangay Sabang. This is also where the major tourism establishments like resorts, hotels, transient houses, among others can be found. Therefore, the most appropriate respondents of the study are those who are currently residing and working within Barangay Sabang.

3.3 SAMPLE AND SAMPLING TECHNIQUE

Barangay Sabang is composed of 1,095 households based on the data given by the Philippine Statistics Authority (2016). In order to get the total sample size, the researchers used Slovin's formula, while in identifying those who are living within or below the poverty line, the researchers used the poverty threshold parameter, which was also provided by the Philippine Statistics Authority.

The respondents of the study were all based on the purposive sampling method. The researchers conducted a survey per household. Qualified respondents must be 18 years old and above. The respondents are also those people who are currently employed or have the potential to be employed directly or indirectly in tourism related services, and those who are living within or below the poverty line. The barangay officials together with the barangay house workers have the capability of assessing the town's experiences and perspectives when it comes to the growth of tourism industry in the area; hence, they accompanied the researchers in order to know which areas within the barangay are experiencing high incidents of poverty.

The researchers also employed a qualitative approach through a semi-structured interview for gathering information from the government officials for a more in-depth analysis. On the other hand, the answers of each respondent to the given questionnaires were statistically recorded and examined.

3.4 RESEARCH INSTRUMENTS

The researchers used survey questionnaires to get the demographics of the respondents, such as their gender, age, civil status and number of family members, and also the job profile which showed if the respondents are employed or unemployed, and their average monthly income. This tool also examined the perspective of the local residents of the tourism industry in economic and social aspect, as well as the benefits of the existing training program for the tourism development provided by the local government.

The survey questionnaires were written into two languages, English and Tagalog, because these are the languages used by the respondents. Furthermore, the survey questionnaires were sub-divided into four conjugate parts to be able to identify separately the perspectives of the respondents into the different given aspects. The first part was the demographic and job profile of the respondents concerning their gender, age, number of family members, employment and monthly income. The first part will then serve as the basis to identify as to whether the respondents may be considered impoverished or well-off as evidenced by the results of the survey. The second part pertains to the perspective of the respondents regarding the social aspects of tourism within their community, including questions that aims to know how familiar and open the respondents are regarding the continuous growth and development of the tourism industry in their barangay. The third part of the questionnaire however aims to know the insight of the respondents, this time, in terms of the economic aspects of the tourism industry in their barangay. This segment of the questionnaire would thus like to know as to whether tourism does provide additional jobs for the local respondents, facilitates infrastructural developments and how the industry affects the price of the goods sold within the barangay. The fourth and last part of the research instrument pertains to the perspective and willingness of the respondents with regards to the possible Pro-poor Tourism programs and strategies in their barangay. These possible Pro-poor Tourism programs and strategies are proposed and formulated by the researchers as guided by their first-hand observations within the research locale

On the other hand, a four-point Likert Scale was used in identifying the degree of evaluation (1-Strongly Agree; 2-Agree; 3-Disagree; 4-Strongly Disagree). The questions in the survey are partially inspired from the questionnaire used in the study of Andalecio (2015)

(Community Based Ecotourism: Basis for Sustainable Development in Sibuyan Island in Romblon) because Andalecio's (2015) paper and this research share same aspects, such as the economic and social perspective in the tourism industry of the local residents who served as the respondents of the study. The survey questionnaires will undergo pre-testing to prove the effectiveness of the research instrument.

The research instruments also went through a further face validation process wherein the researchers have consulted a total number of five tourism professors from the University of Santo Tomas, College of Tourism and Hospitality Management who are all experts and professionals in the field of the tourism industry including their research adviser and statistician to ask for their opinions and comments regarding the effectiveness and consistency of the formulated research questions. The experts and professionals' suggestions were all considered by the researchers; making final adjustments with the survey material wherein after the questionnaires were fully approved by the said tourism professionals, the researchers went on to the mass production of the survey instruments which were then used for the actual survey and data gathering.

The researchers employed guide questions drawn out from the survey to acquire the qualitative data. The purpose of the set of guide questions is to identify the perspective of the Local Government Unit and the private sector with in regard to the tourism industry, and to obtain additional information from the local residents through an interview.

The aforementioned instruments are the most effective and appropriate from the view of the researchers, for it helped in providing a tangible, firsthand data obtained from the respondents; hence, both instruments aided in gathering the data needed by the researchers by means of descriptive and numerical forms.

3.5 DATA GATHERING PROCEDURES

The needed data and information for the study were collected by the researchers through the use of survey questionnaires and semi-structured interviews. Initially, letters of permission were given to the barangay officials prior to the survey and interviews. A pre-test was also conducted in the researchers' university, with other students as sample respondents, before gathering the actual data in the study's locale for the finalization of the research instrument to prove the effectiveness of the questionnaires. Finally, to determine if the questions were consistent and aligned with the study's main objective and theme, the Cronbach's Alpha was used to measure not only the consistency, but also the validity and reliability of the questionnaires. Based on the results, the survey questionnaires garnered acceptable values, and good consistency (refer to appendix H and appendix I for the results).

The survey, which involved the actual gathering of feedbacks from the chosen respondents, served as a written medium that the researchers distributed for their subjects to answer. The survey questionnaire was formulated by constructing and suitable questions that are directly related to the research's main objective and thought. The survey also consisted of questions regarding the respondents' perspective in the tourism industry in their barangay together with its economic aspects. A four-point Likert Scale was also employed to identify whether the respondents agreed or disagreed with the statements in the questionnaire. Given that the identities of the respondents are not important, the confidentiality of the answered survey questionnaires was assured. The researchers of the study also knew that the respondents' awareness of the survey may affect their effectiveness and honesty in answering the questionnaires; hence, the researchers gave the respondents the option to keep their identities anonymous.

On the other hand, the researchers also conducted interviews to gather raw and reliable data directly from the chosen subjects. The interview questions were also formulated in a way where the researchers would be able to gain suitable and related responses from the subjects

who meet the main objective of the study. The actual gathering of all needed information and data for the study was conducted by the researchers from March 10 to 12, 2017 in Barangay Sabang Baler. The researchers coordinated with the barangay officials on the first day of fieldwork. The survey was then accomplished on the second day, and on the last day, the researchers conducted an interview with the Barangay Captain of Sabang and Municipal Tourism Officer of Baler.

Furthermore, the secondary data which are the academic journals, articles, books and theses related to the theme of the study were obtained and gathered by the researchers through extensive online and library researches. These data were used for the study's review of related literatures and at the same time, provided additional information needed by the researchers which were essential to the study itself by filling the gaps of the research and supplying important and information that are out of the researcher's knowledge.

3.6 STATISTICAL TREATMENT OF DATA

The statistical formula used to process the research data was the Slovin's Formula. It is a purposive sampling method which estimated the sampling size of the respondents from Brgy. Sabang, Baler, Aurora. The researchers applied Slovin's Formula to determine the calculation of the sample size, given the population size and a margin of error.

The Slovin's Formula is computed as $n = \frac{N}{1 + Ne^2}$ whereas:

n = number of samples
N = total population
e = margin of error

In the research locale, Barangay Sabang, Baler, Aurora,
Given N = 1,095 (total number of registered households in the barangay for the year 2015)
e = .10 (10%)

n = 1095 / (1 + 1095 * $.10^2$)
n = 1095 / (1 + 10.95)
n = 91.63 / 92 total respondents

The researchers distributed a total of 150 questionnaires among the individual households in the research locale. It exceeded the required number of respondents according to the calculated Slovin's formula; nevertheless, out of the 150 questionnaires, 115 were declared to be valid while the other 35 collected data were invalid, due to the lack of information supplied by the respondents.

The four-Point Likert Scale was also set as a parameter used in the research study to measure how the respondents answered the given questionnaires. This scale is widely known as an approach in scaling insights and responses from survey questionnaires. Psychologist Rensis Likert was the inventor of the scale, and also where the scale was named from.

On the other hand, the conversion scale for Cronbach's Alpha, which was used to determine the consistency of the question items listed in the survey material, was derived from *McDonald (1999) where:*

Table 3.1 Cronbach's Alpha

Cronbach's Alpha	**Internal consistency**
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable

$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

A high value for this measure means that the questions are consistent. All values increase as one value increases, or all values decrease as one value decreases. However, a very high value (close to 1.00) may mean redundancy in questions. Conversely, low value means that the items are not coherent in measuring the subject of a survey.

Another statistical formula utilized in this study are the weighted mean and the standard deviation formulas for grouped data taken from the survey questionnaires, grouping the respondents with their age ranges. Mean is the average of a particular data and is defined as the mean of a set of values where each value or measurement has a different weight or degree of importance. On the other hand, standard deviation was used to quantify the amount of variation or dispersion of a set of data values.

The formula for the weighted mean of a grouped data is

$$\bar{x} = \frac{\sum xw}{\sum w}$$

Whereas:

x = mean w = number of measurements

$\bar{x}$ = measurement or value

The formula for the standard deviation of a grouped data sample is

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

Whereas:

$\bar{x}$ = each value in the population

x = mean value of the sample

s = summation

n-1 = number of values in the sample minus 1

Lastly, the researchers employed the Poverty Threshold Parameter from the Philippine Statistics Authority (PSA) to measure the poverty rate and incidence. It aided in determining impoverished communities who also served as respondents in the chosen research locale. Poverty Threshold is the minimum income and expenditure required for families or individuals to meet the basic food and non-food requirements (PSA, 2016). If a family or an individual has an income that will fall below the poverty threshold, and cannot supply their minimum basic needs in a sustained manner, they will be considered poor as stated in Republic Act (RA) 8425, the Social Reform and Poverty Alleviation Act of the Republic of the Philippines.

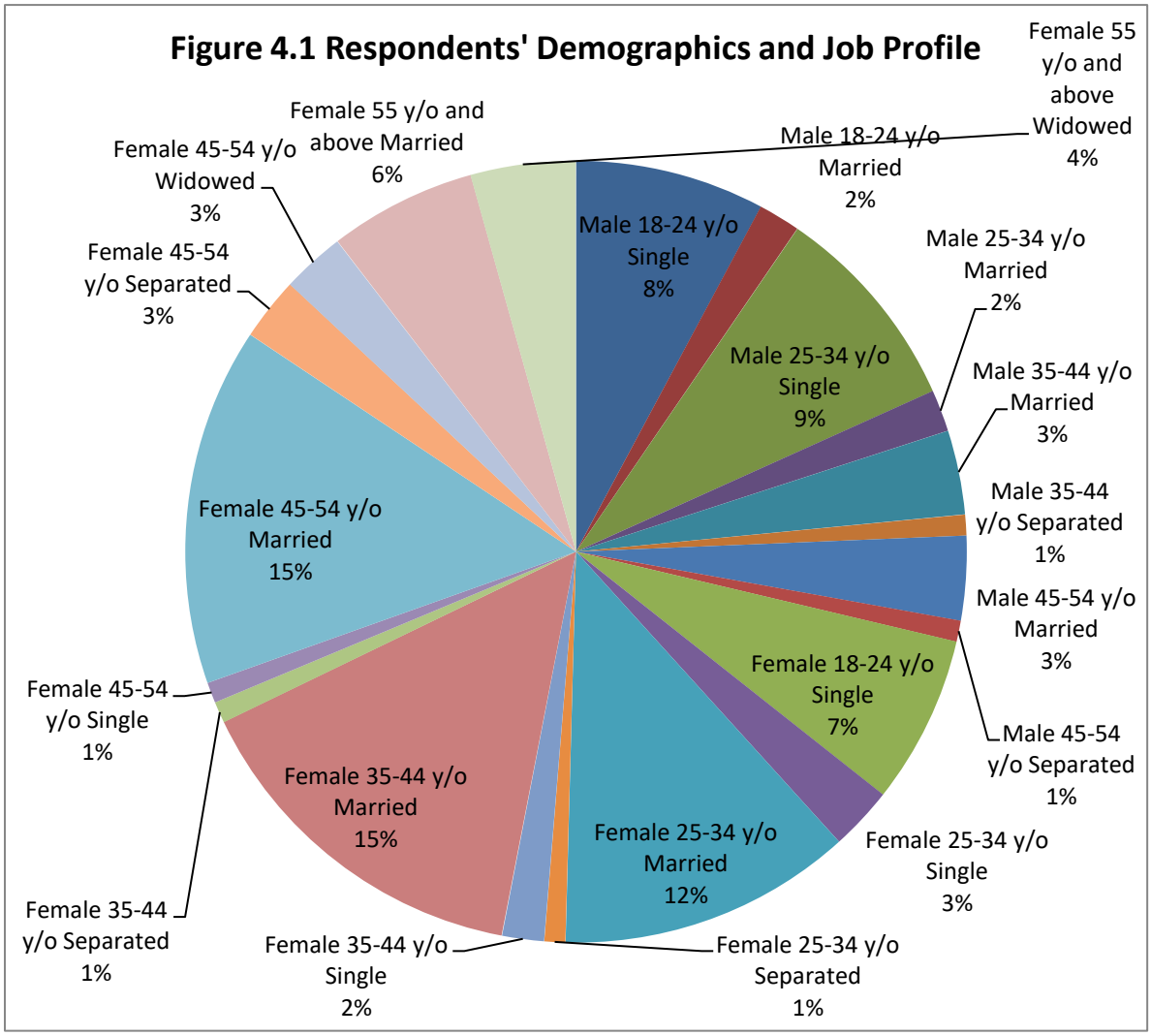
Poverty threshold is computed as:

$$\boldsymbol{Poverty\ Threshold} = \frac{\boldsymbol{Food\ Threshold}}{\boldsymbol{Food\ Expenditure\ or\ Total\ Basic\ Expenditure}}$$

To determine whether a family is living below the poverty line, the researchers computed the total family income divided by the number of family members. According to PSA, a family of five members needs an amount of Php 6,365 every month to fulfill the food requirement, and an amount of Php 9,140 to meet the food and non-food needs. Therefore, an individual family member must allot an amount of atleast Php 1,828. If they do not meet the said amount, then they may be considered as impoverished.

CHAPTER 4
PRESENTATION AND DATA ANALYSIS

The data presented and analyzed in the succeeding parts of this chapter answers the research problem of the study: How can Pro-poor Tourism as an approach help diversify the livelihood options of the impoverished community in Brgy. Sabang, Baler?



The demographic of the research respondents are presented in percentage form and it is revealed that out of the 115 respondents, majority are ***female (71%),*** and most respondents are ***married*** garnering ***58%***. The dominant number of respondents belongs to the ***25-34-year-old (27%)*** age bracket. ***Eighty-three percent*** of the respondents are ***employed***, while the rest ***(17%)*** are ***unemployed***. Among the 83% employed, ***23%***, which is the majority, belongs to the ***25-3- year-old*** age bracket.

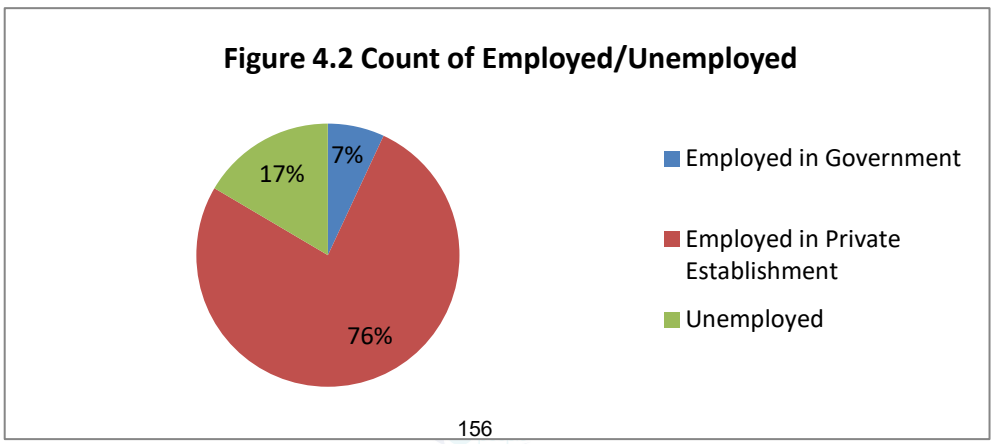
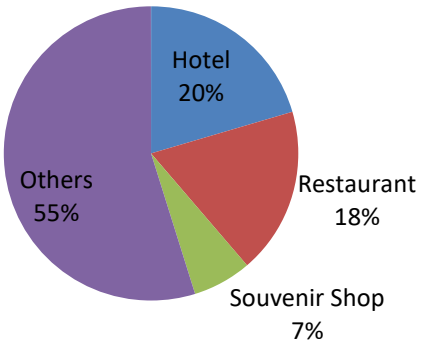
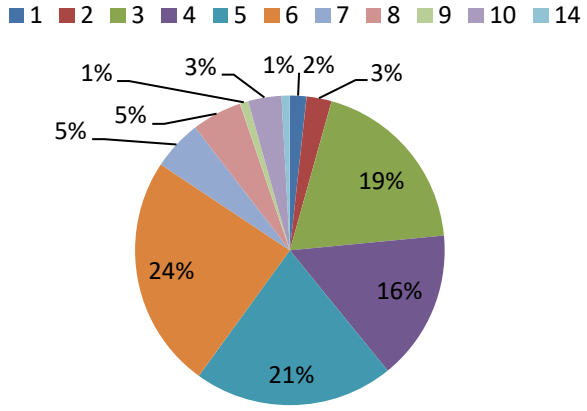


Figure 4.3 Distribution of Employment



The researchers also found that out of the 83% employed, ***76%*** are employed in a ***private establishment***, which are composed of ***20%*** are working in the ***hotel, 18%*** are working in a ***restaurant***, ***7%*** are working on a ***souvenir shop***, and ***55%*** are employed in ***others:*** either they are self-employed or working in a non-tourism related business establishment (Refer to Figure 4.2 *Count of Employed/Unemployed* & Figure 4.3 *Distribution of Employment*).

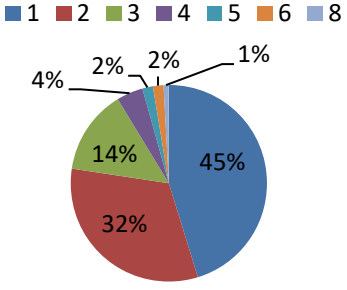
Figure 4.4 Actual count of Family Members



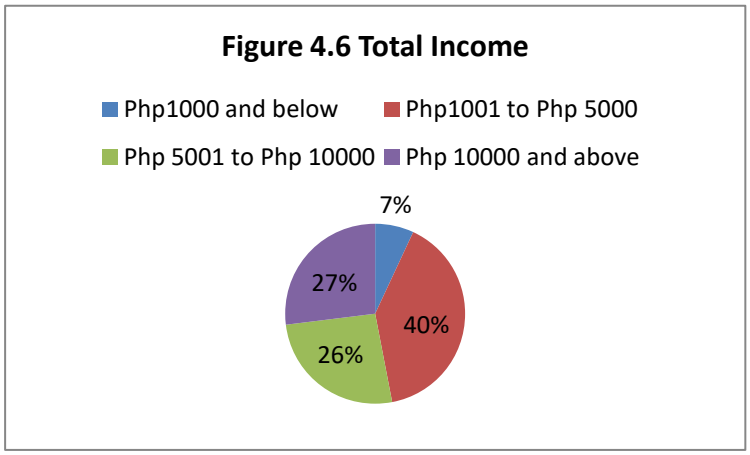
Most respondents' family has an average of ***five to six members***, ***21%*** have ***five*** members, and ***24 %*** have ***six*** members in the family (See Figure 4.4 *Actual count of Family Members*).

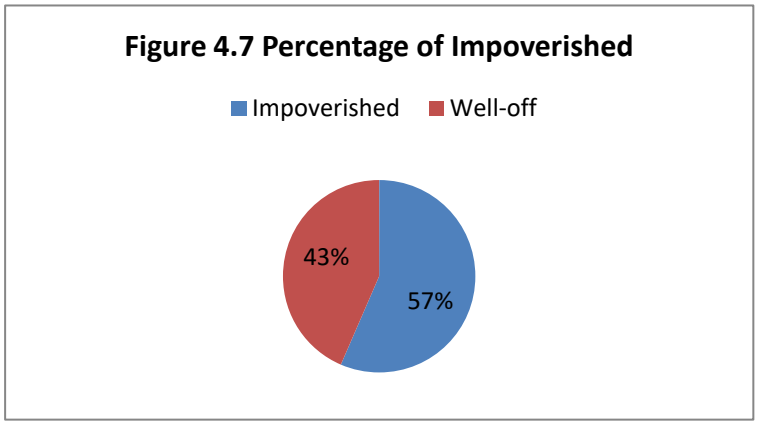
In Figure 4.5 *Actual Count of Family Members Employed*, out of the 115 households surveyed, ***45%*** of it has only ***one person*** employed in the family, and ***46%*** have at least ***two to three persons*** employed in the family. ***Seven percent*** of the household surveyed belongs to the family income bracket of ***Php 1,000 and below***; whereas, ***26%*** belongs to the ***Php 5,001 to Php 10,000*** family income bracket. ***Twenty-seven percent*** of the households fall under the ***Php 10,000 and above*** income bracket. A majority of which is ***40%***

Figure 4.5 Actual Count of Family Members Employed



of the household surveyed belong to the ***Php 1,001 to Php 5,000*** income bracket. Based on the researchers' computation (from the standards of poverty threshold provided by the Philippine Statistics Authority) if the families surveyed live below the poverty line based on their incomes, more than half or ***57%*** of the households surveyed are considered ***impoverished*** *(*Refer to Figure 4.6 *Total Income* & Figure 4.7 *Percentage of Impoverished)*





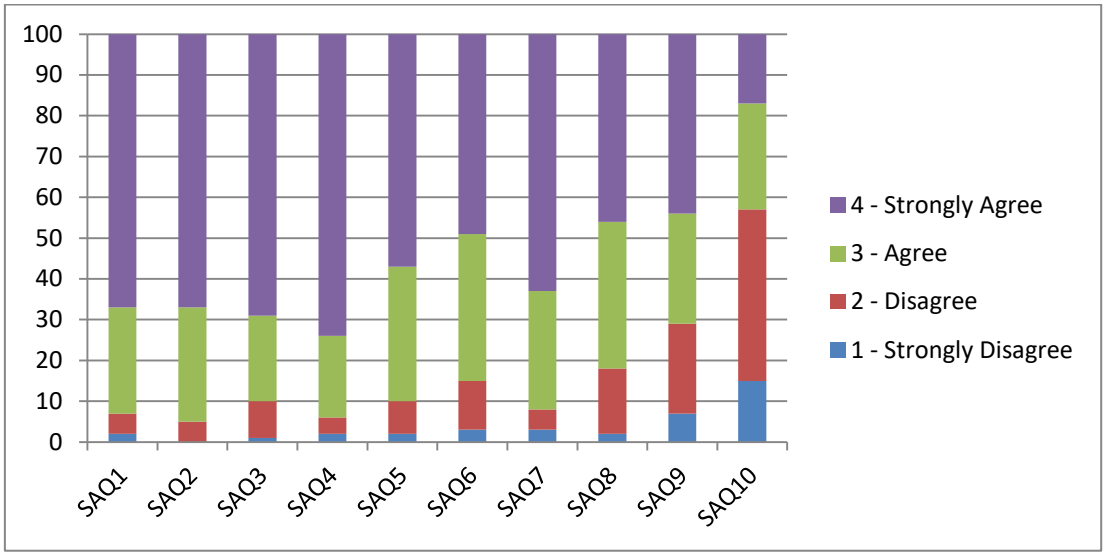
4.2 RELIABILITY OF THE DATA PRESENTED

To illustrate the reliability of the data collected through the questionnaires sent out, the researchers used the Cronbach's Alpha for the item analysis. The said treatment was also used to determine if the question items were consistent in talking about the subject. A high value for this measure means that the questions are consistent. All values increase as one of the values increases, or all values decrease as one value decreases. However, a very high value (close to 1.00) may equate to redundancy in questions. On the other hand, a low value means that the items are incoherent in measuring the subject of the survey. Based on the results, values are acceptable and as an overall test, the survey has good consistency (Refer to appendix for the results).

