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Economic Valuation Report

DENR-BMB AND ADB

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Executive Summary

This report is a contribution to the literature on economic valuation of natural resources, specifically marine turtles (*pawikan*) and Blue-naped parrots (*pikoy*). The valuation framework used in the calculations was adopted from The Economics of Ecosystems and Biodiversity (TEEB) of UNEP. The economic values of these two taxonomic groups were categorized into three components, namely: direct use value, indirect use value, and non-use value (which in this case was limited to existence value). The theoretical bases for the economic values were anthropocentrism and theory of value which characterize value as the sum of the money that every individual is willing to pay for a good. This willingness-to-pay (WTP), in turn, was based on the welfare gains of people, emanating from the use and intrinsic worth of natural resources.

For the use value, pertinent literature was consulted to construct a calculation framework that involved assessing the benefits derived from wildlife into three major categories: traded value (for Blue-naped parrots only), tourism value, and ecological value. By applying the relevant and established methods and techniques for estimating value under each category, using both primary and secondary data sources, the streams of use values (per year) were estimated to range from USD57.9 million to USD63.9 million for *pawikan*, and USD724,510 to USD5.9 million for the *pikoy*. Taking into consideration the average lifespan of these two, about 58 years for the *pawikan* (Avens, et al. 2015) and a median longevity of six years for the *pikoy* (Young, et al. 2011), the stock use values of the specified wildlife were computed to be USD634.4 million to USD699.8 million for *pawikan*, and USD3.9 million to USD31.6 million for *pikoy* at the NEDA-suggested (and DENR-BMB endorsed) 10% discount rate. The estimates also show that each specimen of the *pawikan* (average for all species within the taxon) is on average worth USD86,975 to USD95,948. while each Blue-naped parrot has an economic use value of USD456 to USD3,720 at the 10% discount rate.

It must be noted that much effort was exerted to collect the most appropriate, pertinent, and useful data and information to conduct the economic valuation of *pawikan* and *pikoy* in the Philippines, but the lack of sustained, institutionalized efforts to collect comprehensive scientific information on these creatures (as well as on other wildlife) in the country has been a major constraint in the conduct of this research. Much of the data used in the calculations of the economic use values was sourced from secondary sources, extrapolated using logical assumptions and expert views, and collated from focus group discussions. As a way forward for future efforts on valuation, it is suggested that funding be made available for institutionalized primary data collection on natural resources, including wildlife, their habitats, and the ecological roles they play.

For non-use value, surveys were conducted in areas where the confiscation of illegally-traded wildlife was known to occur in order to provide insight on consumer behavior and demand for *pawikan* and

pikoy specimens and by-products, and to generate WTP values for the protection of these wild animals. These sites were San Juan City and Manila City in Metro Manila, as well as Cebu City and the municipality of Minglanilla in the Cebu province (see Appendix 4 for more details on the site selection process). Through this contingent valuation method, the WTP responses were processed into urban and rural economic value estimates, and then extrapolated across the segments of the Philippine population under the two respective classifications. The results show that the annual non-use value of *pawikan* is USD186.0 million, and USD667.6 million for the *pikoy*.

There are a few matters that must be highlighted regarding the conduct of the study and the resulting calculations. First is that there were many data gaps that had to be filled such as the population numbers of the two taxonomic groups, the contribution of each to the delivery of ecological services, and their respective sustainable harvest rates. To do this, the study relied heavily on empirical literature for guidance. For gaps that the literature could not bridge, the author used very conservative but arbitrary estimates. The Department of Environment and Natural Resources (DENR), specifically their Biodiversity Management Bureau (BMB), offered much guidance in terms of what assumptions and data should be used for the calculations.

Second, scientific models that could describe and quantify the ecological dynamics between the priority taxonomic groups (i.e. *pawikan* and *pikoy)* and their respective natural environments are needed to refine the ecological values estimates. This is particularly important if one of the objectives of this exercise were to contribute to the natural asset accounting efforts that have started in the Philippines. It must be emphasized, however, that this activity is time-consuming, costly and would involve, at the minimum, the participation and collaboration of natural scientists and natural resource economists.

Third, it was decided that the traded value for the *pikoy*, but not the traded value for the *pawikan*, be included in the final calculations because there are certain wildlife species listed under the national list of threatened species that may be allowed for captive breeding pursuant to the Philippine Wildlife Act (RA 9147). The Blue-naped parrot is considered by DENR-BMB to be included in that list for possible future harvesting. Captive breeding of marine turtles is not feasible because of their biology and thus not recommended. As trade of marine turtles is prohibited under the Wildlife Act, the Trade value was therefore excluded.

And finally, this report would like to note that it does not recommend adding together the use and non-use values because the former is a local value whereas the latter is a global one. The use value pertains to the benefits that individuals gain from natural resources found locally, whereas the non-use value refers to the intrinsic value of the natural resource as a good that could be found anywhere in the world. As such, these two values were not combined in the report and, instead, presented separately. For policy guidance, the use value can serve as more useful tool and guide for policy makers because it represents the tangible impacts a taxonomic group to the economy, while the non-use value does not. Further, the non-use value and the methods used to estimate it are highly susceptible to bias as the Report of the NOAA Panel on Contingent Valuation suggests (Arrow, et al. 1993).