4.3 PERSPECTIVE OF THE RESPONDENTS TO THE TOURISM INDUSTRY IN TERMS OF ITS SOCIAL ASPECT

Based on the respondents' answers, the prevailing perspective of the local residents to the existence of tourism industry in Barangay Sabang, Baler is positive; hence, they are open for changes within the barangay, such as culture exchange with the tourists. They also recognize the possible negative effects of tourism in their community. The table below shows the result of the survey in the particular set of items:

Graph 4.1 Results of the Perspective of the Respondents to the Tourism Industry in Terms of its Social Aspect



When the respondents were asked if they were aware on the existence of tourism destinations in their barangay, majority of the respondents ***(67%)*** answered *strongly agree.* It reveals that they are familiar with the existence of tourism destinations in their barangay. However, seven percent (5% disagree and 2% strongly disagree) answered the otherwise.

When asked if tourism makes their barangay attractive to visitors**,** 67% answered strongly agree on their perspective that their barangay attracts visitors because of tourism, 28% agreed; however, they are not really convinced, and the remaining five percent opposed the statement.

Sixty-nine percent of the respondents answered strongly agree, and 21% answered agree as to their perspective about the further growth and development of the tourism industry in their barangay for the succeeding years. However, the prevailing ten percent (consisting 9% disagree and 1% strongly disagree) perceives that the tourism industry in their barangay is on its peak. The results of survey also showed that 94% of the respondents (both who answered 74% strongly agree and 20% agree) concedes to the statement that they are supporting the existence of tourism industry in their barangay. The remaining six percent answered the opposite, that they do not tolerate the existence of the industry. In terms of job and employment, 57% of the respondents are looking forward to have a job related to the tourism industry, 33% also agreed, but are satisfied as long as they have a job even if not related to tourism, and the remaining ten percent who answered otherwise, do not want to get involved in tourism. The researchers also acquired the data that almost half, or 49% of the respondents who answered strongly agree would like to have a business related to tourism, 36% who answered agree would like to have a business even if it is not tourism-related, and the remaining 15% who answered the opposite, reflects the lack of interest to establish their own businesses whether related or non-related to tourism.

When the respondents were ask if they are open to cultural exchange, 63% answered strongly agree, 29% responded agree, while the remaining eight percent, who responded otherwise, shows no appeal to interact with the visitors.

Less than half of the respondents (46%) who answered strongly agree are convinced that the growing industry paves the way to new and effective health facilities that benefits the locals, another 36% agreed, but reflects their doubt that facilities are due to tourism, and 18%

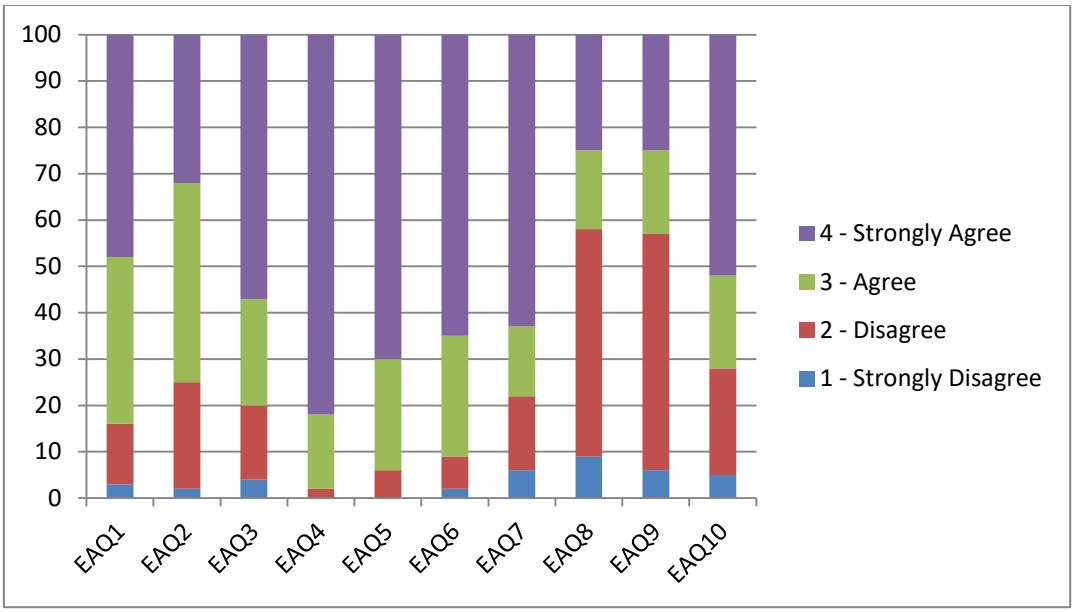
including the 2% who strongly disagreed, reveals that there are no healthcare facilities brought by tourism.

Questions concerning social problems caused by tourism in the destination, 71% of the respondents, including the 44% who answered strongly agree, believe that tourism causes heavy traffic in their barangay, while 29%, combining those who disagreed and strongly disagreed, are neither affected nor noticed the heavy traffic in the barangay. However on a positive perspective, more than half of the respondents (57%) combing those who answered (15%) strongly disagree and (42%) disagree, reflects their belief that tourism does not really cause social problems; however, the remaining 43%, combing those who answered (17%) strongly agree and (26%) agree, show their negative perspective on tourism.

4.4 THE PERCEIVED ECONOMIC BENEFITS OF APPLYING THE PRO-POOR TOURISM APPROACH IN THE EXPANSION OF THE LIVELIHOOD OPTIONS FOR THE IMPOVERISHED COMMUNITY IN BARANGAY SABANG, BALER

In terms of the economic benefits of tourism development, the perspectives of a majority of the respondents are more positive than negative. There may be an increase with the prices for some local products like fish and other seafood because aside from a higher demand, there are sellers who take advantage to the price. Nonetheless, the respondents are more positive in the economic aspect of tourism development basing on their answer: (1) tourism provides additional livelihood sources; (2) it benefits and becomes a source of income for the residents and workers in their barangay; (3) it facilitates the development and promotion of their existing local products; and (4) tourism contributes to the infrastructure development of their barangay. Below are the results of the survey:

Graph 4.2 Results of the Perspective of the Respondents to the Tourism Industry in Terms of its Economic Aspect



Most of the respondents strongly believe that tourism provides jobs and livelihoods for the farmers, fishermen, carpenters and the workers in the coconut plantation in their barangay. Forty-eight percent of the respondents strongly agreed, while 36% of the respondents agreed. On the other hand, there are few who believed otherwise, 13% of the respondents disagreed and three percent of the respondents strongly disagreed.

Most of the respondents agreed that people who are participating in tourism-related jobs are receiving salaries and benefits. Forty-three percent of the respondents agreed on the statement above, while 32% of the respondents strongly agreed. However, there are still some who opposed the given statement, 23% of the respondents disagreed and two percent strongly disagreed.

More than half of the respondents said that through tourism, their family income increased. Fifty-seven percent of the respondents strongly agreed to the given statement while 23% of the respondents agreed. On the other hand, 16% of the respondents disagreed and 4% strongly disagreed.

In analyzing the data gathered, it can be deduced that the statement above is verifiable. Eighty-two percent of the respondents strongly agreed to the given statement, while 16% agreed. Only two percent of the respondents disagreed.

Some of the existing products include suman and seafoods. A huge number of respondents believed that the growing tourism industry facilitates development and promotion of the existing local products. Seventy percent of the respondents strongly agreed, while 24% agreed. On the other hand, six percent of the respondents disagreed.

More than half of the total respondents arrive at a common answer. Sixty-five percent strongly agreed while 26% agreed. On the other hand, seven percent disagreed, and two percent strongly disagreed. However, according to the tourism officer, even before the boom of the tourism industry, infrastructure development was already a priority.

Sixty-three percent of the total respondents strongly agreed to the statement, while 15% agreed. On the other hand, 16% disagreed and six percent strongly disagreed. According to the the barangay captain and some interviewed residents, many sellers are taking advantage of the price. More often than not, tourists are the usual victims of unjustified pricing. However, according to some interviewed sellers, prices remained the same because they stick on the recommended price for the product/s, though they are also aware that there are sellers who are really taking advantage to the tourists.

Most of the respondents do not believe that the price of transport fares increased because of tourism. Forty-nine percent of the respondents disagreed on the above statement, while nine percent strongly disagreed. There are few who believe that the above statement is verifiable. Twenty-five of the total respondents strongly agreed, and 17% agreed.

More than half of the total respondents do not agree that the price of electricity bill increases because of tourism. Fifty-one percent of the total respondents disagreed on the above statement, while six percent strongly disagreed. On the other hand, 25% of the total respondents strongly agreed on the statement, while 18% agreed. Conversely, more than half of the total respondents believe that the prices of the local products increased because of tourism. Fifty-two percent of the respondents strongly agreed on the above statement, while 20% agreed. On the other hand, 23% of the total respondents disagreed, while the remaining five percent strongly disagreed.

4.5 WILLINGNESS OF THE LOCAL GOVERNMENT IN INCORPORATING THE PRO-POOR TOURISM APPROACH WITH THE EXISTING TOURISM PROGRAMS IN BARANGAY SABANG, BALER

4.5.1 Interview with Mr. Benedict Isaguirre – Sabang Barangay Captain

According to the interview with the barangay captain of Sabang, there are funds allocated for job opportunities; however, as of the moment there are only two street sweepers and summer job offerings for the teenagers, most especially to the less fortunate whose parents lack the capability to support their studies. In terms of tourism-related opportunities, a majority of the residents in Sabang are surfing instructors, and many tricycle drivers are now

registered tour guides. Barangay Captain Benedict Isaguirre can also foresee that the tourism industry in the barangay would grow more in the following years. In terms of diversifying tourism products, the municipality is planning to build a zip line to introduce a new activity that would attract more tourists.

However, despite the positive impacts of the growing tourism industry, he is aware of the negative impacts brought by it. One of the major issues they are facing right now is improper waste disposal. As the number of tourist arrivals continuously increase, the garbage increases. Hotels and other accommodation establishments are disposing their wastes to the nearest land area. There is no available land space where the garbage could be disposed. The garbage truck is only collecting waste within the Poblacion area but not in Sabang and other neighboring barangays. Also, the barangay's main source of water comes from deep well; hence, they rarely get enough water from it. Also, according to Barangay Capt.Benedict, even if there are already a number of established hotel and restaurant businesses, the municipality is still open for investors. Brgy.Captain Benedict said that they are surprised by the sudden rise of the tourism industry that is why it was an unplanned tourism development, most especially in their barangay, the most visited area in Baler.

4.5.2 Interview with Ms. Riza P. Del Rosario – Baler Municipal Tourism Officer

Ms. Riza, Baler's Municipal Tourism Officer, stated that together with the continuous tourism development in their area, they also provide several premier programs with the objective of helping the members of their community. These programs are created to provide additional sources of income especially for the tricycle drivers by training them to become tour and "trike" guides. The trainings are conducted with the help of the Department of Tourism where tricycle drivers are taught how to handle tourists. She also said that this program is open for all tricycle drivers in their area. As long as the tricycle driver is a resident of Baler, the tricycle unit is registered, and if they own a driver's license, they may apply for the said program. Aside from that, they also have programs for the local producers in their community who joined the program of the Department of Trade and Industry (DTI). These local producers are taught to improve their products that are marketed and sold in the municipal hall, giving them additional livelihood and income especially when the tourists patronize the products they make. One example of their local product is "suman" which is highly demanded by tourists.

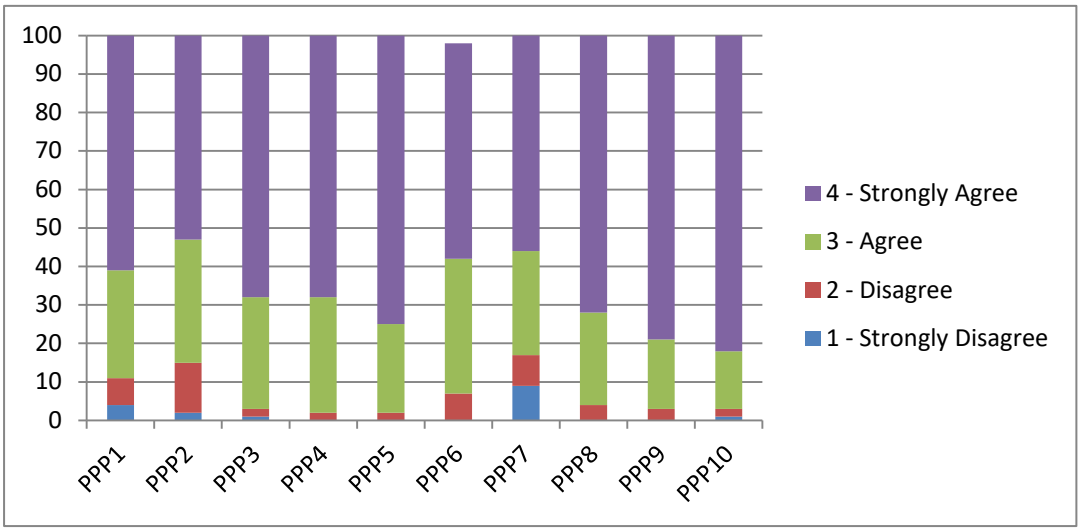
Other than the creation of the aforementioned programs, Ms. Del Rosario also said that the local government allocates funds for the development of the tourism industry in their town as well, focusing and prioritizing the development of their premier sites. She also mentioned several existing NGOs in their community that embody the impoverished residents such as NGOs representing fishermen and farmers, and other accredited NGOs like Kabalikat, Guardian and The Knights of Columbus, the most active one. When asked about their willingness to have an entrepreneurial development for rural tourism in their community, Ms. Del Rosario stated that it would be a big help to the overall community of Baler as it is always better to have an investor who personally resides within the area.

Lastly, as for the implementation of the ordinances, Ms. Del Rosario said that there are still some who disobeys the law, although most are just minor offenses. Their ordinances are not yet strictly implemented, most especially in terms of the protection of their national environment. Currently, there is no carrying capacity in any of their tourist attractions despite the continuous growth of the tourist influx in Baler.

4.6 STRATEGIES AND PROGRAMS THAT COULD BE DEVELOPED UNDER PRO-POOR TOURISM TO ATTAIN INCLUSIVE GROWTH IN BARANGAY SABANG, BALER BASED ON THE RESULTS OF THE SURVEY

Part of the study was for the researchers to come up with various possible Pro-poor programs and strategies in Barangay Sabang with the main objective of diversifying the livelihood options for the impoverished. The programs and strategies that the researchers formulated were all based on their observations within the research locale and of the already existing training programs provided by the local government, putting into consideration the feasibility and effectiveness of each proposed program once they are actually implemented. The researchers then conducted a survey to find out the perspective of the respondents regarding Pro-poor programs by answering and evaluating each strategy with the use of the 4-point Likert Scale. The gathered quantitative data was then visually presented and analyzed through the use of pie charts.

Graph 4.3 Results of the Perspective of the Respondents Regarding the Proposed Pro-Poor Strategies and Programs



The graph above describe as to whether what percentage of the respondents answered 4 (Strongly Agree), 3 (Agree), 2 (Disagree) and 1 (Strongly Disagree) per question indicated. The results reflect the total percentage of the respondents who are willing to participate and willing to support the possible Pro-poor programs and strategies as proposed by the researchers for their barangay. Based on the results, it reveals that the tenth given possible program or strategy (PPP 10) garnered the highest percentage of strongly agreeing respondents, meaning that a majority will accept and support the projects that will encourage tourists to patronize the services and products of the local entities, believing that it is the best possible strategy among the given programs to help diversify their livelihood options and give them additional income. The seventh program or strategy (PPP 7), on the other hand, had the most number of disagreeing respondents; meaning that the proposed possible strategy of giving farmers their own farm lands for agricultural activities for them to earn by supplying the local restaurants with rice and vegetables, may not be effective at all or may mean that there are not much farmers in their barangay to benefit from the said program.

The table provided below shows a further analysis of the results, displaying the total average for each possible Pro-poor programs and strategies with four being the highest average, with 40 being the overall perfect score.

Table 4.4 Average Scores of the Proposed Pro-Poor Programs and Strategies Based From the Results of the Survey

	PPP1	PPP2	PPP3	PPP4	PPP5	PPP6	PPP7	PPP8	PPP9	PPP10	PPP Score
AVE	3.45	3.37	3.63	3.66	3.73	3.46	3.31	3.69	3.77	3.77	35.84

Where:
PPP = *Proposed Pro-poor Programs*
High scores: PPP 1, PPP 3, PPP 4, PPP 5, PPP 6, PPP 8, PPP 9, PPP 10
Low scores: PPP 2, PPP 7
Overall PPP score: 35.84 over 40

4.7 PROPOSED ACTION PLAN

Based on the results of the perspective of the respondents regarding the proposed pro-poor strategies and programs, the researchers came up with an action plan that incorporates the Pro-poor Tourism approach to help diversify the livelihood opportunities for the community members, specifically for the people who are living below the poverty line in Barangay Sabang, Baler. The developed action plan is further elaborated below:

4.7.1 The "Sabang Recreation Center"

Proposed Pro-Poor Tourism Program of Activity

Objectives	To establish tourism related businesses that would provide livelihood opportunities for the impoverished residents of Barangay Sabang, Baler, making tourism growth more inclusive through generating jobs.
Expected Outcome	Generate atleast 130 jobs including positions for housekeeping, cook, waiters, front officers, pool attendants, gardeners, maintenance, massage therapists and the like.
Program Components	The site will consume an estimate area of 3,000 square meters that has recreational facilities, and will promote sustainable development by using "eco-friendly" materials for the construction of the establishment of the project. The whole area will be composed of facilities such as wall climbing facilities, hanging bridge, sky bicycle activities, a swimming pool, a spa and wellness house, an events house for a capacity of 100 persons, a three-stalled food park, a souvenir shop and a 10-room transient house.
	Interested participants in the said program, must sign up and be assessed with the help of the Local Government Unit of the barangay (through the Department of Social Welfare and Development and Barangay House Workers).
	The trainings will be provided in partnership with Technical Education and Skill Development Authority (TESDA). The following are the suggested vocational and training courses of TESDA that are effective for the competitiveness of future employees of the suggested program: a) Customer Services NC II is a training in assisting customers who wish to avail the products or services. Duration: Minimum of 156 hours to complete. b) Tour Guiding Services NC II is a training in managing and assisting tourists from the day of their arrival up to the day of their

	departure. Duration: Minimum of 196 hours to complete. c) Housekeeping NC III is a training in regard to supervising maintenance and cleanliness of guest room floors and public areas in conference centers, hotels, motels, restaurants, clubs, resorts and luxury liners. Duration: Minimum of 76 hours to complete. d) Events Management Services NC III is a training in planning and organizing events in different venues such as conference centers. Duration: Minimum of 108 hours to complete. e) The Hilot (Wellness Massage) NC II is a training in planning the hilot wellness program of client/s. providing pre-service to client/s, applying hilot wellness massage techniques, and providing post-advice on post-services to clients. Duration: Minimum of 120 hours to complete. f) Front Office Services NC II is a training in assisting customers who want to stay or make reservations for staying in a commercial establishment that provides accommodation such as hotels, inns, pension houses, and the like. Duration: Minimum of 436 hours to complete. g) Travel Services NC II is a training in arranging trips for customers including providing them with the necessary travel documents and making reservations for their travel accommodation. Duration: Minimum of 196 hours to complete. h) Contact Center Services NC II is a training in interacting with customers and assisting them with their concerns over the phone. Duration: Minimum of 356 hours to complete. i) The Food and Beverage Service NC III is a training about providing food and beverage service to guests. Duration: Minimum of 336 hours to complete. j) Bartending NC II is training on how to prepare, mix, and serve drinks to the patrons of a bar. Duration: Minimum of 286 hours to complete. k) Commercial Cooking NC III is a training in managing a small restaurant or cooking business. Duration: Minimum of 244 hours (3 months) to complete. However, the workers will be employed based on the trainings that they acquired. If not, then it is their choice on how they will utilize the training that they received from TESDA.
Timetable	The program will be based on a Short Term planning that will be executed for one to three years. It will involve the following phases: a) Phase 1: coordination with the NGOs, recruitment of potential employees with the help of DSWD and BHW for determining who will be prioritized in this program in a span of 6 months to 1 year b) Phase 2: training of potential employees by the TESDA for another 6 months to 1 year, as well as the start of the construction of the site c) Phase 3: deployment and actual implementation of the project
Source of Fund	The source of fund for this project will come from the bilateral funding with United States Agency for International Development (USAID), since they already have a linkage with the local government unit of Baler that includes Barangay Sabang.
Office-in-Charge	The program will fall under the Municipal Tourism Office for the reason that they are already controlled by the municipal government, thus they have an experience in presiding similar initial programs such as the 'trike guide program' for the Baleriano Tricycle drivers.

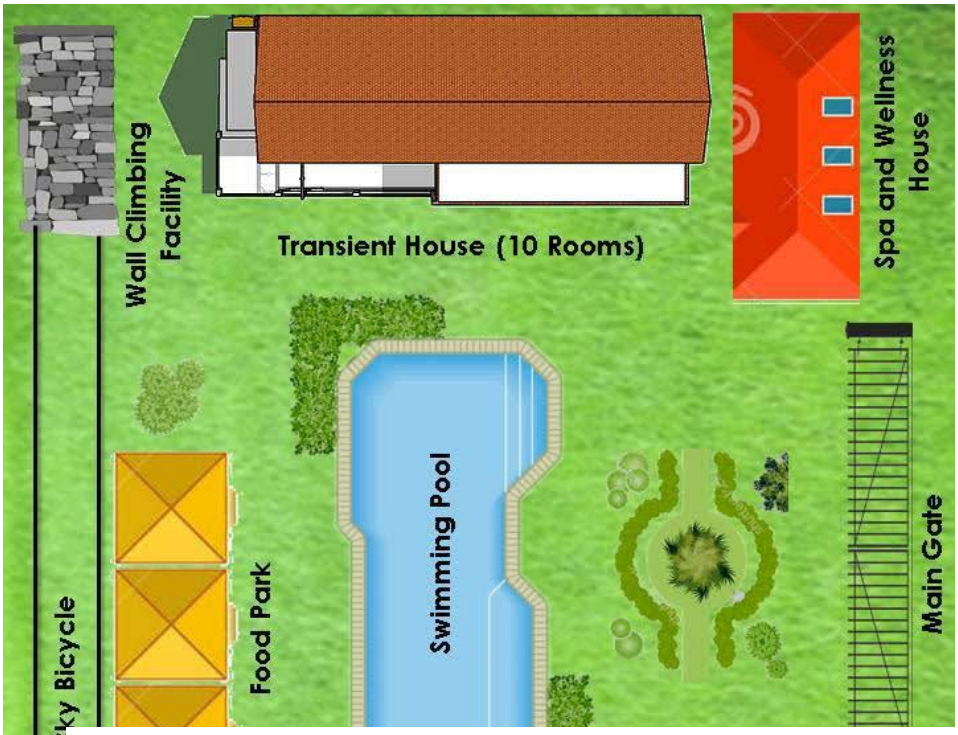


Illustration 1*: The Researchers' Perspective of Sabang Recreation Center*

CHAPTER 5

CONCLUSION AND RECOMMENDATION

In this chapter, the researchers discuss the conclusions based on the analyzed and interpreted data that they collected through the use of questionnaires in conducting a survey to the local residents of Barangay Sabang, Baler. Finally, the recommendations that the researchers provided will be elaborated for the successful diversification of livelihood opportunities through Pro-poor Tourism approach.

5.1 CONCLUSION

The results of the conducted survey in Barangay Sabang, Baler showed that the majority of the respondents are female with a total average of 71% who are married and within the age range of 45-54 years old (15%) and 35-44 years old (15%). The females are the dominant respondents since most of them are the one in charge of staying and taking care of the home. Job opportunities present in the barangay are more suited for males such as being a tricycle driver and fisherman which garnered the highest percentage in terms of employment (Others 56%). The result illustrated a very high percentage of self-employment or working in a non-tourism related business establishment. As for the number of family members in the barangay, the average family in Sabang consists of five to six members with 40% of the families having an average monthly income of Php1000-Php5000. Average monthly income was computed using the standards of poverty threshold sourced from the Philippine Statistics Authority, an average of 57% from the households surveyed in the barangay were considered impoverished or are living below the poverty line. Despite the growing tourism industry and numerous possible job opportunities, there is still a huge case of poverty, and an unequal distribution of livelihood among the residents in the barangay is quite evident because of the percentage of the produced results.

The general perspective of the local residents of Barangay Sabang in regard to the tourism industry in their community shows to be positive. A majority of them are familiar about the existence of the tourism destinations in their locality. They also believe that the tourism industry makes their barangay more appealing to the visitors. Majority of the respondents also support the existence of the tourism industry based on the results of the survey. Moreover, they can foresee that the tourism industry will develop further, and will experience continuous growth in the succeeding years. In terms of having a job in the tourism industry, most of the respondents show their interest in getting involved most especially if they would really be given a chance to be employed. The respondents are also willing to get involved when it comes to cultural and values exchange with tourists coming to their barangay. Many of the respondents also believethat the growing tourism industry serves as an instrument to have new and effective health facilities that could benefit them as well.

According to the results from the conducted survey to the people who are currently residing and working in the tourism-related establishments in Barangay Sabang, most of the respondents believe that the growing tourism industry has the capability to expand livelihood options, most especially to the impoverished community of Barangay Sabang. Moreover, a majority of the respondents have strongly agreed that they will support NGOs who aim to give importance to the impoverished community in their locality. Respondents also strongly agreed in giving support to possible Public-Private Partnerships because of the possibilities for more job opportunities. Additionally, with the help of TESDA, it will be a good avenue for willing residents, and everyone who has the potential to have the opportunity to be provided with trainings and seminars for future employments in the tourism industry.

The respondents also strongly agree that some of the non-tourism related jobs like fishing, farming, and carpentry, have chances to be involved and still participate in the growing tourism industry in their area. *Bangkeros* could provide transport to visiting tourists in the nearby island, and the carpenters could be trained to create local handicraft products.

Overall, the local respondents are undeniably willing to give support to enterprises and projects that would surely help the impoverished in their barangay, and those who would patronize the local services and products. However, the people from Barangay Sabang and the Barangay Captain recognized some of the negative impacts brought by the tourism development in their area. According to the survey, majority of the respondents believe that tourism has caused heavy traffic and overcrowding in the barangay, most especially during holy week. Another pressing problem is improper waste disposal where according to the Barangay Captain, hotels and other accommodation establishments are just disposing their waste and garbage in nearby land areas. There are also tourists who are very irresponsible, leaving their trashes improperly disposed. Despite the overall positive views of the respondents, there are still negative social issues brought by tourism that are needed to be resolved to be able to maintain a harmonious relationship between the tourism industry and the people of Barangay Sabang.

On the other hand, to further support the gathered data from the local residents, the answers of Sabang's Barangay Captain and the Tourism Officer of Baler from their respective interviews may be concluded that the Local Government Unit has the interest to incorporate Pro-poor Tourism approach, but not to their existing tourism programs; nonetheless, they will consider it for future projects of the government. Presently, the existing project of the tourism office under the command of the Municipal Hall of Baler, are the "trike guides", the project of the Barangay Hall such as having street sweepers, and summer jobs for students, could not incorporate the PPT approach because it is open for everyone who are interested. Nevertheless, the willingness of the local government is certain that their main objective for their future programs is to help their community members.

The study also revealed that a majority of the respondents, who are both the impoverished and well-off, would actually support the proposed possible Pro-poor tourism programs that would help diversify the livelihood options of the impoverished communities. In terms of the main focus of the study, which are the impoverished communities in Barangay

Sabang, they expect the help of Non-Government Organizations and Pubilc-Private Establishments, but if the results are to be compared, majority of the respondents believe that rather than the Public-Private Establishments, the Non-Government Organizations could help them better in providing them more sources of income and job opportunities. In terms of the actual proposed possible Pro-poor tourism strategies and programs by the researchers, most received favorable agreements and feedbacks from the respondents where they believe that the said programs may be feasible and effective within their community. Results showed that 8 out of the 10 proposed programs received high scores from the respondents, while only two received low scores.

This may only mean that the proposed programs by the researchers are feasible, effective, and could be accepted and participated by the local community of the research locale, especially of the impoverished communities in Barangay Sabang. Furthermore, it can be concluded that the respondents are willing to be engaged and involved in tourism-related businesses and establishments to earn additional income by being provided more diversified livelihood options. Lastly, it is undeniable that the tourism industry could help them earn more since more tourists are visiting their locality, although there are no actual means to do so, but with the existence of the proposed possible Pro-poor tourism programs and strategies with the aid of the non-government organizations and public-private establishments, it would serve as an avenue to extend the benefits and opportunities of the tourism industry to everyone in the community.

5.2 HYPOTHESIS RESULTS

The results reveal a rejection of the formulated null hypothesis because the socio-economic perspective of the local residents of Brgy. Sabang, Baler, especially the impoverished community, is positive. Consequently, their prospect about the Pro-poor Tourism approach will be an effective strategy to diversify their livelihood opportunities.

5.3 RECOMMENDATION

From the conclusion of the interpreted data that the researchers gathered, the following are the recommendations to diversify livelihood options for the impoverished community in the research locale:

5.3.1 The Implementation of the "Sabang Recreation Center" Action Plan

The researchers would like to recommend the Local Government Unit, with the help of the Municipal Tourism Office and in coordination with the Department of Tourism, to apply and implement the action plan that the researchers proposed within the study.

The researchers have also considered and included other factors for improvement within the barangay including their political governance, the sustainability of their natural environment, and community involvement as discussed in the following sub-topics:

5.3.2 Strict Implementation of Ordinances

The local government of the research locale must be strict in the implementation of laws within the community to minimize and/or at least be able to avoid the underlying negative effects brought by the tourism industry, such as the potential threats of crime, especially in terms of protecting and sustaining the locality's natural resources and environment. Based on the observations and the researchers' interview with Mr. Benedict Isaguirre, Sabang's Barangay Captain, and Ms. Riza Del Rosario, Baler's Municipal Tourism Officer, the researchers found out that one of the pressing problems within the barangay is the improper disposal of waste, particularly within the areas that are mostly visited by tourists. According to Brgy. Capt. Benedict Isaguirre, there are already a number of business establishments, specifically hotel and restaurant businesses, within the municipality, and yet they continue to open opportunities for other investors to establish their own private businesses within the community despite knowing that these huge number of tourism-related establishments are already overcrowding the municipality. Moreover, these establishments also do not have proper land use planning and development. These said issues and concerns within the community should be strictly observed by the local government to be able to analyze, assess, and evaluate if could properly and strictly implement new or existing policies or laws that would maintain order in the locality.

5.3.3 Safeguarding Natural & Cultural Heritage and Vulnerable Groups

Under the National Tourism Development Plan Executive Summary for 2011to 2016, there are various actions and activities that can be implemented to be able to safeguard the natural and cultural heritage, and protect vulnerable groups. The following are the suggested activities or actions based in the National Tourism Development Plan Executive Summary for 2011to 2016 which could be adopted to promote inclusive growth and facilitates further development of tourism in Barangay Sabang : (a) developing unique local products; (b) conducting conservation workshops; (c) advocating the sustainable use of heritage sites; (d) exerting effort to increase the number of heritage sites for international recognition and lastly; and (e) providing professional linkages between sustainable heritage and tourism.

5.3.4 Enhancement of Nature-Based and Cultural Tourism Products

Barangay Sabang in the town of Baler is surrounded by natural attractions, such as beaches and mountain ranges. Cultural resources are also existent in the area because residents give much significance to their local culture and heritage. Those natural attractions and cultural resources are assets that can be capitalized by the poor since it is more accessible to them compared to financial resources.

The wide range of mountains and the long stream of beaches are the major attractions in the place. A visit to Baler will never be complete without experiencing the high waves and magnificent view in Sabang's coastline. However, aside from that, there are still more to see in Baler that can be developed for resource and product development in terms of the natural areas and the cultural traditions.

For the natural areas, more activities have the potential to be offered in the place. In Sabang's coastline, snorkeling, banana boat riding, and even scuba diving could be developed for added leisure aside from the common surfing activity. Moreover, the mountain ranges of Sierra Madre surrounding Barangay Sabang and the nearby areas, makecaving, hiking, trekking, and other adventure activities enjoyable for tourists visiting Baler.

Baler can also be an avenue for cultural and heritage attractions that would give more effect in areas needing tourism enhancement. The marketing for town fiestas and festivals should also be intensified. Local cuisines and restaurants should be improved, and native rituals and costumes must be enriched for more tourism experience. `

The enhancement of the nature-based and cultural tourism products is an effective approach for better assets that could suffice the inadequate opportunities for the poor. It can help the impoverished to be more involved in the growing tourism industry in the community of Barangay Sabang, Baler.

5.3.5 Access to Capital Credit

The perspective of the residents of Barangay Sabang toward their willingness to open up their own tourism-related businesses was discussed, and the responses were varied. There are residents who would want to be engaged, while there are other who felt otherwise (please see chapter 4). It is also found out that the residents' willingness depends on the capital that they have. The researchers would recommend to the local government in partnership with the cooperative and rural banks to help the residents especially the vulnerable members of the community by giving them an access to credit capital and start up their own businesses. It could either be tourism-related or not, in which their small-scale businesses could be a source to maximize the income a family gains.

5.3.6 National Government, Private Sector and Local Government Dialogue

The national and local government together with the private sectors within the community should build strong relations with each other. The said parties should be aware of the current situation of their locality and its residents, in terms of the tourism industry, most especially of the impoverished communities who should also be receiving the benefits and vast opportunities of the tourism industry. With the help of the said parties, the impoverished people's livelihood options may be diversified, giving them additional sources of income which may also be one of the means and/or strategies to reduce the poverty rate in the research locale. The researchers also recommend the government and the private sectors to conduct consultations regarding the said issue, and at the same time, produce actual strategies and programs with the commencement of seminars that would involve the local residents most especially the impoverished communities that would give them awareness regarding the benefits of the tourism industry. The opportunities that the industry could offer to the locals could be achieved by engaging themselves in tourism-related businesses and jobs and by diversifying livelihood options to gaining additional sources of income.

The national and local government along with the private sector should also convene about pressing issues within the locality, such as the lack of waste disposal management, laws that are not strictly implemented, and the increasing number of business establishments that are already overcrowding the locality's environment. The national government should also be able to formulate environmental impact assessment that would help them oversee solutions to minimize perils.

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Appendix A – Transcript of Interviews with the Municpal Tourism Officer of Baler and Barangay Captain of Sabang, Baler

TOURISM IN GENERAL
Q1: "Nakikita niyo po ba na sa mga darating pang taon ay mas lalago pa ang Turismo dito sa Baler?" ***(****Could you foresee that Tourism here in Baler will further grow in the succeeding years?)* A: "OO, iyon din kasi ang pinagpaplanuhan ng local government o ng pamahalaang bayan na ma-sustain talaga naming ang paglago ng industriya ng Turismo. Unang-una, marami kaming mga site na magaganda pero kasabay ng promotion na iyon ay nandoon iyong pinagpaplanuhan din naming at ginagawa rin naming proteksyon. Ibig sabihin kasabay ng pag-unlad na ito dapat mayroon din kaming mga local ordinances na talagang napoprotektahan niya ang aming bayan." *(Yes! That's what the local government is planning to sustain the growth of Tourism Industry. First and foremost, we have a lot of beautiful sites, but along with the promotion, we also create plans to protect it. What I mean is that, along with this development, we should also have local ordinances that will protect our municipality.)* **Q2: "Since na-validate na po natin na totoo po talaga ang impormasyon na nandoon sa newspaper na iyon, sa papaanong paraan niyo po ginagamit iyong tax revenue na iyon in terms of tourism development?"** *(Since we already validated the information from that Newspaper, on what ways do you use those tax revenues in terms of tourism development?)* A: "Sa tourism development din kasi ay mayroon kaming mga inaallocate na fund ang ating pamahalaan para talaga namang madevelop pa iyong mga site. Tapos hindi lang din naman kami doon nagtutuon, mayroon din kaming mga capability building at diyan din namin kinukuha iyong halimbawa ay sa MDR namin just in case na may mga emergency ay magkaroon talaga ng allotted fund para sa mga ganyan. Gaya dun sa cultural arts promotion, sa marketing, doon din namin siya kinukuha. Atsaka hindi lang din naman kasi doon nakatutok iyong programa naming. Unang-una kasi ang mga turista naman ay hindi lang sila iyong pinoprotektahan. Pero sa mga basic services talaga ng government, halimbawa sa mga senior citizen, kahit hindi sila taga-dito sa Baler pag senior sila talagang binibigyan din sila ng mga proteksyon." *(The local government also allocates funds for the tourism development especially to develop the premier sites. And we don't only focus with that, we also have capability building where we get the MDR just in case there is an emergency, which also has allotted funds. For example is the Cultural Arts Promotion, in marketing, that's where we get the budget. Also that's not the only center of our programs. First and foremost, tourists are not the only ones being protected. But in the Basic Services of the government, for example is the senior citizens, even if they are not residents of Baler, we also give them protections.)* **Q3: "Maam, kalian po nagstart yung actual na pagdagsa ng mga turista?"** *(Ma'am, when did the influx of tourist started?)* A: "Ang pag dagsa kasi ng mga turista ay nagsimula ito noong 2013. Before may pumupunta pero hindi naman siya ganun karami pag dumagsa. Konti pa lang pero kilala na rin sya. *(Tourist influx started last 2013. There were visitors before but not as many as what we have now. There were few, but it is already known.)* **Q4: "Bakit po kaya sa tingin nyo biglang dumagsa noong taon na yun ang mga turista? Ano po kaya yung dahilan bakit biglang dumami?"** ***(****Why do you think there is an influx of tourist that year? What do you think is the reason?)* A: "Isa sa nakita namin ay yung sa promotion. Nagkasunud sunod kasi ung kay Kris tv, tapos yung kay Drew Arellano, nagshooting dito yung kay Kim Chui at Coco Martin. Ang laki kasi ng naging tulong noon sa promotion. And kami din dito sa munisipyo, naka-avail kami ng funding sa DOT at DTI para mas mai-market pa namin yung Baler sa labas ng Aurora." *(One reason is the promotion. There's a row (of TV shows) like Kris TV, the one with Drew Arellano, (movie) of Kim Chiu and Coco Martin was also shot in here. It was a big help in promotion. Also us here in the municipal government, we avail funds from DOT and DTI to market Baler outside of Aurora.)*

Q5: "And siguro maam yung sa social media din po?" *(And Ma'am maybe because of the social media?)*
A: "Oo yung sa social media. At saka syempre katulong naming yung mga pumupunta dito na pag nagpunta sila dito, ayan, magboblog sila or mag popost sila na ganito sa Baler, kumakalat ng kumakalat." *(Yes, social media. We are also helped by those who visits here, they do blogging or post something about Baler, until it reach other people.)*

Q6: "Meron pa po. Sa tingin nyo po, ano po ang strength ng Baler in terms po sa tourism? Kasi po diba baler po, Surfing. Hindii po kaya manawa yung mga turista na pupunta dito na ay sa Baler surfing lang. Ano pa po yung iba?" *(Another thing, in your perspective, what is the strength of Baler in terms of Tourism? When we say Baler, this means surfing. Don't you think the visitors might get bored because Baler is just for Surfing? What are the others offered?"*
A: "Hindi, marami pa naman kami. Unang una kasi, ang Baler is, sabi nga namin nandito ang historical na mga pangyayari. Isa yun sa pinapakita namin. Tapos yung kultura, and syempre, alam niyo naman Baler, may dagat, may bundok, may mga ilog. Talagang yung sa natural talaga kami. *(No, there's a lot more. First and foremost, Baler also has a historical site, that's what we also market. Also the culture, and of course, as we all know, Baler has a sea, mountains and rivers. We are really nature-based.)*

Q1: "Nakikita niyo po ba na sa mga darating pa pong taon ay lalago pa po ang turismo dito sa inyong baranggay?" (*Do you think that the tourism industry in your barangay will experience more growth in the coming years?* **)**
A: Sana, kasi, nabigla din kami sa biglang pagdating ng mga turista dito eh. Kaya lang ang problema namin ngayon eh yung basura namin. Walang maluwag at malaki na lupa na ano mapaglalapatan ng aming mga basura. Tapos, tubig. Nabigla kami kasi ang aming pinagkukunan ng tubig dito ay gaya nung deep well na hindi naman habang panahon eh marami kaming maiaahon na tubig mula sa ilalim. (*I hope so because we were surprised by the sudden tourists influx here. The problem right now is the garbage disposal. There's no available land space where the garbage can be disposed. Also, the water supply, we were surprised because our main provider of water is the deep well and not all the time we can get enough water from it*)

Q2:"Kumbaga parang unplanned po yung tourism development?" *(So it's like an unplanned tourism development?)*
A:Oo, lalo na sa parte dito. (*Yes, especially here in this part (Brgy.Sabang))*

SOCIAL ASPECT

Q1: "Hindi po ba sa Turismo po talaga may mga negative na makikita? Isa po doon ay baka magcause siya ng traffic, o baka magkaroon siya ng dahilan upang tumaas ang crime rate. Mayroon po ba kayong mga precautionary measures para po maiwasan natin ang mga insidenteng ganito? *(Is it really because of Tourism that we see negative things? One is that it might cause heavy traffic or would cause an increase in crime rate. Do you have precautionary measures to avoid such incidents?)*
A: "Ang local government, halimbawa pagdating ng kagaya ngayong summer, mayroon kaming task force na binubuo para maprotektahan iyong mga ganyang pagkakataon o masagutan at mapagplanuhan talaga. Para hindi magcause ng traffic, mayroong ginagawang re-routing ang munisipyo para hindi naman makaabala din doon sa mga turista. Tapos kami, iniinform namin ang mga tao sa mga bawal at pwedeng gawin. Nagpapakalat kami ng mga hotline number at mayroon kaming mga tourist information desks na itinatayo para atleast mas madaling icontact at mas madaling matugunan iyong mga sinasabi nating kagaya ng crime rate. At nagpapaalala din kami, sa pamamagitan ng radio program na tuwing Wednesday at doon ay dinidiscuss namin kung ano pa ang mga plano ng pamahalaang bayan." *(The Local Government, for example is this coming summer, we do form a task force to avoid those situation or at least a solution and we do really plan for it. To avoid heavy traffic, there are re-routing orders from the municipal hall so that we could not cause*

disturbance even to the tourists. Our duty is also to inform the people on what is prohibited and allowed at the same time. We give out copies of our Hotline numbers and we also have Tourist Information Desks to be easily reachable and then we could respond much faster those incidences such as crimes. And we also remind the people through our Radio programs every Wednesdays, and on air we discuss the plans of the Municipal Government.)

Q2: "Bago po ba magkaroon ng tourism dito sa Baler, pinapriority niyo narin po ba iyong mga infrastructure development?" (*Even before the existence of Tourism here in Baler, do you prioritize the infrastructure development?)*
A: "Oo, kasi sabi nga natin iyong mga nauna pa mang mga official na na-elect ay nakita narin naman nila na kailangan talaga. Lalo itong mga network natin sa kalsada ay talagang kailangan kasi kung hindi gumanda ang mga kalsada ng Baler ay baka hindi kami napupuntahan ng ganito. Talagang iyong accessibility tinitignan nila iyan." *(Yes, as I've said those officials who were first elected saw the need to develop. These 'networks' on our roads here in Baler needs to be expanded because if not, we could not be visited. They also foresee the accessibility.)*

Q3: "Bago pa po magkaroon ng Turismo talagang nagpapagawa na po ng maaayos na daan?" ***(****Even before the existence of Tourism they already build up convenient roads?)*
A: "Oo, talagang mayroon naman kaya lang siguro mas naging matimbang iyong pagkakaroon namin ng tourism. Maganda iyong nakita or doon sa mga naunang namuno, nakita nila na ito ang kailangan ng Baler dapat buksan sa lahat para naman mas lalong umunlad." *(Yes, there is but it's just that we prioritized the existence of Tourism. What the first elected leaders here in Baler saw the urge to develop infrastructures as a way to open up Baler for its further growth.)*

Q4: "Kailan po nagsimula iyong mga projects na ito?" *(When did this projects started?)*
A: "Matagal na kasi iyan. Noong 2004, isa sa mga pinakadinaraanan ay itong ating Bongabon Road – Baler, pero iyan sinimulan na nilang ipagawa kaya lang nagkaroon nga ng problema.
Noong nagkaroon kami ng flashflood sa Villa Aurora, nasira iyong tulay at nasira iyong mga pinagawang daan kaya mas nabigyang pansin itong kabilang daan, Pantabangan – Aurora Rd. Pero doon sa pagpapasemento nilang iyan, ay talagang mas napabilis naman ang pag-unlad pa ng Baler. Pero itong Bongabon Road hindi parin nila tinitigilan iyan, patuloy paring pinagagawa. Ngayon, doon sa huling pagbisita ng mga tour guide namin, nadadaanan na iyong tulay." *(It was long ago. Last 2004, one of the first roads to be developed is the Bongabon – Baler Road, but there was a problem. When we had flashflood in Villa, Aurora, the bridge got broken and the developing road was fully damaged, so they gave attention to the other highway, which is the Pantabangan – Aurora Road. Through the development of roads, the growth of Baler also increased. But they also didn't stop building of Bongabon Road. For now, the last time it was visited, the road can be used already.)*

Q5: "Mayroon po bang mga NGOs dito sa Baler?" *(Are there any existing NGOs here in Baler?*
A: "Oo, marami naman. Gaya ng Kabalikat, Guardian, K of C, marami kasing mga accredited dito. Ang Knights of Columbus ay active sila." *(Yes, there's a lot. For example is the Kabalikat, Guardian, K of C, there are a lot of accredited in here. The Knights of Columbus they are very active.)*

Q6: "Mayroon po bang mga NGOs na kumakatawan sa mga mahihirap na community dito po sa Baler?" *(Are there any NGOs that represent the impoverished community here in Baler?)*
A: "Marami naman kami kasi unang-una, iyong kagaya dito sa may Diguisit Area. Iyong mga mangingisda ay mayroong kumakatawan na NGOs sa kanila. Mga magsasaka, mayroon kasing mga farmers talaga na active para maiparating nila sa pamahalaan kung ano nga ba iyong talagang pangangailangan nila." *(We do have, for example is in the Diguisit Area. There are NGOs that represent the Fishermen. The Farmers, there are also active farmers that would like to communicate to the municipal government their needs.)*

Q1: "Ano po iyong Bahay ng Pagbabago?" *(What is that House of Change?)*
A:Doon yun sa Suklayin. (*That was located in Brgy.Suklayin)*

Q2:"Rehab po ba iyon?" *(Is that a rehab?)*
A: Oo pero hindi naman totally rehabilitation yun kundi bibigyan lang sila ng dalawampung araw para magkaroon ng recovery. *(Yes but not totally a rehabilitation. They were given 20 days to gain recovery)*

Q3: "Mayroon po ba kayong alam na mga existing NGO po dito sa inyong baranggay?" *(Are you aware of the existence of various NGOs here in your barangay?)*
A:Parang wala yatang NGO rito. Non-government organization no? *(It seems like there's no NGO here. Non-Government Organization, right?)*

Q4: "Opo, sa munisipyo po?" *(Yes, how about in the municipal office?)*
A:Ay, sa munisipyo meron. Gaya ng Ligang Baler. *(In the municipal office there are, like the "Ligang Baler")*

Q5:"Tungkol saan po iyong NGO na yun?" *(What is that NGO all about?)*
A:Yung Ligang Baler kasi sa munisipyo. Parang operatiba nila iyon. Meron ding mga samahan ng magsasaka at ng mga mangingisda. (*Ligang Baler is under the municipal office, it's like a cooperative. The are also associations that represent the farmers and fishermen*)

Q6:"Nabanggit po ng secretary niyo kanina na bababa na daw po yung population dito ng mga residents ng Sabang. Irerelocate na daw po kasi yung ibang mga residente. So sino po yung mga nirerelocate na yun and paano naman po yung mga taong walang sariling lupa dito sa baranggay?" *(The secretary of the barangay was mentioned to us that the population of the barangay is about to decrease because there are residents who will be relocated. Who are those residents and how about those people who do not own a lot here in the barangay?)*
A: Oo nga, nabawasan na kami dito sa totoo lang ng mga 150 na families. Karamihan sa kanila, hindi kanilang lupa talaga yun. Kaya nung nagbakasyon yung may ari ng lupa dito, inobliga na niya na paalisin. Meron naman silang pinaglilipatan. *(Yes, we were decreased by 150 families. Most of them don't really own the lot so when the owner came for a vacation, they were oblige to leave the place. But then, there are available relocations for them)*

Q8:"Pero ang sabi po nila sir is nagbabayad po sila ng renta?" (*They said they were paying for rent?)*
A:Ano yun, parang ano lang, yung renta naman eh makatarungan naman siguro. Kung ikaw may sarili kang bahay at lupa, walang renta yun. Kumbaga ang usapan lang noon, magbibigay lang sila ng 7,000 panimula pero kanila na yung lupa at bahay. *(That rent is just. If you have your own house and lot of course there would be no rent for that. There was an agreement before that they have to pay an amount of 7,000 pesos first and then the house and lot were up to them)*

Q9:"Pero sir doon po sa paglilipatan nila,wala na po silang renta?" *(But in the relocation site are they required to pay a rent?)*
A:Meron. Ang renta nila dyan ay 100 per month. Tapos tinaasan ng 300 tas 500. *(Yes, they have to. 100 pesos per month)*

Q10:"Last question na po sir, parang hati po kasi yung perspective ng mga taga dito. Yung iba po payag po sila na may tourism habang yung iba po hindi po sila payag na may tourism kasi daw po nagdadala ng kalat, nagiging magulo. Ano naman po yung masasabi niyo dun?" *(Last question sir, it seems like the perspective of the residents here about tourism development are different. Some are in favor while some are not because they believed that it only brought garbages and disorderliness, what's your stand about that?)*
A:Ganito kasi yun, kunwari may mga turista, siguradong may kalat eh. Kasi may dala silang baon, hindi naman nila binabalik yung kalat nila basta ibabagsak nalang kung saan saan. (It goes like this, for example, there's a tourists, for sure there would be trashes. They bring their own stuff like packed meals and they just throw their trashes anywhere)

Q11:"Hindi po ba dapat iconsider din natin yung gusto ng mga residente dito bago po tayo mag open ng business?" *(Don't you think it's better to consider what do the residents want before opening another businesseses?)*
A:Sana. Kaya lang nabigla nga eh. Nagkanya kanyang bukas na ng negosyo eh. *(I hope so but we were surprised. All of a sudden, they just opened their own businesses)*

ECONOMIC ASPECT

Q1: **"Maari po ba kayong magbigay ng mga specific na produkto kagaya po nang mga naimarket niyo nang produkto"** *(Can please give us specific products that you already marketed?)*
A: "Kagaya ng suman, kakaonti lang ang gumagawa niyan pero ngayon sa dami ng mga turista na naghahanap ng sumang Baler. Dati kasi dito lang naming namamarket iyan pero ngayon gumagawa na sila at kumukuha pa sila ng worker nila. Kung dati 200 lang sa isang araw ang ginagawa nila, ngayon hanggang isang libo. Ganoon karami ang umoorder sa kanila." *(For example is 'suman' there are only few who makes those, but nowadays, since there are a lot of tourists, the demand for 'Suman' here in Baler is also high. Before, we only market those here, but now there are a lot who creates (Suman) and they also get workers. If before, they only made 200 per day, now they produce at least 1000. That's how high is the demand.)*

Q2: "Ano po iyon, parang nagkaroon ng factory kumbaga?" *(Was it like they built a factory?)*
A: "Hindi, sa mga bahay din lang nila pero mas marami na iyong mga worker nila kasi iyong sumang Baler talaga ay napakatagal gawin. Iyong 200 na suman ay parang isa lang ang dating gumagawa, ngayon kapag naging isang libo na ang order, hindi na iyan kayang gawin ng isang tao kaya kumukuha na sila ng additional na workers nila." *(No, it's just in their own houses, but has a lot of workers because 'Sumang Baler' takes a lot of time to be done. 200 'Suman' which was created by a single person, when they have an order of 1000, it cannot be done by a single person, that's why they get additional workers.)*

Q3: "Mga taga-Baler din po?" *(Are they also from Baler?)*
A: "Oo, taga-Baler din." *(Yes, they are also from Baler.)*

Q4: "Aware po ba kayo doon sa napabalita sa Business Mirror na 818% po ang naging increase ng tax revenue mula 2014. From 23million hanggang naging 239million na tax revenue ng Baler? According po yata iyon sa interview ni Mayor sa Business Mirror." *(Are you aware on the article released by the Business Mirror that the increase of tax revenue reached 818% since 2014, from 23 million it increased to 239-million tax revenue of Baler? That was according to the interview of Business Mirror to the Municipal Mayor.)*
A: "Kung dati kasi ang mga taga gawa lang namin ng local products ay 10 lang ang aming local producer, ngayon 47 na sila kaya nagtaas din ang pumapasok na income. Iyong local surf school namin, dati 10 lang din iyan, ngayon ay 38 naman sila. Iyang mga transient houses, lodging at hotel, dati kakaonti lang pero ngayon ay talagang naglipana na. Nadoble halos ang bilang. Dati ilang bangko lang DBP, Landbank, tsaka mga rural banks lang ang mayroon, pero ngayon may RCBC, Chinabank, at may PNB narin kaya ganoon talaga kabilis ang naging pagtaas ng source of income namin." *(If before the workers of our local products are only 10 persons, now it reached to 47 workers that's the reason why there is an increase in the income. Those local surf schools, there were just 10 before but now there are 38 in number. Those transient houses, lodging and hotels, there were only a few but now there are a lot of them. The number doubled. Before banks like DBP, Land Bank, and other rural banks exists, but nowadays, we also have RCBC, China Bank and even PNB, that's the reason on how fast the source of income increased.)*

Q5: "Willing po ba kayong magkaroon ng Entrepreneurial Development for Rural Toursim?" *(Are you willing to have an Entrepreneurial Development for Rural Tourism?)*
A: "Yes, kasi alam kong malaki ang maitutulong niyan sa bayan ng Baler dahil sabi nga namin mas maganda na sigurong taga-dito sa Baler din mismo ang mag-invest kaysa nanggagaling pa sa ibang bayan. Kasi once na natuto naman ang mga taga-Baler, siguro mas maganda na sa amin na mismo galing iyong mga mamumuhunan." *(Yes, because I know that it would be a big help to the community*

of Baler, as we are saying, it is better to have an investor who reside here in Baler instead of those who will come from other places. Once the people of Baler learned, I think it is better if the capitalist will also come from here.)

Q6: "Sa ngayon po, ano pong mas marami, iyong mga investor na galing sa labas o yung investor na galing dito sa Baler?" *(For now, whose more dominant, your outside investors or those who were from here in Baler?)*
A: "Sa ngayon kasi, marami na rin yung taga dito na nagtatayo ng mga business nila, especially yung mga may kamag-anak sa abroad na taga dito din talaga. Ngayon nila nakikita na ganun pala ang naging pag- unlad ng Baler. Naglalabas na sila ng mga puhunan nila. Yung dating mga lumang bahay lang nila pinagawa na nilang commercial building na hindi na yung dating residential lang nila." (*Nowadays, there a lot of residents who builds up their own businesses, especially those who have relatives in abroad. This is just the moment, that they see the development of Baler. They give out capitals. Their old residential houses are renovated as a commercial building.)*

Q1: "Anu-ano po iyong mga programa ninyo upang makatulong po sa mga mahihirap dito po sa Brgy. Sabang?" (*What are your programs that aimed to help the impoverished here in Brgy.Sabang?* **)**
A: Mayroon kaming pondo para sa pagbibigay ng mga trabaho. Kagaya niyan, mayroon kami ngayong street sweeper na dalawa, binibigyan namin ng trabaho yun. May mga bata rin na gaya pag summer, mayroon silang summer job. (*We have funds allocated to provide jobs. For example, we have 2 street sweeper. Also, there are children who do summer job*)

Q2: "Paano niyo po pinipili yung mga street sweeper at yung mga estudyante po para sa summer job?" (*How do you choose those street sweeper and those students who will perform the summer job?*)
A:Yung kasing street sweeper namin, yun talaga yung mga walang wala.Tapos yung mga nagsusummer job naman, yun din yung mga walang mabigay yung mga magulang nila na pampaaral para atleast nakakatulong kami sa kanila. (*Those street sweeper are the people who are really less fortunate as well as those students whose parents lack the capability to support their study, in that way, we were able to help them)*

Q3:"Willing po ba kayo na magkaroon ng entrepreneurial development dito po sa inyong baranggay, yung para po sa rural tourism?" *(Are you willing to conduct an entrepreneurial development for rural tourism here in your barangay?)*
A; Oo naman *(Yes of course)*

Q4:"Sinusuportahan niyo po?" *(Do you support it?)*
A:Oo para makatulong doon sa mga mahihirap. *(Yes so as to help those impoverished)*

Q5: "Sabi niyo po kanina, willing pa kayong mag karoon ng entrepreneurial development po. Ibig sabihin po ba nun open pa po kayo sa ibang mga private businesses po dito? Hindi po ba masyadong pangit na yung mangyayari nun kasi lahat business po. Ilang transient house na po yung magkakatabi na pareparehas." *(You said while a go that you're willing to have an entrepreneurial development, is that also means that you're still open for private businesses here? Don't you think it's unhealthy because the place was already congested with a lot of private business establishments?Like for instance, the place is surrounded by a lot of transient houses built next to each other)*
A:Siguro, ang iniisip kasi namin dito ay yung kagaya ng zipline, ganon. Yung wala pa dito. Yung sa mga ibang lugar kasi may mga banana boat na wala pa samin. Parang yun yung gusto ng alkalde namin dito na magkaroon pati yung zipline. Kung nakikita niyo yung Ermita, doon sana yung umpisa. Para atleast makaakit pa ng ibang turista. Kasi wala nang iba eh, dagat lang yung pinupuntahan dito eh. Surfing lang. *(Perhaps we are thinking of having a zipline and another one is to have a banana boat since both are not yet present here. Our mayor wants to have a zipline. If you have been in Ermita, that place is the target starting point so as to attract more tourists. What we only have here is the sea, only for surfing)*

Q6:"So, ibang business naman po?" *(So another type of business?)*
A:Oo kasi, marami na ditong mga hotel, marami naring mga kainan. Sobra sobra na nga eh.
(Yes because there are already various number of hotels and restaurants businesses and it was more than too much)

Q7:"Pinapayagan po ba na hindi ka taga rito tapos magiinvest ka?" *(Do you allow investors who are non-residents?)*
A:Okay lang. kasi open naman si mayor sa mga ganun na mga investors. *(It's okay. Our mayor is open for those investors)*

POLICIES

Q1: Pwede po ba kayong magbigay ng mga halimbawa ng local ordinances na iyon para po maproteksyunan pati iyong mga taga-Baler? *(Can you please give us examples of local ordinances to protect even those who are living in Baler?)*
A: "Specialy dito, iyong sa Sabang Beach o itong ating karagatan na dati kasi ay pinapasyalan lang ng mga tao. Iyong mga namamasyal na iyan, ay mayroon narin kaming ordinansa na bawal na talaga magkalat. Magpicnic man sila pero huwag silang mag-iiwan ng mga pinagkainan. Ang pagbobonfire ay ipinagbawal narin diyan para ma-save talaga natin ang mother earth. Ayan mga ipinagbabawal na talaga. (*Especially here, in Sabang Beach or our Ocean that was just visited by people before. Those who visits there, we have an ordinance about littering in the area. They could have picnic, but they should not leave their trashes. Creating Bon Fires is also not allowed to save our mother earth. That's what we really prohibit.)*

Q2: "Halimbawa po, may mahuli po kayong nagkakalat, may mga kaukulang parusa po ba?" *(If for example, you caught people who litters are there any punishments?)*
A: "May penalty siya. Doon kasi sa mga ipinagbabawal na pagkakalat, mayroon iyang kaukulang penalty na ang nagpapaimplement niyan ay ang ating MENRO, iyong ang ating Environment Officer dahil nasa trabaho niya iyan. Pero kami bilang agency din, inirereport namin sa kanila kasi mayroon din silang mga deputized enforcer para kahit wala sila mayroong talagang magiging parang pulis sa lugar. *(He has a penalty. Where 'No Littering' is implemented there are corresponding penalties, and MENRO, who is also our Environment Officer implements this because it his duty. Also as an agency, we report to them because they have these deputized enforcers who patrols and secures the area.)*

Q3: "Nakita po namin sa website ng Baler na mayroon po pala kayong ordinance na 40% po dapat ng mga nagtatrabaho ay residente ng Baler (ordinance no. 004-2011-an ordinance enjoining all business establishments, investors, contractors and the like to hire a minimum of forty-percent of their work force from qualified and bonafide residents of the municipality of Baler). Papaano niyo po namomonitor ang implementation ng ordinansang ito?" *(We have seen in the website of Baler that you have a local ordinance that 40 percent of the employees and workers must be a resident of Baler (ordinance no. 004-2011-an ordinance enjoining all business establishments, investors, contractors and the like to hire a minimum of forty-percent of their work force from qualified and bonafide residents of the municipality of Baler). How do you monitor the implementation of this ordinance?)*
A: "Ang ordinansang iyan ay naka-base sa Republic Act/Batas ng Department of Labor and Employment na in-adopt ng munisipyo dahil ang mga project na iyan bago pa sila magsimula ay kumukuha na ng permit sa aming engineering department kaya mas madali naming mamonitor iyong mga ganyan." *(That ordinance was based on a Republic Act /Law of the Department of Labor and Employment adopted by the Municipal Government, because even before that project started, they do get permits from the Engineering departments for easy monitoring.)*

Q4: "Ang pagkakaroon po ba ng ordinansang ito ay requirement po ba talaga?" *(Is the ordinance required?)*
A: "Oo, requirement talag iyon. Atsaka karamihan naman din ng mga contractor dito ay mga taga-dito din sila sa Baler. Lalo kapag ang funding niyan ay nanggaling sa munisipyo, local contractor din

naming na taga-dito din sa Baler iyong mga worker nila." *(Yes, it is required. And most of the contractors are also from Baler. Especially when the funding came from the Municipal Government, the workers of the local contractors are those people who live here in Baler.)*

Q5: "How about sa implementations po ng mga ordinances?" *(How about the implementation of the ordinances?)*
A: "Okay lang naman po kaya lang mayroon po talaga yung mga pasaway, pero siguro kulitan lang. ipaliwanag sa kanila talaga, kasi may mga tao naman na sasabihin "ay oo, bawal pala"kaya sumusunod naman. May mga pasaway lang talaga na alam naman kung bawal na, nakapost na diyan bawal magtapon mayroon parin nagtatapon." *(It is alright, however there are some who bends the law, but it's just minor. We have to make them understand, because there are people who can be reprimanded, "yes, it's not allowed" so they follow. There are also stubborn people who know that it is not allowed, posted signage as a reminder but then they still do liter.)*

Q1: "Ano po yung mga precautionary measures niyo po para wala naman po masyadong maging negatibong impact yung turismo po dito halimbawa po yung mga krimen at gaya po nung sinasabi niyo sa basura?" (*What are your precautionary measures so as to lessen the negative impacts of tourism like the occurrence of crime and the problem of garbage disposal you are mentioning while a go?***)**
A:Sabagay kasi ano naman, pag talagang umuunlad ang isang bayan. Natural na lilitaw ang mga yan, krimen na alam niyo na, may nag nanakaw. Pero, hindi naman masyado eh kasi very supportive naman yung aming mayor patungkol sa mga establishing order. Umiikot naman talaga yung mga pulis namin. Gaya narin nung mga nagaadik dati, ipinunta sila doon sa Bahay ng Pagbabago. (*Well, it is given that development is also associated with those, crime like stealing but it's not really a problem here because our mayor is very supportive in terms of establishing order. Our police officers are going around the area to patrol. Like those addicts, they were sent to "House of Change"*.)

Q2:"Ang concern lang po namin is meron po bang ano po, kumbaga 'ngipin' ang oridnansa po natin para maenforce po iyong batas?" *(Our another concern is if there teeth to the enforcement of the ordinance?)*
A:Eh sa ngayon kasi kapag 'ngipin' ang pinaguusapan, di po masyado kasi yung basurahan namin dyan, sobrang liit. Kunwari, kagaya ninyo, pag nahuli kayo na nagtapon kayo dyan, pag sasabihan muna kayo. Warning muna. Ngayon pag pangalawa na, mag cocommunity service na kayo. Yun lang yung patakaran ng ating munisipyo ngayon. Kasi paano ang gagawin namin sa basura namin, hindi naman kami hinahakutan ng basura dito sa baranggay. Kumbaga kami, sarili na namin yun. Ang hinahakutan lang kasi ng basura dito sa amin ay yung limang baranggay doon sa Poblacion. Pero yung outside Poblacion kagaya namin, hindi umiikot dito yung truck. *(Right now, if we're going to talked about the teeth in enforcing the ordinance, there's not much because our space for garbage disposal is too small. For instance, if you were caught littering for the first time, you will just get a warning. If you were caught for the second time, you should do a community service. That's the only ordinance of the municipality for now because how are we going to dispose our garbage accordingly if the garbage truck does not go here in our barangay to collect our trashes. There are only 5 barangays in the Poblacion area wherein the truck are going around to collect the garbage.)*

Q3:"Pero paano iyon sir kasi may batas tayo dito na pag more than 10 years na silang naninirahan dito at hindi mo pinapaalis, pwede mong iappeal at meron pong karapatan ang mga illegal settlers na to na mag file na apila sa korte. Wala lang silang pera pang abogado." *(But sir we do have this law that if you're settling for more than years in that particular area, you cannot simply ask them to leave, they have the right to file an appeal in the court but then the problem is they lack financial means to support their actions)*

A:Tiyaka ano, wala silang samahan na malakas. 150 families yun eh, andoon sa Setang. *(Also they don't really have a strong cooperative. They are 150 families and they were in Setang)*

Q4:"Pero okay naman po sila doon?" *(But are they living fine there?)*

A:Okay naman na, may tubig na sila, may kuryente na ngayon. *(Yes they are, there's already a water supply as well as electricity)*

ENVIRONMENTAL ASPECT

Q1: "Parang nakikita po namin na through environment, that is your main capital or your main tourism product. So mayroon po ba kayong carrying capacity? For example po sa Sabang Beach, ilan lang po yung dapat turistang nandiyan? Sa mga waterfalls po natin, kung may carrying capacity din po ba?" *(As we can notice, nature and environment is your main capital and your main tourism product. Do you have a carrying capacity? For example in Sabang Beach, how many tourist it can only accommodate? In the Waterfalls, how many is the carrying capacity?)*
A: "Sa ngayon wala pa. yung nga ung pinaguusapan namin ng MENRO. Hindi kasi namin maiopen sa public yung pag bisita doon gaya sa mangrove. Kasi may mga bagay na dapat naming protektahan. Hindi parin namin maiopen ung mountaineering ditto sa may Diguisit Area, kasi wala pa kaming hawak na talagang local na ordinance para meron kaming mga dapat na sundin para atleast maprotektahan. Ang susunod siguro naming na isa sa hinahanapan pa naming is yung sa farm tourism, agri-tourism para atleast mas madagdagan pa, hindi lang puro sightseeing. Mayroon na kaming dinedevelop kaya lang kailangan pang pag-aralan iyon ng mabuti." *(For now, we don't have. That's what we are talking about with the MENRO. We cannot open the Mangroves for the tourist to visit it. There are things that should be protected. We also cannot open the mountaineering site here in Diguisit area, because we don't have a local ordinance yet, to be followed to at least protect the destination. What we will give emphasis next time is the Farm Tourism, Agri-Tourism to add as an activity not only sightseeing. We are developing something but it is still in process.)*

Q1:"Dito po sa Sabang, since dito po yong focus ng mga turista dahil andito po yung mga coastal area at yung Beach, ang concern lang namin po is kasi ang sabi nung munisipyo, meron daw po silang ordinansa na bawal pong magkalat. Pero base po sa obserbasyon namin at yung ding sinabi ng munisipyo meron parin pong mangilan ngilan na nagviviolate po nito." (*Since Sabang is the most visited by tourists because of the costal area and the beach, according to the municipal office, there is an ordinance that prohibits littering but our concern is based on our observation and what the municipal office said there are people who keep on violating the said ordinance***)**
A:Ay oo, marami. *(Yes, there are lot)*

Q2:"Paano po yung mga basura niyo dito sir?" *(What do you do in your garbage here, sir?)*
A:Kanya-kanya nalang na segregate. Kagaya nung mga hotels dyan, yung mga lupa doon sa karatig na lugar, doon nalang sila nagtatapon ng basura. *(We segregate it on our own. Like the hotels there, they dispose their garbage in the nearby land area)*

Q3:"Kaya po pala nasabi niyo rin po kanina na parang nabigla po kayo sa biglaang pagdating ng mga turista." *(That's why you said you were surprised about the sudden tourist influx)*
A:Oo, nabigla talaga. Kasi nga, biglang nag boom eh noong 2012 lang kasi ito eh. *(Yes, we were really surprised because it was in 2012 when the boom in the tourism industry was started)*

Q4:"Pero sa Sabang po, sa aspetong pang environment, sa tingin niyo po meron na po bang negatibong nangyayari at naidudulot ang turismo dito sa baranggay?" *(But here in Sabang, in terms of environmental aspect, do you think there are negative impacts brought by tourism in your barangay?)*
A:Wala pa naman sa environment kasi itong dagat namin open sea. Pacific ocean. Tapos dalawang ikot yung napunta samin. *(There's none in terms of environmental aspect because it's an open sea then you have to go around about twice to get here)*

Q5:"Pero paano yun sir kasi dati merong mga instances na sa ibang lugar dito sa Pilipinas, yung coastal area nila malawak. Kumbaga bago ka makarating sa tubig is maglalakad po muna

kayo sa mga buhanginan. Eh ano po yung napansin niyo since dito po kayo lumaki. Nung maliit pa po kayo, gaano po kalawak yung mga buhanginan?" *(But how about those instances wherein like in some other areas in the Philippines which also possessed a spacious coastal area, it would require you to take a short walk before reaching the shoreline. Since you have grown up here, when you were a kid, how large was the stretched of the shoreline before?)*
A:Malayo. Siguro mga nasa kalahating kilometro pa bago yung dagat noon. *(Perhaps around half kilometer before the actual sea)*

Q6:"Tapos ngayon lumalapit na po?" *(How about now, is it becoming closer?)*
A:Oo. Eh nung bata ako malayo. Mga tatlong beses pa ako humihinto bago marating yung tubig. Eh ngayon, meters lang eh andun na tayo sa tubig. *(Yes, when I was a child, it would took me three stop-overs before reaching the sea)*

Q7:"Ang nakakatakot kasi diyan sir kumbaga, nagiging reactive yung munisipyo imbis na magiging proactive kasi tulad ng nangyayari sa Maynila, hindi nila na foresee na after 10 years magiging ganyan yung traffic. Kaya sila isip ng isip ng paraan kung paano solusyonan eh sa simula palang dapat nakikita na nila kung ano yung mangyayari. Ayon lang po yung takot namin kasi napakaganda po ng lugar na ito eh." *(What's threatening on the part of the municipality is they are becoming reactive instead of being proactive. Like what happened in Manila, they were not able to foreseen the condition of traffic after 10 years. Now, they kept on thinking what should be the solution when in the first place they should have seen the possible occurrences from the beginning. We are just afraid because this place (Baler) is a very beautiful destination.)*
A:Oo, lalo na pagka iyong mahal na araw, puro ano na dito, sasakyan na yung mga kalsada. Puno na. Sa dagat wala ka namang mapupuwestuhan diyan. Sa totoo lang ah, puro ano na dyan, tao. Kaya ayun namomroblema narin yung mayor namin eh. Nung kasing panahon ng mga Angara sa tagal ng panahon, hindi nabigyan ng pansin yung paglalagyan ng ano namin, basura. Doon na nagkaroon ng problema kasi mas maraming turista, mas maraming basura. Pero marami namang nabigyan ng trabaho ang turismo dito gaya nung mga kabaranggay ko, nagtuturo silang magsurf. Halos karamihan dito surf instructor na. *(I agree, most especially during the holy week season, the streets are fully occupied by the vehicles. In the beach, you can no longer have a space. It's overcrowded. Even our mayor found it very problematic. During the time of the Angara's, they were not able to pay attention in proper waste management and it became more problematic when the number of tourist arrivals is continuously increasing. Despite of all those problems, many residents of the barangay were provided jobs because of tourism. Most of them are surfer instructor now.)*

PROGRAMS

Q1: "Gusto lang po naming malaman kung may mga program napo ba kayo na under ng tourism upang mabigyan ng kabuhayan, specifically po iyong mga mahihirap dito po sa Baler?" *(We would just like to know if there are programs under Tourism to provide livelihood, specifically for the impoverished community here in Baler?)*
A: "Pag sinabi kasing pag-unlad ng Turismo dito sa bayan ng Baler, nagging pangunahing programa kasi talaga naming ay ang matulungan iyong aming mga kababayan na magkaroon sila ng pagkakakitaan specially iyong mga dati naming mga tricycle drivers lang ngayon ay nagging tour and trike guides sila na lumalabas. Naging iba iyong klase ng paghahanapbuhay nila, hindi iyong basta sila ay pangkaraniwang driver lang. Binigyan naming sila ng pagkakataon na sila ang maging tour guides dito sa bayan ng Baler. Nagtraining sila sa pamamagitan ng Department of Tourism at tinuruan sila kung paano ba talaga maghandle ng mga turista. Isa palang iyon, mayroon din kami sa mga local producers namin. Through DTI naman, tinuruan iyong mga local producers na maimprove iyong mga kanilang mga products at iyon ang minamarket din naman ng mga taga-munisipyo para mas dumami pa iyong pagkakakitaan. Kung ito man ay family enterprise, pinopromote namin iyong mga product nila para mas makilala pa iyong mga produkto at tangkilikin parin nung mga turista." *(If we are talking about the development of Tourism here in Baler, our premier program is to help the members of our community, so that they have a source of income, especially those who were just tricycle drivers, now they became tour and 'trike' guides. Their livelihood has changed; they are not just an ordinary driver. We gave them the chance to be the tour guides here in Baler. They had trainings*

through the Department of Tourism, and they were taught on how to handle tourists. It's just one example. We also have for the local producers, who went through the DTI. Local Producers were taught on how to improve their products, and that's what people from the municipal hall markets, so that there would be an increase in the livelihood. If these are Family enterprises, we promote their products, so that it these products will be known and be patronized by the tourists.)

Q2: "May itatanong lang po ako sa no.1 po sa program niyo, paano niyo pinipili yung mga tour and trike guides? May qualifications po ba?" *(I just have a question on your number 1 program, how do you choose your tour and trike guides? Are there any qualifications?)*
A: "Wala naman kaming naging qualification, basta residente ng Baler. Pagka tricycle driver, yung tricycle dapat may rehistro, yung driver dapat may lisensya, para talagang legal yung activity na ginagawa namin." *(We don't have any qualifications, as long as he is a resident of Baler. If a tricycle driver, the tricycle unit must be registered, and the driver must be licensed, so that the activity is a legal one.)*

Q3: "Yun po bang program na inopen ninyong yun, open po sa lahat yun o kung sino lang may gusto?" *(Is the program open for everyone or just for those people who would like to join?)*
A: "Open naman. Kung sino yung interesado sya yung mag-aapply. Kasi meron din naman ginawang screening ang DOT Region 3 at basta siya. Central office parin nanggaling ang mga trainor. Kumbaga sumunod talaga kami doon sa standard ng DOT kung paano sila i-train." *(It is open for everyone; those who are interested may apply. The DOT Region 3 also has a screening. The Central Office provides the trainers. We also follow the standard of the DOT on how to train them.)*

Q4: "Ganun din po sa ibang programs niyo, open din po sya sa lahat? *(What about the other programs? Is it open for everyone?)*
A: "Oo, inopen naming siya sa lahat. Siguro sa mga susunod nga tinatarget din namin ang mga estudyante. Marami pang pinag aaralan na pwedeng isa-batas na kung paano pa makatutulong doon sa mga kabataan." *(Yes, it is open for everyone. For instance, our next target is the students. There are ordinances being studied on how to help the youth.)*

Q1:"May mga programa po ba kayo na under ng tourism para po mabigyan ng kabuhayan yung mahihirap?" *(Do you have programs under tourism which aim is to give livelihood for the impoverished?)*
A:Lahat kasi ng tricycle dyan, pinapaccredit sa munisipyo para sila yung mag tour guide sa mga kagaya ninyo. *(All of those tricycle drivers were asked by the municipal office to become an accredited tour guides for the visitors like you)*

Q2:"Sa ngayon po parang nagfofocus po muna sila sa mga tricycle driver? Yun palang po yung pinaka existing na program?" *(Currently, they are just focusing with the tricycle drivers? That's the only existing program as of the moment?)*
A: Oo, yun palang. *(Yes, that was it)*

APPENDIX B - Item Analysis and Cronbach's Alpha Results of the Pretest

Correlation Matrix

	SA 1	SA 2	SA 3	SA 4	SA 5	SA 6	SA 7	SA 8	SA 9	SA 10
SA 2	0.802									
SA 3	0.488	0.304								
SA 4	0.802	0.583	0.913							
SA 5	0.651	0.421	0.513	0.656						
SA 6	0.356	0.167	0.609	0.583	0.656					
SA 7	0.655	0.408	0.745	0.816	0.459	0.408				
SA 8	-0.089	-0.250	0.000	-0.042	0.070	0.375	-0.204			
SA 9	0.257	0.320	0.000	0.120	0.247	-0.280	-0.196	-0.180		
SA 10	0.122	-0.227	0.138	0.152	0.596	0.152	0.186	0.152	0.291	
EA 1	-0.066	-0.185	-0.225	-0.185	0.138	0.123	-0.302	-0.031	0.384	0.392
EA 2	0.218	-0.068	0.248	0.272	0.115	0.272	0.333	0.782	-0.294	0.248
EA 3	0.089	-0.167	0.304	0.250	0.515	0.667	0.408	0.042	-0.520	0.227
EA 4	0.802	0.583	0.913	1.000	0.656	0.583	0.816	-0.042	0.120	0.152
EA 5	0.802	0.583	0.913	1.000	0.656	0.583	0.816	-0.042	0.120	0.152
EA 6	0.356	0.167	0.609	0.583	0.421	0.583	0.408	-0.042	0.320	0.152
EA 7	0.353	0.073	-0.134	0.073	0.185	-0.293	-0.180	0.257	0.581	0.400
EA 8	0.106	-0.199	-0.364	-0.199	0.112	-0.398	-0.098	0.000	0.191	0.634
EA 9	0.218	0.467	-0.319	-0.117	0.197	-0.117	0.143	-0.554	0.056	0.027
EA 10	0.184	-0.098	-0.269	-0.098	0.304	-0.098	-0.361	0.270	0.637	0.469
PPP 1	0.524	0.356	0.163	0.356	0.651	0.802	0.218	0.356	-0.171	0.122
PPP 2	0.356	0.167	0.609	0.583	0.656	1.000	0.408	0.375	-0.280	0.152
PPP 3	0.524	0.356	0.163	0.356	0.651	0.802	0.218	0.356	-0.171	0.122
PPP 4	0.218	0.000	-0.149	0.000	0.229	0.408	0.200	0.000	-0.196	0.186
PPP 5	0.356	0.167	0.609	0.583	0.656	0.583	0.408	-0.042	0.120	0.152
PPP 6	0.263	0.123	0.000	0.123	0.138	0.123	0.000	-0.185	0.532	0.112
PPP 7	0.034	-0.064	-0.116	-0.064	0.107	-0.064	-0.156	-0.223	0.643	0.377
PPP 8	0.764	0.612	0.373	0.612	0.688	0.102	0.500	-0.153	0.441	0.557
PPP 9	0.524	0.356	0.813	0.802	0.651	0.802	0.655	0.134	0.043	0.122
PPP 10	1.000	0.802	0.488	0.802	0.651	0.356	0.655	-0.089	0.257	0.122

	EA 1	EA 2	EA 3	EA 4	EA 5	EA 6	EA 7	EA 8	EA 9	EA 10
EA 2	-0.302									
EA 3	-0.123	0.068								

```
EA 4    -0.185   0.272   0.250
EA 5    -0.185   0.272   0.250   1.000
EA 6     0.431  -0.068   0.250   0.583   0.583
EA 7     0.190   0.269  -0.440   0.073   0.073  -0.110
EA 8     0.294   0.163  -0.199  -0.199  -0.199  -0.398   0.701
EA 9     0.129  -0.429   0.117  -0.117  -0.117  -0.117  -0.308   0.070
EA 10    0.472   0.040  -0.147  -0.098  -0.098   0.147   0.822   0.529  -0.189
PPP 1    0.263   0.218   0.535   0.356   0.356   0.356  -0.039  -0.106   0.218
0.184
PPP 2    0.123   0.272   0.667   0.583   0.583   0.583  -0.293  -0.398  -0.117  -
0.098
PPP 3    0.263   0.218   0.535   0.356   0.356   0.356  -0.039  -0.106   0.218
0.184
PPP 4    0.603   0.000   0.408   0.000   0.000   0.408  -0.180   0.098   0.429
0.120
PPP 5   -0.185  -0.068   0.667   0.583   0.583   0.583  -0.110  -0.398  -0.117
0.147
PPP 6    0.773  -0.302  -0.123   0.123   0.123   0.739   0.190   0.000   0.129
0.472
PPP 7    0.895  -0.364  -0.255  -0.064  -0.064   0.574   0.252   0.229   0.156
0.508
PPP 8    0.075   0.167  -0.102   0.612   0.612   0.102   0.494   0.488   0.286
0.241
PPP 9   -0.066   0.218   0.535   0.802   0.802   0.802  -0.235  -0.532  -0.094  -
0.079
PPP 10  -0.066   0.218   0.089   0.802   0.802   0.356   0.353   0.106   0.218
0.184

         PPP 1   PPP 2   PPP 3   PPP 4   PPP 5   PPP 6   PPP 7   PPP 8   PPP 9
PPP 2    0.802
PPP 3    1.000   0.802
PPP 4    0.655   0.408   0.655
PPP 5    0.356   0.583   0.356   0.000
PPP 6    0.263   0.123   0.263   0.603   0.123
PPP 7    0.034  -0.064   0.034   0.469  -0.064   0.895
PPP 8    0.218   0.102   0.218   0.000   0.102   0.075   0.156
PPP 9    0.524   0.802   0.524   0.218   0.802   0.263   0.034   0.218
PPP 10   0.524   0.356   0.524   0.218   0.356   0.263   0.034   0.764   0.524

Cell Contents: Pearson correlation


Item and Total Statistics

          Total
Variable  Count    Mean  StDev
SA 1         10    3.70   0.48
SA 2         10    3.60   0.52
SA 3         10    3.50   0.71
SA 4         10    3.60   0.52
SA 5         10    3.20   0.92
SA 6         10    3.60   0.52
SA 7         10    3.50   0.53
SA 8         10    3.20   1.03
SA 9         10    2.40   1.07
SA 10        10    2.10   0.57
EA 1         10    3.60   0.70
EA 2         10    3.20   0.63
EA 3         10    3.40   0.52
EA 4         10    3.60   0.52
EA 5         10    3.60   0.52
EA 6         10    3.60   0.52
EA 7         10    2.60   1.17
EA 8         10    2.50   1.08
EA 9         10    2.90   0.74
EA 10        10    2.90   0.88
PPP 1        10    3.70   0.48
PPP 2        10    3.60   0.52
```

PPP 3	10	3.70	0.48
PPP 4	10	3.50	0.53
PPP 5	10	3.60	0.52
PPP 6	10	3.60	0.70
PPP 7	10	3.70	0.67
PPP 8	10	3.80	0.42
PPP 9	10	3.70	0.48
PPP 10	10	3.70	0.48
Total	10	100.90	9.39

Cronbach’s alpha = 0.8715

APPENDIX C - Item Analysis and Cronbach's Alpha Results of the Survey

Correlation Matrix

	SA 1	SA 2	SA 3	SA 4	SA 5	SA 6	SA 7	SA 8	SA 9	SA 10
SA 2	0.480									
SA 3	0.423	0.545								
SA 4	0.316	0.349	0.534							
SA 5	0.383	0.340	0.368	0.396						
SA 6	0.238	0.268	0.148	0.232	0.464					
SA 7	0.334	0.466	0.408	0.580	0.408	0.501				
SA 8	0.081	0.241	0.233	0.446	0.325	0.309	0.354			
SA 9	-0.105	0.075	-0.052	-0.106	-0.008	0.009	-0.180	-0.017		
SA 10	0.056	0.067	-0.031	-0.086	0.046	-0.001	0.024	0.223	0.319	
EA 1	0.150	0.245	0.159	0.333	0.205	0.574	0.492	0.304	-0.068	0.120
EA 2	0.048	0.089	0.046	0.179	0.136	0.293	0.222	0.291	0.016	0.185
EA 3	0.216	0.312	0.350	0.469	0.399	0.338	0.541	0.262	-0.062	0.076
EA 4	0.305	0.442	0.387	0.488	0.446	0.302	0.463	0.323	-0.037	0.041
EA 5	0.380	0.600	0.510	0.652	0.417	0.344	0.579	0.407	-0.036	0.006
EA 6	0.079	0.385	0.322	0.392	0.330	0.343	0.375	0.353	0.122	0.144
EA 7	0.125	0.108	-0.001	-0.011	0.305	0.097	0.067	0.002	0.241	0.355
EA 8	0.100	0.078	-0.056	-0.154	-0.030	-0.010	-0.064	-0.002	0.104	0.371
EA 9	0.065	0.115	0.028	-0.042	0.122	0.038	-0.009	0.197	0.076	0.370
EA 10	0.056	0.084	-0.000	-0.078	0.252	-0.001	0.004	0.061	0.189	0.335
PPP 1	-0.053	0.165	0.178	0.128	0.167	0.182	0.309	0.065	-0.039	0.035
PPP 2	-0.142	0.059	-0.014	0.092	0.105	0.050	0.169	0.089	0.039	0.031
PPP 3	0.077	0.307	0.128	0.157	0.176	0.105	0.195	0.214	-0.005	0.037
PPP 4	0.171	0.237	0.251	0.312	0.119	0.055	0.184	0.249	-0.028	0.018
PPP 5	0.109	0.345	0.220	0.294	0.184	0.045	0.290	0.174	-0.062	0.025
PPP 6	-0.035	0.218	0.338	0.288	0.253	0.094	0.206	0.300	0.056	0.073
PPP 7	0.041	0.170	0.144	0.146	0.108	0.157	0.231	0.147	-0.154	-0.064
PPP 8	0.048	0.174	0.078	0.273	0.196	0.074	0.185	0.062	0.002	-0.042
PPP 9	-0.007	0.268	0.131	0.052	0.138	0.039	0.210	-0.027	-0.012	-0.049
PPP 10	0.004	0.255	0.129	0.183	0.184	0.217	0.226	0.113	0.141	0.052

	EA 1	EA 2	EA 3	EA 4	EA 5	EA 6	EA 7	EA 8	EA 9	EA 10
EA 2	0.350									
EA 3	0.408	0.282								

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EA 4     0.380   0.201   0.385
EA 5     0.488   0.290   0.475   0.698
EA 6     0.382   0.288   0.349   0.589   0.501
EA 7     0.200   0.250   0.119   0.294   0.156   0.280
EA 8     0.125   0.033  -0.023   0.082   0.089   0.074   0.472
EA 9     0.190   0.104   0.112   0.117   0.078   0.108   0.468   0.508
EA 10    0.166   0.204   0.042   0.225   0.077   0.219   0.761   0.491   0.502
PPP 1    0.227   0.232   0.237   0.089   0.091   0.362   0.128  -0.065  -0.001
0.079
PPP 2    0.122   0.193   0.199   0.018   0.025   0.112   0.021  -0.033  -0.145  -
0.059
PPP 3    0.160   0.202   0.169   0.233   0.218   0.193   0.176  -0.018   0.096
0.126
PPP 4    0.141   0.008   0.080   0.178   0.280   0.106  -0.139  -0.106  -0.035  -
0.170
PPP 5    0.278   0.136   0.256   0.369   0.385   0.309   0.217   0.100   0.158
0.149
PPP 6    0.162   0.044   0.144   0.161   0.237   0.353   0.052  -0.237   0.017
0.011
PPP 7    0.109   0.045   0.059   0.069   0.126   0.148  -0.060  -0.041   0.037  -
0.085
PPP 8    0.116  -0.079   0.259   0.297   0.243   0.203   0.004  -0.199  -0.154  -
0.121
PPP 9    0.137  -0.054   0.110   0.324   0.186   0.304   0.191  -0.001  -0.026
0.154
PPP 10   0.222   0.117   0.149   0.303   0.208   0.522   0.186  -0.011  -0.070
0.102

         PPP 1   PPP 2   PPP 3   PPP 4   PPP 5   PPP 6   PPP 7   PPP 8   PPP 9
PPP 2    0.517
PPP 3    0.410   0.453
PPP 4    0.205   0.182   0.405
PPP 5    0.360   0.265   0.457   0.337
PPP 6    0.339   0.235   0.286   0.608   0.265
PPP 7    0.283   0.213   0.177   0.239   0.166   0.412
PPP 8    0.228   0.341   0.305   0.089   0.281   0.246   0.108
PPP 9    0.453   0.464   0.440   0.136   0.440   0.295   0.142   0.628
PPP 10   0.383   0.415   0.270   0.103   0.307   0.305   0.333   0.520   0.646

Cell Contents: Pearson correlation


Item and Total Statistics

          Total
Variable  Count    Mean  StDev
SA 1        115    3.58   0.68
SA 2        115    3.62   0.59
SA 3        115    3.59   0.69
SA 4        115    3.66   0.65
SA 5        115    3.46   0.72
SA 6        115    3.32   0.79
SA 7        115    3.53   0.72
SA 8        115    3.25   0.81
SA 9        115    3.09   0.97
SA 10       115    2.46   0.95
EA 1        115    3.30   0.79
EA 2        115    3.06   0.79
EA 3        115    3.31   0.90
EA 4        115    3.79   0.47
EA 5        115    3.63   0.60
EA 6        115    3.55   0.70
EA 7        115    3.34   0.96
EA 8        115    2.59   0.96
EA 9        115    2.62   0.93
EA 10       115    3.19   0.96
PPP 1       115    3.45   0.81
PPP 2       115    3.37   0.78
```

PPP 3	115	3.63	0.58
PPP 4	115	3.66	0.51
PPP 5	115	3.73	0.48
PPP 6	115	3.46	0.70
PPP 7	115	3.31	0.95
PPP 8	115	3.69	0.54
PPP 9	115	3.77	0.48
PPP 10	115	3.77	0.53
Total	115	101.79	9.84

Cronbach's alpha = 0.8538

Omitted Item Statistics

Omitted Variable	Adj. Total Mean	Adj. Total StDev	Item-Adj. Total Corr	Squared Multiple Corr	Cronbach's Alpha
SA 1	98.209	9.635	0.2778	0.4866	0.8520
SA 2	98.174	9.517	0.5373	0.6043	0.8461
SA 3	98.200	9.544	0.4073	0.5702	0.8487
SA 4	98.130	9.523	0.4697	0.6909	0.8472
SA 5	98.330	9.454	0.5171	0.5858	0.8456
SA 6	98.470	9.493	0.4115	0.6336	0.8484
SA 7	98.261	9.425	0.5594	0.6521	0.8444
SA 8	98.539	9.468	0.4280	0.4794	0.8478
SA 9	98.704	9.749	0.0492	0.3203	0.8615
SA 10	99.330	9.562	0.2519	0.4209	0.8542
EA 1	98.496	9.407	0.5201	0.5814	0.8450
EA 2	98.730	9.543	0.3468	0.4203	0.8503
EA 3	98.478	9.373	0.4875	0.4807	0.8458
EA 4	98.000	9.559	0.5939	0.6795	0.8464
EA 5	98.157	9.458	0.6283	0.7648	0.8439
EA 6	98.243	9.396	0.6136	0.6803	0.8430
EA 7	98.452	9.395	0.4259	0.7073	0.8480
EA 8	99.200	9.639	0.1647	0.5793	0.8574
EA 9	99.174	9.544	0.2775	0.4889	0.8532
EA 10	98.600	9.482	0.3321	0.6960	0.8514
PPP 1	98.339	9.490	0.4041	0.5528	0.8486
PPP 2	98.426	9.606	0.2696	0.5632	0.8525
PPP 3	98.157	9.578	0.4334	0.5251	0.8485
PPP 4	98.130	9.689	0.2783	0.6556	0.8519
PPP 5	98.061	9.599	0.4875	0.4442	0.8481
PPP 6	98.330	9.543	0.3973	0.7209	0.8489
PPP 7	98.478	9.589	0.2224	0.4112	0.8552
PPP 8	98.104	9.686	0.2700	0.6384	0.8520
PPP 9	98.026	9.648	0.3849	0.7584	0.8500
PPP 10	98.017	9.586	0.4645	0.6795	0.8481

Appendix D - Weighted Mean and Average Results of the Survey

Social Aspects (SA)

Measure	SA 1	SA 2	SA 3	SA 4	SA 5	SA 6	SA 7	SA 8	SA 9	SA 10	SA Scores
AVERAGE	3.58	3.62	3.59	3.66	3.46	3.32	3.53	3.25	3.09	2.46	33.57
Std Dev	0.68	0.59	0.69	0.65	0.72	0.79	0.72	0.81	0.97	0.95	4.03
25th Pct.	3	3	3	3	3	3	3	3	2	2	31
50th Pct	4	4	4	4	4	3	4	3	3	2	34
75th Pct	4	4	4	4	4	4	4	4	4	3	37
Min	1	2	1	1	1	1	1	1	1	1	24
Max	4	4	4	4	4	4	4	4	4	4	40

Economic Aspects (EA)

	EA 1	EA 2	EA 3	EA 4	EA 5	EA 6	EA 7	EA 8	EA 9	EA 10	EA Score
AVERAGE	3.30	3.06	3.31	3.79	3.63	3.55	3.34	2.59	2.62	3.19	32.38
Std Dev	0.79	0.79	0.90	0.47	0.60	0.70	0.96	0.96	0.93	0.96	4.78
25th Pct.	3	3	3	4	3	3	3	2	2	2	29
50th Pct	3	3	4	4	4	4	4	2	2	4	33
75th Pct	4	4	4	4	4	4	4	3.5	3.5	4	36
Min	1	1	1	2	2	1	1	1	1	1	20
Max	4	4	4	4	4	4	4	4	4	4	40

Proposed Pro-poor Programs (PPP)

	PPP 1	PPP 2	PPP 3	PPP 4	PPP 5	PPP 6	PPP 7	PPP 8	PPP 9	PPP 10	PPP Score
AVERAGE	3.45	3.37	3.63	3.66	3.73	3.46	3.31	3.69	3.77	3.77	35.84
Std Dev	0.81	0.78	0.58	0.51	0.48	0.70	0.95	0.54	0.48	0.53	3.98
25th Pct.	3	3	3	3	3.5	3	3	3	4	4	33
50th Pct	4	4	4	4	4	4	4	4	4	4	37
75th Pct	4	4	4	4	4	4	4	4	4	4	39
Min	1	1	1	2	2	1	1	2	2	1	25
Max	4	4	4	4	4	4	4	4	4	4	40

Sustainable development of Nation Park in Japan
Case study in Tanabe city Torinosu Peninsular in Wakayama

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National parks in Japan use park zoning system to designate national park area as such regardless of private land ownership. According to the calculation in 2016, over 25.5% of natural park's lands are privately owned. Since some of natural parks' lands are owned privately, park management needs support from regional residents, scholars or researchers didn't focus on residents' participation much.

However, sustainable development of national parks in Japan becomes an important issue, because of attention on biodiversity. Socio-ecological production landscapes (SEPLs) with high biodiversity have been formed by human activities in harmony with nature. Japanese government decides to extent national parks' boundary to areas with SEPLs. Yoshino Kumano National Park (YKNP) is a good illustration. Torinosu peninsula which we chose for case studying, locates in YKNP extension area. On this peninsula, villagers have farming and fishing livings, make a life in harmony with nature for a long time. The purpose of this study is to pick up issues that a national park community will be faced with on the way to a sustainable development. In conclusion, SEPLs is disappearing in this area, because agriculture decline, aging of land owners, lack of successors and low ecosystem knowledge.

Technical analysis methodology for the optimization of environmental licensing

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Abstract

Improving the speed and quality of services provided by environmental agencies has been an increasingly frequent requirement of society. At the same time, most environmental agencies have insufficient resources to meet the high demand for environmental licensing requirements and diverse external demands, which stimulates the search for new environmental public management tools. Among the main challenges for environmental licensing, subjectivity and lack of focus are the main obstacles to an efficient technical analysis and, consequently, an environmental licensing that contributes significantly to sustainable development. In this sense, this paper presents a pragmatic methodology to guide the execution of the technical analysis in environmental agencies, maximizing the quality and minimizing the environmental impacts and time involved, in order to contribute to the improvement of the environmental control and quality. The methodology consists of a stepwise and tiered approach whereby environmental impacts are identified and analyzed systematically and in a coordinated and integrated manner, resulting in a diagram of pollution sources, allowing agile and lean technical analysis and a more effective decision-support tool.

Keywords: pollution prevention; environmental policy; sustainable development; pollution control; environmental management; government

1. Introduction

The relationship between man and the environment has undergone profound transformations throughout the development of civilizations. Essentially, man seeks in nature the resources that assure him survival, convenience and comfort. However, processes of transforming natural resources into products useful for life in society, because they are not perfect, cause the generation of waste, which if improperly released into the air, water and soil can result in significant environmental impacts.

Most of the time, the environment was able to absorb the impacts of anthropogenic intervention, most of them local coverage. However, in the last 250 years, from the industrial revolution, the capacity of waste generation was potentiated with new production methods and the loading and concentration of process residues were no longer so easily assimilated by the environment.

The increasing requirement of citizens for higher quality public services increasingly reinforces the importance of adopting good management practices in environmental licensing and environmental impact assessment processes (Carvalho et al, 2014; The World Bank, 2012; UNEP, 2004; Arts, Caldwell and Morrison-Saunders, 2001; Marshall et al, 2005).

At the same time that the demands of an environmentally more conscious society require more speed and quality in the services provided, the public administration is conditioned to achieve more results with fewer resources, in increasingly varied and complex environmental themes, which invariably go through the search the compatibility between socioeconomic development and environmental conservation.

The imprecision and subjectivity in the technical analysis stand out among the main challenges of environmental licensing (Abema, 2013). The decomposition of the technical analysis reveals that there are three essential components for carrying out a complete analysis, namely: production process, environmental controls and environmental legislation. Although such information is available for research, it is sparse and non-integrated, which hinders and limits the work of many environmental agencies. In this sense, the use of more adequate tools represents important differential and opportunity for environmental agencies.

The present work presents a methodology of technical analysis for optimization of the environmental licensing, providing a coordinated and logical route for the integration of the relevant technical information for the accomplishment of a fast and standardized analysis, that represents more security and quality, thus contributing to the development of corporate processes and technological tools to obtain more effective results in the field of public environmental management and also to improve environmental quality and control.

2. Material and methods

The present work has a qualitative nature, with secondary data collection, having been applied a literature review technique using books (Cheremisinoff, 2002; Rhyner et al, 1995; Braile and Cavalcanti, 1993; Reinhold, 1992), scientific journals (Bruin et al, 2015; Carvalho et al, 2014; Arts, Caldwell and Morrison-Saunders, 2001), theses and dissertations (Santos, 2014) that deal with the themes of public environmental management, environmental impact assessment and pollution prevention and control, as well guidelines adopted by environmental agencies and international organizations (USEPA, 2017; New Zeland, 2017;

Canada, 2015; Australia, 2015; European Union, 2011; The World Bank, 2012; UNEP, 2004).

Qualitative research can contribute to studies in administration, especially when the objective is to understand complex organizations, their processes, structures, context, interrelationships. In this way, studies with a qualitative approach can describe the complexity of a given problem, analyze the interaction of certain variables, understand and classify dynamic processes experienced by social groups, contribute to change process of a given group and understanding the particularities of individuals' behavior (Santos (2014); Goulart and Carvalho (2005); Richardson, (1999)).

The methodology was designed to contribute with environmental agencies in the identification of pollution sources and in the evaluation of environmental compliance of industrial process, in a systematic, coordinated and integrated way. The methodology focuses on emissions to air, releases to water and land as well waste management related to operating phase, in order to stimulate prevention and adequate control of pollution sources. The processes were created using *WBS Schedule Pro* and *Bizagi Modeler* software, version 3.1.0.011, a business process management solution based on BPMN (Business Process Modeling Notation) (Bizagi, 2016).

3. Results and discussion

The results section describes the steps and outcomes towards methodology for optimization of technical analysis in environmental licensing that was designed.

3.1 Step 1 – Represent the macroprocess

Knowledge of the industrial process is fundamental for understanding the relevant environmental aspects and for carrying out a complete and assertive environmental analysis.

The representation of the macroprocess must be done in a summary block diagram, containing beginning and end, considering in high level the main processes, as well as their main inputs and outputs. Each process must be named, described and identified with a unique code, so as to ensure the traceability of information throughout the analysis.

Processes can be named from the way raw materials are transformed into products. The simplest macroprocess would consist of only one process with one input and one output. However, the raw materials that constitute the process input may need some processing before feeding the process that turns them into the product of interest. Likewise, the product obtained may need treatment in order to meet the necessary specifications. In this way, a simple macroprocess could be represented generically by three processes: processing of raw materials, manufacturing of products and processing of products. An example is shown in Figure 1.

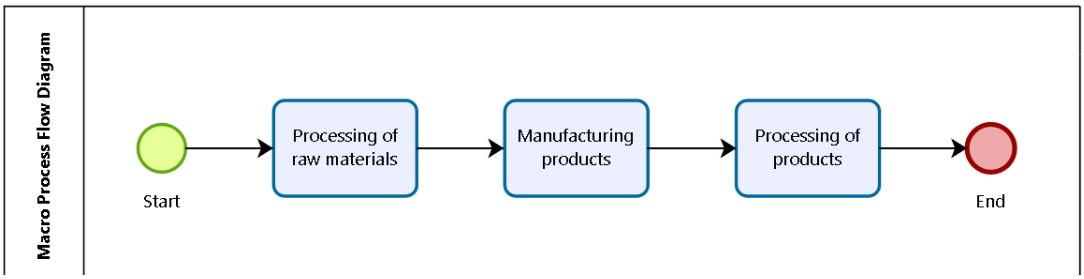

Figure 1. Flow diagram for a three-step macroprocess.

It may occur, however, that there is more than one raw material treatment process or more of one raw material that requires treatment. In addition, obtaining the product may be accompanied by a co-product, and both may need one or more treatment processes.

It is noted, therefore, that the amount of processes varies according to the type of product and the way it is obtained. Although the methodology is applicable regardless of the number of processes, it is recommended that a macroprocess be represented in a flowchart containing 3 (which corresponds to a process for the steps: processing of raw material, transformation of raw material into product and treatment of the product obtained) to 9 processes (equivalent to three processes of raw materials, three manufacture process and three processes of products and co-products).

3.2 Step 2 – Perform the hierarchical decomposition of processes

The second step is to define the scope of the environmental analysis, through the decomposition of the processes until the identification of the sources of pollution, in order to avoid lack of focus and the adoption of subjective criteria during the environmental analysis.

Represent the type of industry under analysis in a block on the first line. Establish the first level of hierarchical decomposition based on the processes obtained in the first step, in order to obtain a structure similar to an organization chart.

Select a process and perform the decomposition in simpler processes, obtaining the second level of hierarchical decomposition, and so on up to a level that allows the understanding of the activities performed that may represent potential sources of pollution.

An example of a hierarchical process decomposition is shown in Figure 2. In this example, the main process is decomposed into three processes (P1, P2 and P3), the first two processes being decomposed into two (P11 and P12) and three (P21, P22 and P23) processes respectively. One of the processes obtained in the second level (P21) is still decomposed into two other processes (P211 and P212), in a third level of decomposition.

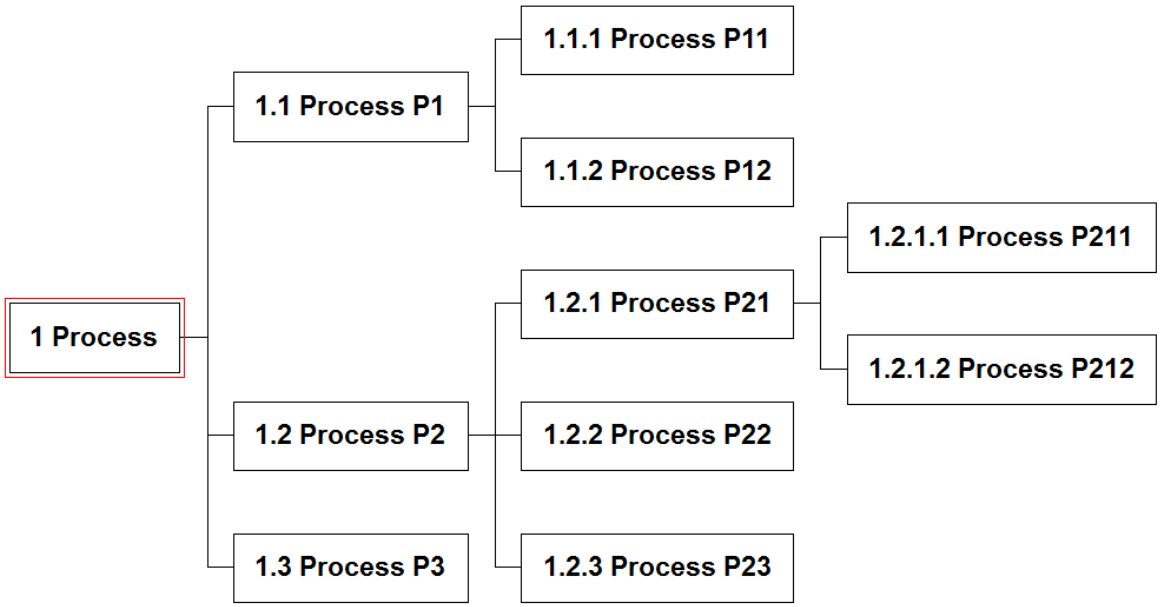

Figure 2. Example of hierarchical process decomposition.

The extent of decomposition varies according to the degree of detail required for an adequate environmental assessment, which may vary according to the type and complexity of the process. The subdivision of the process into smaller components allows for better management of environmental pollution sources, with a clearer definition of the scope of environmental analysis, which contributes to greater agility and assertiveness by environmental agencies.

The methodology can be applied to any type of process and configuration, however it is recommended that the number of processes obtained from the decomposition of a given level is at least 2 and a maximum of 9 processes. This is because it does not make sense to decompose a process into a single process, because it would be identical to the process at the previous level. Thus, depending on the amount of decomposition levels it may be necessary to decompose a process into two or more processes. Similar to what was argued in step 1, it is recommended not to decompose a process into more than 9 processes. If this condition is verified, the processes should be grouped and decomposed into one more level.

Each decomposed process must be named with a noun, described and identified with a unique code, so as to ensure the traceability of information throughout the analysis. The principles of subordination between elements should be observed, avoiding ambiguous names and denotation of different elements with the same name to facilitate understanding.

Processes can be named from the way the activities that integrate it transform inputs into outputs, from physical changes or chemical conversions, Since physical or chemical transformation processes are not perfect, wastes are generated and, if control is not adequate, there may be emission to the air and releases to water or land. Examples of processes of physical change and chemical conversion that may represent or contain sources of pollution are presented in Tables 1 and 2, respectively (Shreve, 2012).

Table 1 - Examples of physical changes.

Physical changes	
Gas absorption	Liquid phase extraction

Adsorption and ion exchange	Filtration
Aggregation	Flotation
Crushing	Granulation
Centrifugation	Leaching
Clarification	Milling
Crystallization	Screening
Distillation	Electrostatic separation
Dialysis	Sublimation
Gas diffusion	Transport of solids in bulk (transport on conveyors, pneumatic or fluidized)
Electrodialysis	Transport and storage of fluids (pumps, compressors, blowers, valves, pipes, tanks and reactors)

Table 2 - Examples of chemical conversions.

Chemical Conversions		
Acylation	Condensation	Hydrolysis and hydration (saponification, alkaline fusion)
Alcohololysis	Dehydration	Isomerization
Alkylation	Diazotization and coupling	Neutralization
Amination by reduction	Double decomposition	Nitration
Ammonolysis	Electrolysis	Oxidation
Aromatization or cyclization	Esterification (sulfation)	Polymerization
Calcination	Fermentation	Pyrolysis or cracking
Carboxylation	Silicate formation	Friedel-Craft Reactions
Caustification	Halogenation	Reduction
Combustion	Hydrogenation, dehydrogenation and hydrogenolysis	Sulfonation

3.3 Step 3 – Identify pollution sources

Select a process in last level of hierarchical decomposition and identify if there are sources of pollution with: (i) emissions to air (point source or fugitive emissions); (ii) releases to water (surface waters (eg. lakes, rivers, dams, and estuaries), coastal or marine waters, and stormwater); (iii) releases to land (solid wastes, slurries, sediments, spills and leaks from processing activities and the storage and distribution of raw materials and products); and/or (iv) waste generation. Each source must be identified with a unique code, so as to ensure the traceability of information throughout the analysis.

This framework is the basis of the Pollution Sources Diagram (PSD), which will be obtained at the end of the application of the methodology. PSD draft example is shown in Figure 3.

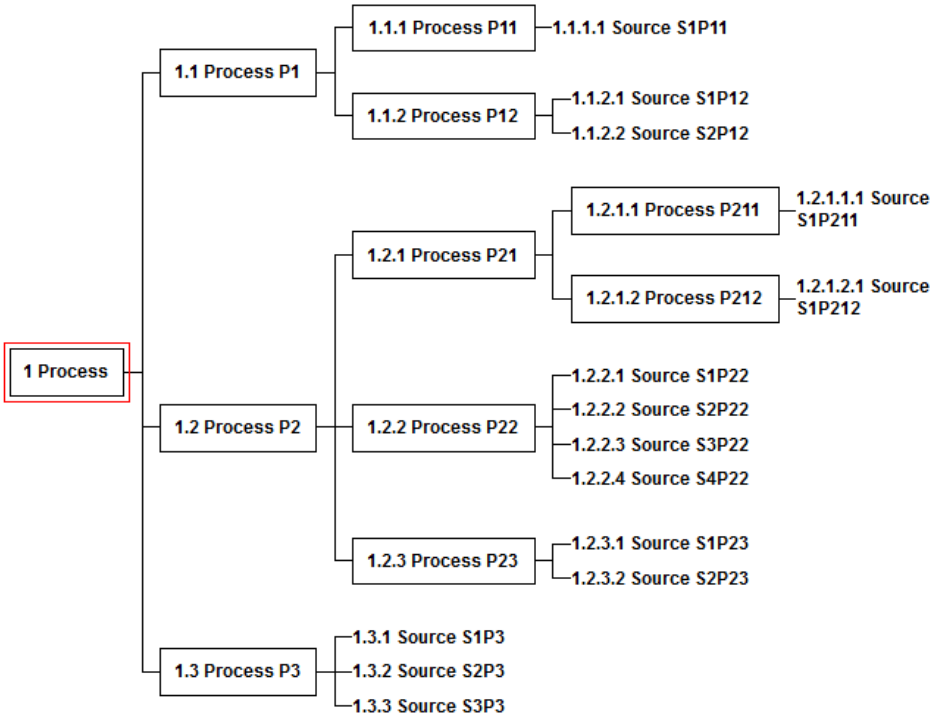

Figure 3. Pollution Sources Diagram draft example.

3.4 Step 4 –Describe the pollution source

Select one of the sources of pollution identified in step 3 and indicate the related:
(i) environmental aspect;
(ii) pollutants generated;
(iii) pollutants prevention measures and its performance;
(iv) pollution control equipment/system or measures adopted and its performance and associated generation of waste;
(v) emission estimation method or environmental monitoring equipment/system and its performance and results.

Also should be indicate information related to waste management: waste identification and its quantity and kind of transfer (Canada, 2015):
(i) recycling and energy recovery: recovery of solvents, organic substances, metals and metal compounds, inorganic materials, acids or bases, catalysts, pollution abatement residues, or the refining or reuse of used oil;
(ii) treatment prior to final disposal: physical, chemical, biological or thermal treatment and treatment in municipal sewage treatment plants;
(iii) disposal: landfills, land application, underground injection, storage off-site prior to final disposal, and tailings and waste rock.

Examples of air and water pollution control equipment/system are shown in Figure 4 and 5, respectively.

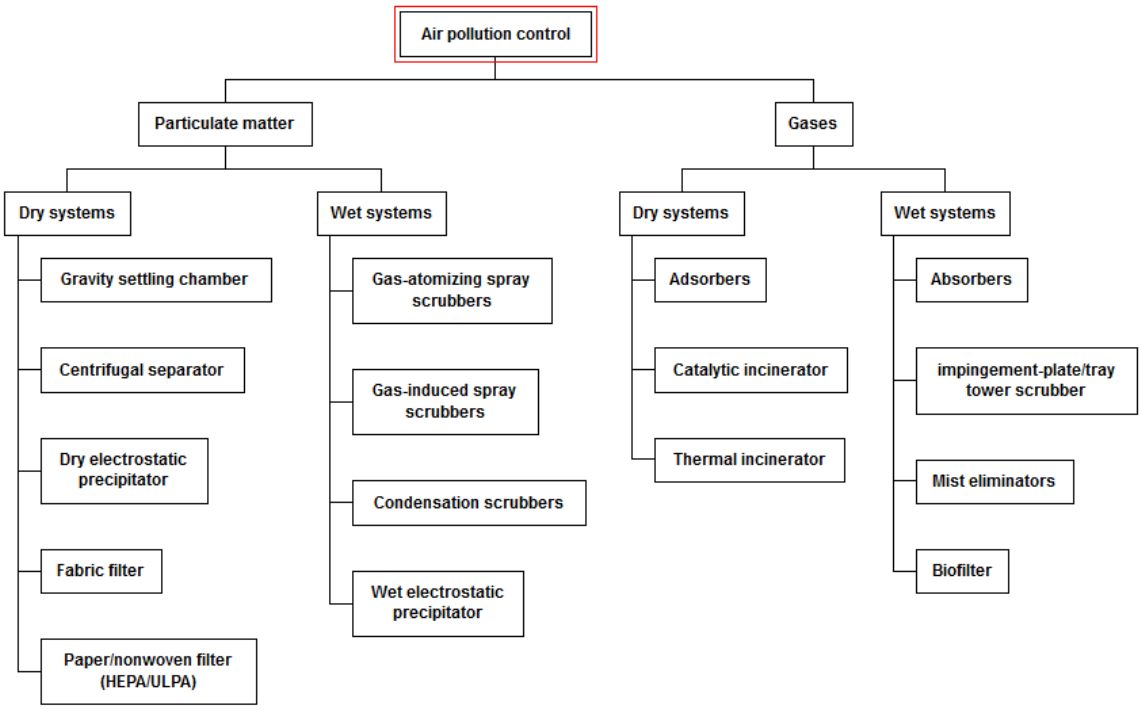

Figure 4. Air pollution control equipments.

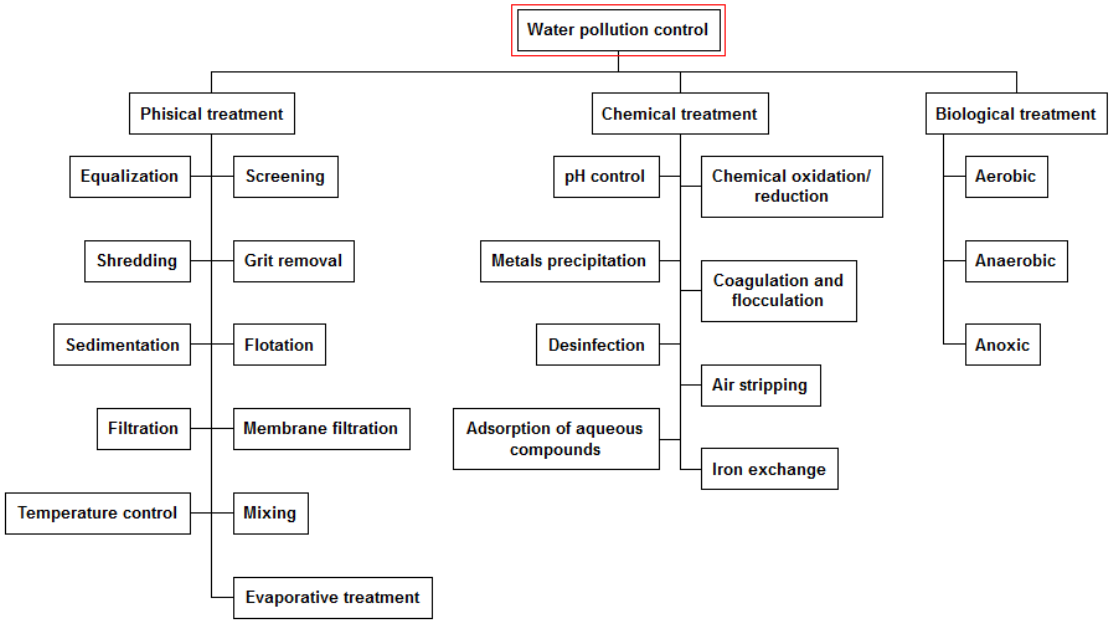

Figure 5. Water pollution control equipments.

3.5 Step 5 – Evaluate environmental monitoring and control

Evaluate the operational performance of the monitoring and control equipment/system and record the emission values of pollutants in the environment. Templates, spreadsheets and equipment manufacturer information may provide useful information to assess whether monitoring and control equipments works properly.

3.6 Step 6 – Assess pollution source compliance

Compare the results with applicable legal requirements and assess the environmental compliance status of the source of pollution. Figure 6 shows the detail of a pollution source (S1P11) with the information obtained in steps 3, 4 and 5.

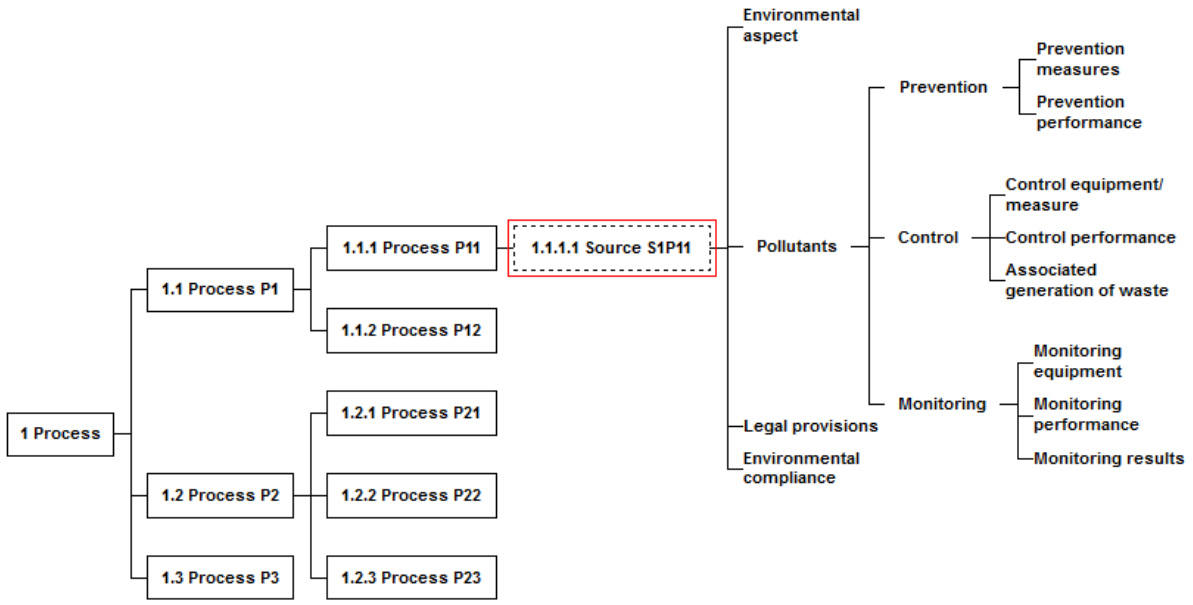

Figure 6. Pollution Sources Diagram example highlighting a specific source.

If there is another source of pollution contained in the same process, return to step 4; If not, return to step 3. Repeat until all the processes with the highest level of detail are considered in the hierarchical decomposition.

3.7 Step 7 – Consolidate the Pollution Sources Diagram (PSD)

Consolidate the diagram in the reverse order of the process decomposition, integrating data:
(i) related to the pollutants emitted to air or released to water or soil and related to the waste generated in each process obtained in step 2, compare with the global mass balance and identify if there are deviations, which could indicate problems in the pollution sources control or monitoring. The accuracy of the data collected must be observed; and
(ii) related to the environmental compliance status of each stage of the macroprocess, indicating the measures applicable in case of non-compliance.

As a result of the application of the methodology is obtained the final version of the Pollution Source Diagram (PSD), with all relevant information for the decision-making process consolidated into a single page.

3.8 Discussion

This paper presents a pragmatic approach to establish an optimized technical analysis in the environmental licensing process. For this, a methodology was developed in a relatively simple framework to identify the main sources of pollution of an industrial process, consolidating the necessary information to the decision process.

The main output is the Pollution Sources Diagram (PSD), which can be a useful tool to prevent and minimize environmental impacts resulting from a productive process and provide

important feedback to environmental agencies to update policy measures and guide technical analysis in similar cases, since a database can be built and serve as a knowledge base, reducing subjectivity and lack of focus throughout the process. However, the approach employed has some limitations. For example, not all environmental aspects have been included and the application of the methodology depends on the quantity and quality of information available. Even so, the methodology enables a time- and cost-efficient way for environmental analysis, resulting in a shorter response time and an optimized control of sources of environmental pollution.

4. Conclusion

A technical analysis methodology was developed to contribute to optimize the environmental licensing process, several times criticized for reasons like slowness and subjectivity. The results suggest that methodology can be a useful tool for environmental agencies since it allows for a faster and more complete environmental analysis, better subsidizing the decision-making process. Further testing of the methodology in practical cases studies would be required to prove its effectiveness and point out improvement opportunities.

Still, it is believed that the systematization of the identification and analysis of pollution sources, through a coordinated and integrated form of environmental compliance assessment, using a tool that enables the construction and updating of workflows and a knowledge base common to the technical staff contributes for greater assertiveness in the decisions taken by the environmental agencies and govern.

Thus, the methodology can contribute not only to the simplification of environmental licensing or of optimization the process of evaluation of environmental impacts, but also to the monitoring of these impacts, allowing the comparison between what was planned and the reality after the granting of environmental permit or license and the consideration of aspects of synergy and cumulativity in the analysis of new industries, with better results in environmental quality and control.

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The Role of Plasma in the Catalytic Removal of Nitrogen Oxides with Hydrocarbon Reducing Agent

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The purpose of this study is to investigate the mechanisms of plasma-enhanced selective catalytic reduction (SCR) of nitrogen oxides (NO_x) with n-heptane as a reducing agent over Ag/γ-Al_2O_3 catalyst. The fact that plasma improves the performance of the SCR process has been experimentally proven in many studies, but the role of the plasma has not yet been clearly elucidated. Upon investigation, it has been found that plasma decomposes n-heptane into several oxygen-containing products such as acetaldehyde, propionaldehyde and butyraldehyde, which are more reactive than the parent molecule n-heptane in the SCR process. Separate sets of experiments using acetaldehyde, propionaldehyde and butyraldehyde as reductants in the absence of plasma have clearly shown that the presence of these partially oxidized compounds greatly enhanced the removal efficiency of nitrogen oxides. The higher the delivered electric energy, the more the amounts of such partially oxidized products. Moreover, the oxidative species produced by the plasma easily converted NO into NO_2. Consequently, it can be said that the main roles of plasma in the SCR process are to produce partially oxidized compounds (aldehydes) and convert NO into NO_2. The NO_x removal efficiency with n-heptane at a temperature of 250^{o}C was measured to be 8%, but it increased to 98% in the presence of aldehyde at the identical temperature. At a lower temperature of 150^{o}C, the NO_x removal efficiencies with butyraldehyde, propionaldehyde and acetaldehyde were measured to be 47, 22 and 16%, respectively, indicating that the reactivity increases as the number of carbon in the aldehyde increases.

Keywords : nitrogen oxides, n-heptane, selective catalytic reduction, plasma

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Uncertainty Analysis of Statistical Downscaling Tool for Tropical Climate

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ABSTRACT

Climate change is a critical issue that affects the Earth's ecosystem. SDSM, a statistical downscaling tool, was evaluated by utilizing output from the CanESM2 model (under RCPs 2.6, 4.5 and 8.5 scenarios), using Singapore's meteorological data from 1961 to 2000 (as Baseline period). The results suggested diverging trends for each meteorological variable. For Maximum Temperature, the model suggested increases of 1.08°C (for RCP 2.6), 1.52°C (for RCP 4.5) and 2.49°C (for RCP 8.5) for the 2080s horizon. During certain months (for 2080s), RCP 8.5 suggested increases above 3°C. Similarly, RCP 8.5 suggested (for 2080s) increases above 5°C for Minimum Temperature. Hence, the forcing from the downscaling tool is evident to a greater extent on the Minimum Temperature. Similar trends were observed for the weather extremes including, 95th percentiles, Warmest Night, etc. For precipitation, RCPs 2.6 and 4.5 suggested an increase of 37-40% in average annual precipitation amounts, while RCP 8.5 suggested an increase of 40%. Generally, difficulty in modelling tropical precipitation was observed. The uncertainty analysis in simulating temperature was illustrated by Prediction Intervals, which were computed from the 100 ensembles generated by SDSM. The results augmented the analyses of current and future tropical climate.

Keywords: Climatic change, Stochastic Downscaling, Meteorological variables, Weather Extremes

INTRODUCTION

Climate change refers to the changes in the weather patterns across the Earth. This usually manifests as a rising trend in temperatures, accompanied by changing rainfall patterns. The reason for climate change is usually attributed to anthropogenic activity induced increases in greenhouse gases emission (McMichael et al., 2006). To determine future climate patterns, General Circulation Models (GCMs) were utilized for simulating the global climate (IPCC, 2007). Usually the output from GCMs is of a coarse scale and can hardly be utilized to determine the future climate change trends at specific locations. Statistical downscaling methods are employed for mitigating such a limitation. Among various alternatives, the Statistical DownScaling Model (SDSM) is a hybrid statistical downscaling tool that has been widely used. Created by Wilby et al. (2002), SDSM combines a multi-linear regression model with a stochastic weather generator and generates climate data for a single site utilizing various scenarios (Harpham and Wilby, 2005). Therefore, by using multiple scenarios, a comprehensive understanding of possible future weather patterns may be ascertained. The regression model within SDSM develops an empirical relationship between the coarser scale predictors and the site-specific predictand. However, there are potential issues when precipitation is the predictand used for modeling (Wilby et al., 2002). This indicates the need to examine the performance of downscaling tools when simulating precipitation, especially in regions receiving copious amounts of rainfall.

Previously, the downscaling tools were used in conjunction with other models to develop an integrated methodology to examine climate change impacts in niche areas. SDSM has been utilized for different studies in the fields of meteorology (Harpham and Wilby, 2005), hydrology (Dibike and Coulibaly, 2005), hydraulics (Shrestha et al., 2017), agriculture (Santikayasa, 2016), pollution (Wilby, 2008), etc. However, applications of SDSM for tropical climate are very few. Hassan et al. (2014) compared SDSM with another downscaling tool for simulating daily scale weather data for Peninsular Malaysia. The study determined that SDSM generated weather patterns with greater accuracy, although issues with certain precipitation indicators persist. In addition, the outputs from CMIP5 models published in Annual Report (AR) 5 are yet to be utilized widely in climate change studies. AR5 determines future climate change using Representative Concentration Pathways (RCPs) as the trajectories of radiative forcing (van Vuuren et al., 2011). Therefore, this study aims to use SDSM to downscale temperature and precipitation for Singapore based on the output from CanESM2 (from AR5) for the RCPs of 2.6, 4.5 and 8.5. Previously, Lu and Qin (2014) presented a disaggregation and downscaling study of Singapore's climate using a k-nearest neighbor (KNN) approach. Scenarios from HadCM3 GCM were used to determine the variation of weather parameters for Singapore's climate. Li et al. (2016) discussed the process of bias correction of GCM output to examine the precipitation indicators. Singapore was the site chosen for their study, and it was concluded that dry and wet spell lengths need careful examination. Therefore, this study represents the continuation of climate change studies in tropical locations.

METHODOLOGY & DATA

The location chosen for this study is Singapore, a city-state located at the end of Malayan Peninsula in South East Asia. As an island and a micro-state, Singapore is particularly vulnerable to the effects of global warming, including temperature rises, changes in rainfall patterns, sea level rises, etc. With a land area of 719 km^2, Singapore is located between the 1st and 2nd parallel north. The location of the weather station is at Changi Airport (01°21′33.16″N, 103°59′21.5″E), as can be seen in Fig 1a. The climate normals for the baseline period of 1961-2000 are illustrated by Fig 1b. The meteorological parameters considered are Maximum Temperature (Tmax), Minimum Temperature (Tmin) and Rainfall (pptn). Daily temperature data for the period 1961-2000 (from National

Environment Agency, Singapore) is utilized for setting up the model, and rainfall data is from 1967 to 2000.

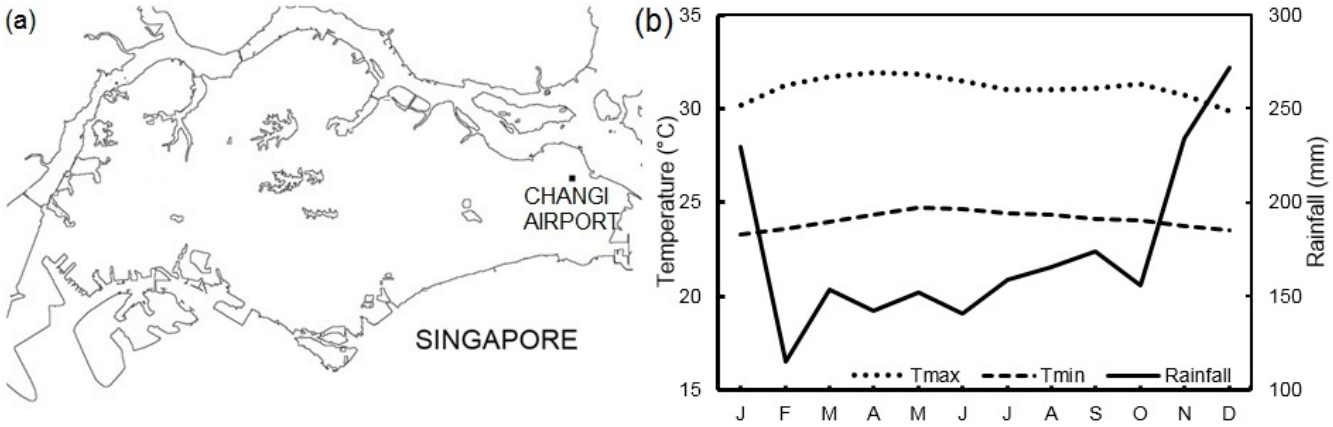

Fig. 1 (a) Location of study weather station and (b) Climate Normals for 1961-2000

SDSM developed by Wilby et al. (2002) establishes empirical relationships between large scale NCEP, GCM predictors and site specific predictands. Regression parameters are calibrated for this purpose. Certain predictors are chosen for each meteorological predictand by computing the month-wise correlation. The predictors are then arbitrarily chosen to set up the predictor-predictand relationship (Mahmood and Babel, 2013). The dual simplex method present within the software is used to determine the parameters. The predictands may be modeled as either conditional or unconditional process (Hashmi et al., 2011). The calibrated model is utilized for generating weather data on a daily scale, up to 100 ensembles for each scenario or for baseline period. The accuracy of this process is determined by comparing the observed data with the generated ensembles for the baseline period. Subsequent to this, the model can be employed to generate weather data using different scenarios from the GCM. Prior to the final computation of the climate change trends, bias correction is carried out for each meteorological parameter. Bias correction for the temperature is carried out in absolute terms unlike precipitation which uses a scaling measure. More information can be obtained in Mahmood and Babel (2013). To express the climate change trend for each meteorological parameter, the following equations are employed (Hassan et al., 2014),

$$Change\ in\ pptn = \frac{P_{scenario,horizon} - P_{baseline}}{P_{baseline}} \quad \text{(Eq. 1)}$$

$$Change\ in\ temp. = T_{scenario,horizon} - T_{baseline} \quad \text{(Eq. 2)}$$

where, $P_{scenario,horizon}$ is the average precipitation generated for a specific scenario at a particular time horizon, $P_{baseline}$ is the average precipitation generated by SDSM for the baseline period. The GCM utilized for this study is the Canadian Earth System Model 2 (CanESM2), which is a second generation model developed by Arora et al. (2011). More information is available at Chylek et al. (2011), Environment Canada (2017) and Flato (2011).

RESULTS

Calibration Results

The SDSM model was used to screen predictors from National Center for Environmental Prediction - NCEP (Saha et al., 2010) to determine the choice of predictors to set up the regression model. The predictors with higher correlations are extrapolated from the correlation matrix (as shown in Table 1).

Table 1. List of Predictors

Variables	Description	Predictand
p1_ugl	zonal velocity	Tmax, Tmin, pptn
p1_vgl	meridional velocity	Tmin
p1thgl	Surface wind direction	pptn
p1zhgl	Surface divergence	pptn
p8_vgl	850 hPa meridional velocity	Tmin
p8zhgl	850 hPa divergence	Tmax, Tmin
p500gl	500 hPa geopotential height	Tmax, Tmin, pptn
p850gl	850 hPa geopotential height	Tmin, pptn
prcpgl	Total precipitation	pptn
s500gl	Specific humidity at 500 hPa height	Tmax, pptn
s850gl	Specific humidity at 850 hPa height	Tmax, pptn
shumgl	Near surface specific humidity	Tmax, Tmin, pptn
tempgl	Mean temperature at 2m	Tmax, Tmin

These predictors are used to set up the regression model. Subsequently, the regression model is examined for its ability in reproducing weather patterns of the baseline period. This can be expressed by the month-wise Standard Error (Wilby et al., 2002) of the model. Fig. 2 provides the monthly Standard Error (SE) of the model for the three meteorological parameters. The lower SE values of precipitation may be attributed to a significant number of dry days or days with trace rainfall. Similarly, SE values of Tmin are lower than Tmax due to the difference in magnitude. Overall, the SE values obtained are lower than those reported by Gagnon et al. (2005) and the SDSM manual (Wilby and Dawson, 2004). The SE values reported for precipitation do not demonstrate significant monthly variations unlike temperature. Besides the magnitudes of these parameters, the choice of predictors influences the calibration process. Also, the lower SE values of Tmin after October may be attributed to the higher rainfall occurrences, which could reduce the intra-monthly variations of Tmin, improving the model calibration process. Conversely, the differences in Tmax during wet and dry days may result in lower accuracy of the SDSM modeling process.

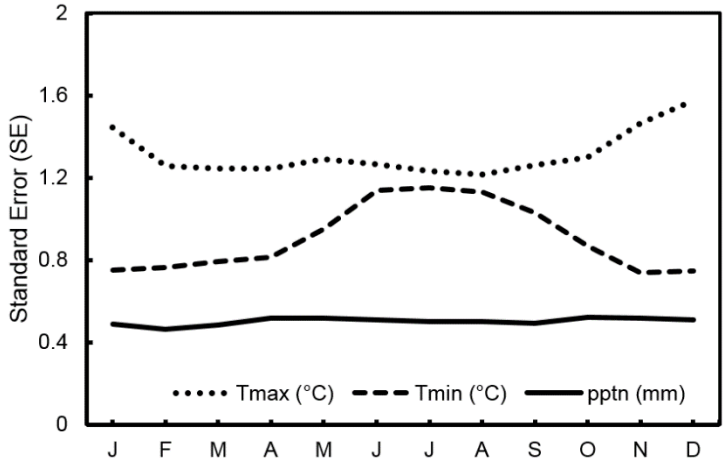

Fig. 2 Standard Error of the monthly regression models of SDSM

The calibration process of the SDSM model may also be examined by generating synthetic weather data for the baseline period. In total, 100 ensembles were generated, and compared with the historical climate normals for the same period. The R^2 values for Tmax, Tmin, and pptn were determined to be, 0.99, 0.99, and 0.88 respectively. The RMSE values for Tmax, Tmin, and pptn were computed as 0.0041°C, 0.0029°C, and 3.5 mm respectively. Subsequently, the SDSM models were utilized to generate the future weather patterns for RCPs 2.6, 4.5 and 8.5. Prior to determining the trends in climate change, the bias in the SDSM output needs to be corrected. This is performed for each meteorological parameter, month-wise. The bias is corrected by computing offsets between the observed and the synthetic data generated using the predictors. The de-biased temperatures and precipitation results can be obtained using the following equations (Mahmood and Babel, 2013),

$$T_{debiased,horizon} = T_{scenario,horizon} - (T_{baseline} - T_{observed}) \quad \text{(Eq. 3)}$$

$$P_{debiased,horizon} = P_{scenario,horizon} * {}^{P_{observed}}/_{P_{baseline}} \quad \text{(Eq. 4)}$$

Maximum Temperature

Fig. 3 illustrates the future trends under different scenarios for the maximum temperature. From the results, it is evident that RCP 2.6 suggests the least increases in Tmax. Between 2050s and 2080s horizons, RCP 2.6 suggests a decrease of 0.04°C. This is in agreement with the description of this trajectory, wherein a reduction in the greenhouse gas emissions is assumed towards the end of this century. The increases during South-west Monsoon (June – September) season provide the greatest quantum in the increasing trends of annual temperature. The same period has also exhibited larger values of SE during the calibration process. This indicates that the SDSM model is less accurate during calibration process during monsoonal seasons. The South-west monsoon season is characterized by short intense rainfall spells during afternoons (Meteorological Services, 2017). This would induce greater variations in the diurnal patterns of temperature, which would not be evident during the drier inter-monsoonal seasons. Generally, the monthly variations in the change of temperature are similar for all the different horizons. The average quantum in increases is greater in RCP 8.5, when compared with RCPs 4.5 or 2.6. The factor of increase in temperatures between 2020s and 2080s for RCPs 2.6, 4.5 and 8.5 are 0.39, 0.88 and 1.8. This is due to the predictors obtained from CanESM2. For Tmax, the annual average increases were 1.08°C (for RCP 2.6), 1.52°C (for RCP 4.5) and 2.49°C (for RCP 8.5) for the 2080s horizon. This was obtained by

examining 100 different ensembles generated by SDSM for each RCP. The highest increase suggested by the model is by RCP 8.5 for 2080s. This is lower than the likely range of mean surface temperature published by IPCC for this RCP (IPCC, 2013). However, the results from RCP 2.6 and 4.5 are within the likely range published. Importantly, SDSM suggests increases above 3°C for few months for RCP 8.5. This would cause considerable effects on Singapore's climate and ecosystem.

The uncertainty stemming from the weather generator in SDSM can be computed by analyzing the different ensembles generated by the regression model. The mean of Tmax is computed for each month by processing 100 ensembles for a period of 10 years before and after 2080 (i.e. 2080s horizon). RCP 8.5 and 2080s was chosen due to the highest increases in Tmax suggested by SDSM for Singapore. Moreover, the magnitudes of Tmax generated by the model would be dissimilar when the ensembles are compared with each other. To scrutinize this process, certain statistical measures may be considered, including Prediction Intervals (PI). The upper and lower PIs are obtained by computing the standard deviation spread from the mean of the predictand. Fig. 4 illustrates the PIs computed from the stochastic weather generator component of SDSM. It may be surmised that the intra-annual variations in PIs are usually similar for all the months. However, the PI spread is proportionately dissimilar. For example, during August, the spread in PIs amount to 4.2%, while in December, the spread in PIs amount to 5.7%. This could be due to the regression model demonstrating greater SE during December (Fig. 2). Therefore, it is important to generate sufficient ensembles (or samples) to quantify the uncertainty due to the stochastic process in SDSM. Another important conclusion from Fig. 4 is that the lower PI may subsume the baseline temperature during the months of October and November. This is significant due to the fact that this RCP and horizon was chosen as it suggested the greatest increase. However, the stochasticity of the weather generator could sufficiently encapsulate the baseline temperature, which would suggest no temperature change for these two months if a random ensemble was chosen as representative of the process.

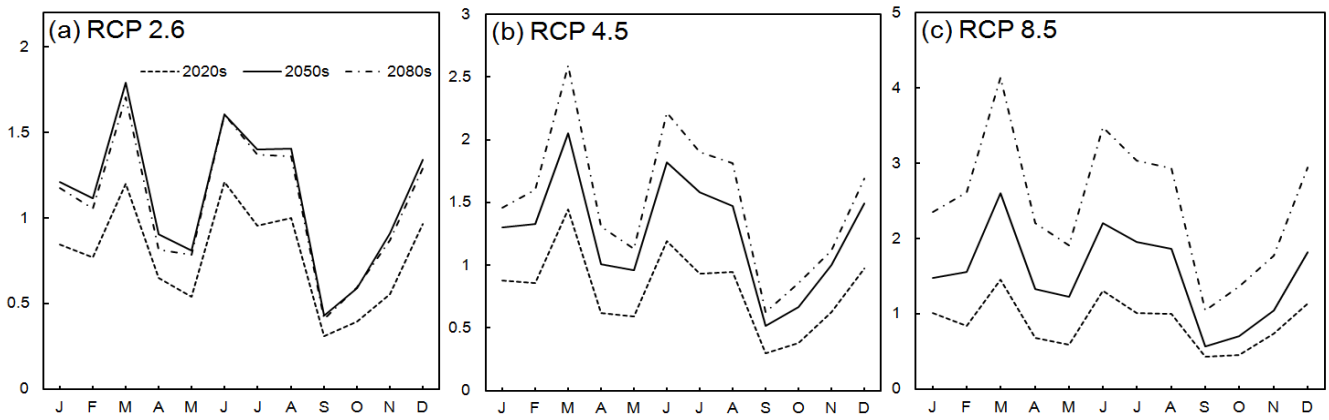

Fig. 3 Monthly changes in Maximum Temperature under (a) RCP 2.6, (b) RCP 4.5, and (c) RCP 8.5

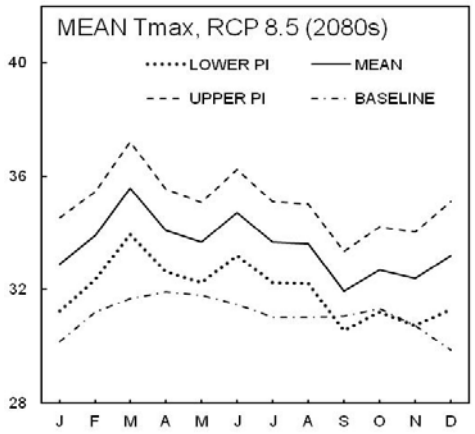

Fig. 4 Uncertainty Quantification of the stochastic weather generator for Tmax (RCP8.5, 2080s)

The 95th percentile of an indicator specifies the value that is equal to or greater than 95% of the values generated. Usually, the maximum, minimum, median and mean of values are used as statistical indicators. Presence of extreme values might induce error in these indicators (Waltman and Schreiber, 2013). Therefore, the 95th percentile of maximum temperature is examined as an indicator to measure climate change. Table 2 lists the results of 95th percentile Tmax for the three RCPs for the different horizons. Interestingly, the decrease in this indicator is obtained when examining RCP 2.6 trends between 2050s and 2080s. This is similar to the average Tmax computed previously. However, the decrease for the 95th percentile indicator is computed as 0.08°C, and is twice the magnitude of decrease in the average Tmax (0.04°C). This clearly suggests that the forcing obtained from this RCP is more evident in 95th percentile, and could be attributable to the large number of ensembles used for computing the results and the relative accuracy of the month-wise regression models used by SDSM to fit the data.

Table 2. Future changes in the 95th percentile of Tmax

	2020s	2050s	2080s
RCP 2.6	0.40	0.79	0.71
RCP 4.5	0.44	0.91	1.19
RCP 8.5	0.51	1.22	2.26

The comparison between the results of this indicator and the average Tmax for all RCPs and horizons suggest that RCP 2.6 and 4.5 demonstrate a greater difference between the two indicators, especially during 2080s. However, RCP 8.5 which represents the greatest emission increases suggests similar magnitudes of average Tmax and the 95th percentiles. The importance of RCP 8.5 is further underscored by the large increases in average Tmax for the different time horizons. Therefore, it is imperative to consider the implications of a 2.26°C increase in the 95th percentile of Tmax when designing future climate change impact studies.

Minimum Temperature

Another temperature parameter perturbed for climate change is the minimum temperature Tmin. The average observed Tmin ranges between 23.28°C in January and 24.74°C in May. The tropical location of Singapore causes little intra-annual variations of Tmin. SDSM is able to calibrate this meteorological parameter more accurately than Tmax. Fig. 5 illustrates the monthly variations in the change in Tmin parameter for different horizons. The predicted change in Tmin by SDSM is much higher than Tmax. The largest change was predicted by RCP 8.5 during 2080s horizon

(5.1°C). During August, an increase of 6.49°C is suggested. The increases in Tmin suggested by RCP 8.5 for 2020s and 2050s are 1.76°C and 3.24°C respectively. Similar variations between Tmax and Tmin have been reported by other research studies that have utilized CanESM2 (Mahmood and Jia, 2016). RCPs 2.6 and 4.5 suggest lower increases in Tmin. RCP 2.6 suggests a decrease in Tmin between 2050s and 2080s. RCPs 2.6 and 4.5 suggest average increases of 2.28°C and 3.18°C, respectively. However, there are certain differences between Tmin and Tmax results. The most evident trend is the increases predicted by SDSM for the January to April (North-east monsoon) period. Given the inter-monsoonal period subsequent to April, increases in Tmin during the drier periods would exacerbate the rising ambient temperatures in Singapore.

The uncertainty of the stochastic weather generator component of SDSM is illustrated in Fig. 6. 100 ensembles were processed to yield the Prediction Intervals, which were compared with the mean of Tmin for the specific scenario and the observed Tmin. The greatest width in PI is observed during July (5.5%), while the least is observed during January (3.56%). This implies that the spread in values of Tmin by the ensembles was lower during January when compared to July, after removing the effect of the magnitudes of temperature. There exists a similarity in the trend of SE during the calibration process and the PI spread. This is evident during the June – August period. The lower PI remains greater than the baseline Tmin values for the period of 12 months. This is due to the greater magnitudes of Tmin changes suggested by SDSM for Singapore. Importantly, increases are predicted by SDSM for the average Tmin and the PI demonstrate dissimilar trends. During April, SDSM suggests lower changes in Tmin (Fig. 5b). However, this does not translate to PIs of lower width (i.e. less spread around the mean) during the same month. This conclusion highlights the need to examine the performance of stochastic weather generators that are incorporated within statistical downscaling tools.

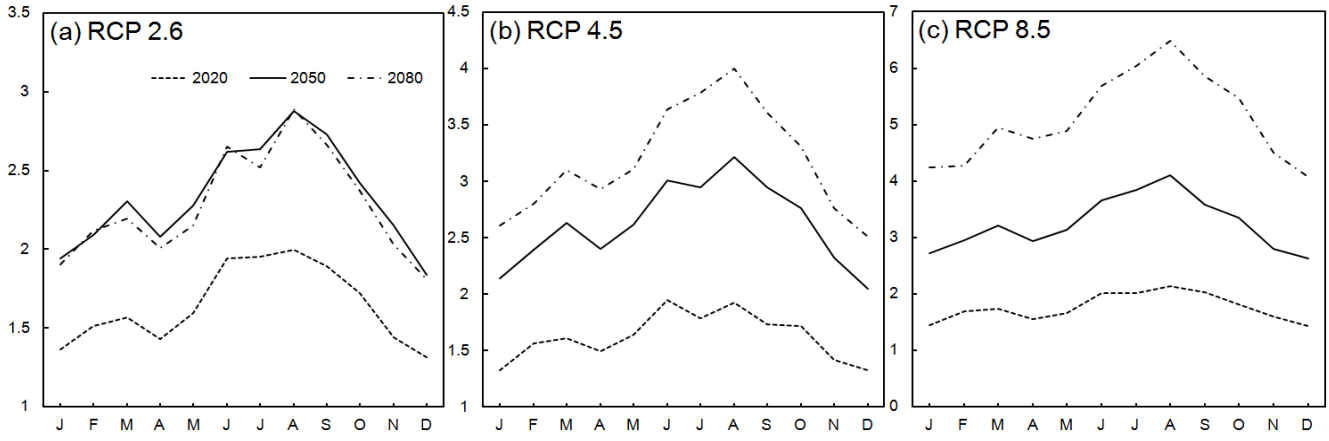

Fig. 5 Monthly changes in Minimum Temperature under (a) RCP 2.6, (b) RCP 4.5, and (c) RCP 8.5

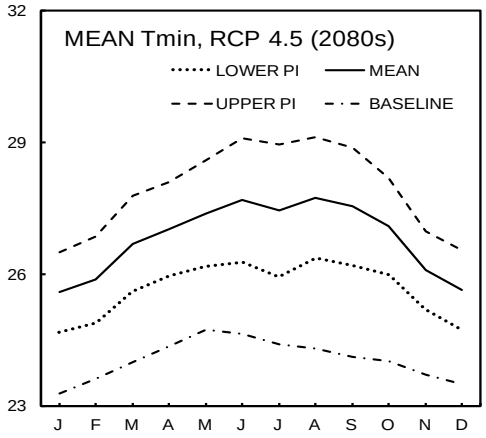

Fig. 6 Uncertainty Quantification of the stochastic weather generator for Tmax (RCP4.5, 2080s)

Given the larger increases in Tmin (when compared with Tmax) predicted by SDSM, the Warmest Night (extreme value indicator) is examined. Table 3 provides the changes suggested for each horizon and scenario. The results mirror the trend observed in the previous results, wherein, decreases are observed between 2080s and 2050s for RCP 2.6. RCP 8.5 suggests the greatest increase between 2050s and 2080s, even after eliminating the effect of the magnitude of change.

Table 3. Future changes of the Warmest Night

	2020s	2050s	2080s
RCP 2.6	1.49	2.22	2.06
RCP 4.5	1.51	2.46	3.01
RCP 8.5	1.62	3.27	5.21

Precipitation

Rainfall is the least accurate meteorological parameter during the calibration process of SDSM. The lesser accuracy is attributable to many reasons, such as (i) tropical patterns of rainfall, with annual amounts exceeding 2000 mm, (ii) rainfall data generally contains multiple days with zero or trace amounts of rainfall, and (iii) the choice of predictors. In this study, data for the period 1967 – 2000 was utilized for setting up the SDSM model and perturbing future climate change. Fig. 7 provides the monthly factor of change in precipitation changes for the different RCPs by SDSM. Unlike temperature results, the precipitation demonstrates varying trends in factor of change for different horizons. For example, when examining RCP 4.5 during South-West monsoon period, reduction in change in precipitation amounts is predicted during 2050s when compared with 2020s. However, the difference between 2050s and 2080s is comparatively negligible. The factors of change with respect to baseline for RCP 4.5 during 2020s, 2050s and 2080s are 0.42, 0.38 and 0.40 respectively. RCP 8.5 also suggests varying factors of change for the different time horizons. For example, in August, the factors of change for 2020s, 2050s and 2080s are 0.77, 1 and 1.57 respectively. In conclusion, all the RCPs suggest increases in precipitation during the South-West monsoon period. However, decreases are suggested during the North-East monsoon and inter-monsoon periods, which predict lower magnitudes of rainfall when compared with baseline period.

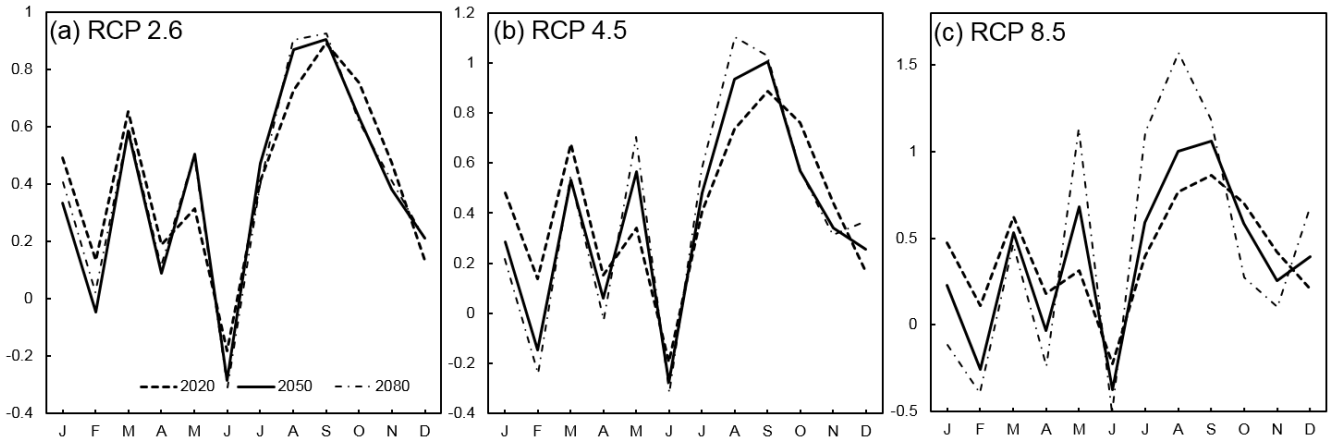

Fig. 7 Monthly changes in Precipitation under (a) RCP 2.6, (b) RCP 4.5, and (c) RCP 8.5

Table 4. Future changes in the Wet day persistence

	2020s	2050s	2080s
RCP 2.6	-0.1144	-0.1196	-0.1215
RCP 4.5	-0.1059	-0.1339	-0.1581
RCP 8.5	-0.1132	-0.1557	-0.2063

One of the important parameters in SDSM that examines the frequency of rainfall is the wet day persistence. Wet day persistence is defined as the total number of consecutive wet days divided by the total number of wet days (Wilby and Dawson, 2004). Table 4 lists the changes predicted by SDSM for this indicator. The changes in this parameter are similar for all time horizons when RCP 2.6 is utilized to perturb the future climate. However, RCPs 4.5 and 8.5 demonstrate decreases during the 21st century. Importantly, RCP 8.5 suggests a decrease of 20.63% during 2080s, which is twice the decrease during 2020s. Hence, it may be surmised that the magnitude and the frequency indicators of rainfall may be influenced by the chosen RCP. The increase in rainfall amounts when combined with the decrease in wet day persistence indicate that future weather patterns would be more extreme, as more rainfall would occur during fewer wet days.

FURTHER DISCUSSIONS

SDSM as a downscaling tool is influenced by the predictor choice. This process may be arbitrary and require knowledge on potential linkages between predictors and predictands. Also, site information, location, seasonal and annual weather patterns would influence the process of choosing predictors (Anandhi et al., 2008). In this study, multiple predictors were thoroughly examined before performing the calibration process. Subsequently, the SE obtained during certain months indicate the difficulty by SDSM in calibrating precipitation and temperature. Therefore, it can be determined that tropical weather patterns generally require a robust and accurate weather generator that can simulate the monthly and annual variations in weather patterns. Another important implication is the choice of GCM utilized for performing this study. Mekonnen and Disse (2016) reported lower errors during calibration when CanESM2 was used, when compared with HadCM3. The precision of the underlying model structure in simulating the interactions between the various components of the Earth's ecosystem would influence SDSM's output. Moreover, the accuracy of the model for a specific location is another important factor for the performance of SDSM. Therefore, models may suggest contrasting changes in climate at the same site due to these reasons. As studies of tropical islands are very few, it is important to test widely used climate

models for their performance in statistical and dynamic downscaling. Furthermore, the changes in weather predicted by SDSM are substantial when examined using different indicators. The rise in minimum temperature that exceeds increases in the maximum temperature suggest a strong heating in urban Singapore. This may cause a series of concatenated effects on Singapore's meteorology that needs further investigation. The results for the 95^{th} percentile of Tmax indicate the trends in the spread of the future maximum temperature values. The rise in precipitation amounts suggest a wetter Singapore, while lower wet day persistence indicates isolated periods of heavier showers. These results would inform the urban planners who seek to model urban hydrology in Singapore.

CONCLUSION

The SDSM downscaling tool was successfully applied to determine the possible future trends in Singapore's climate. The differences between the predictions by the RCPs were discussed. The Tmax and Tmin were projected to rise 2.49°C and 5.1°C respectively, during 2080s, for RCP 8.5. The precipitation would increase by a factor of 0.44 during 2080s, for RCP 8.5. The uncertainty analysis of the weather generator in SDSM provide a tool to scrutinize the variance within the 100 ensembles generated. One of the principal advantages of SDSM is the ability to generate ensembles of weather data at a daily time scale. This would enable further climate change impact studies to be performed at various locations. The quantification of uncertainty in the current study can be utilized to determine the propagation of uncertainty in typical climate change impact frameworks that include hydrologic, agricultural, meteorological, ecological and biological models in conjunction with downscaling tools. Certainly, more research studies that would provide further understanding of the tropical weather patterns and the climate change trends. Multiple downscaling tools need to be compared, given the diversity among the currently available statistical downscaling tools.

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