I. Introduction

I.A. Background

Simply defined, the economic value of a good is the monetary measure of the benefits that the good supplies to an economic agent, normally the consumer of the good. It is measured in terms of the maximum amount of money an individual (the economic agent) is willing to pay to access the good for use or consumption. It is different from the market value, which is the acquired value of a good from the interaction of consumers and producers. We note that there is a difference between price and value, as the former pertains to the amount of money that is paid in order to acquire or access the good, whereas value refers to the monetary equivalent of the benefit that the user or consumer of the good generates for itself when the said good is consumed. Warren Buffet famously differentiates these two in his letter to the Berkshire Hathaway shareholders in 2008 as: “Price is what you pay. Value is what you get” (qtd. in Abhishek 2008). Price and value, however, are linked at the base, because the price-benefit line (commonly known as the demand curve), which represents how much a person will pay for every single additional unit of a good, inadvertently also represents the value of each of unit of the good to the individual consumer. The logic leading to this conclusion is simple: for one unit of a good, a person is willing to pay an amount that is equal to the monetary equivalent of the benefit that the person expects to generate from consuming that unit of a good. As such, the price that a consumer is willing to pay to acquire one unit of a good, therefore, also represents the per unit benefit—the per unit value—that the individual consumer expects to derive from said good. The equilibrium market price—or what the consumer will pay for the good—is determined by the interaction of the consumer and the producer as represented by the demand and the supply curves. It should be made clear that the market price is not the same as the of the good, because the market price represents how much people actually pay for a unit of the good, which is not the same as the maximum amount that people are willing to pay for a unit of this good.

Conventionally, the good’s per unit economic value could be illustrated as the difference between the market price and the maximum amount that people are willing to pay to obtain the good. The more technical representation of the good’s economic value is the size of the consumer surplus, graphically described as the area under the demand curve but above the market price. This is shown in the simple graphical representation in Figure 1.

Not all goods, however, are traded in the market where the price is determined. Such is the case for most natural resources, which are described to be a type of goods known as non-market goods—goods that are not traded in any market and, because of this situation, will therefore not be assigned a market price. The lack of a market price for non-traded natural resources, however, does not preclude us from ascertaining the economic value of the resource, though this exercise does pose a great deal of challenges, much more than for market-traded goods.

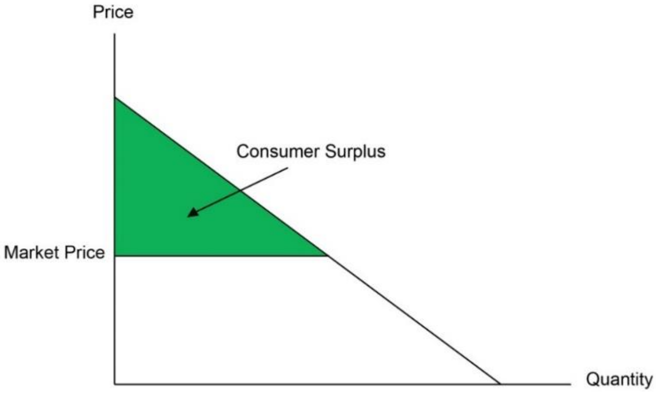

Figure 1 The Demand Curve and Consumer Surplus, Source: Own creation based on textbook definition of consumer surplus

The difficulty (if not the impossibility) in determining the value of specific natural resources lies in the immense task of determining and quantifying the different benefits that can be derived from the resource. This is particularly true for the value of ecosystem services supplied by a resource, because of the gaps in scientific modeling and the precise measurement of the impact of a resource on various aspects of human welfare—ranging from the physical to the non-physical effects.

On top of the limits faced by biological modeling in terms of time, opportunity, and funding is the huge undertaking of collecting the amount of information needed to carry-out an economic valuation. As an example, if we were trying to determine the value of the ecosystem services produced by mangroves, a valuator must have information as to how specific types of mangrove interact with the marine creatures in the area and how these interactions would result in multiple ecosystem services provided by the mangroves themselves as well as the animals they nurture and protect. These services must then be translated into specific impacts on the community, which the researcher-valuator, in turn, must appropriately and carefully monetize based on economic principles. This would have to be done for each ecosystem service, the resulting value of which must be added to the other non-ecosystem services-based benefits that people could derive from the resource. The sum of these resulting monetized values of each benefit the resource provides would be the total economic value of the natural resource.

One key point that must be emphasized at this juncture, is that economic valuation is mainly anthropocentric—although it can include non-anthropocentric dimensions as well (based on the intrinsic value of the natural resource), which means that it is society that makes the determination if the resource has value or not, and if this value is either large or insignificant. This has always been the take-off point of any valuation exercise, because economic valuation is used for policy-making, and policies are created to improve the welfare of members of the society. It is also for this very reason that economic valuation is important for policy-making—providing measurable indicators that can be used by decision makers to determine where policy should begin.

I.B. Anthropocentrism and the Theory of Value

The calculation of economic value is based on the *theory of value*[1] as described in microeconomic theory and can be simply described as the aggregation of the maximum amount of money that every individual is willing to pay to acquire a good. Since there is an assumption of rationality among economic agents (buyers and consumers), it follows that the maximum amount an individual is willing to pay for a good would be equal to the value of the perceived benefits that the individual expects to derive from the good, as was mentioned earlier. In practice, economic valuation of natural resources is guided by the pursuit of determining (to the extent that data would allow) and estimating the monetary equivalent of the benefits that the resource generates for society, either through the direct revelation (stated preference) of the value of the resource or by indirect estimation (revealed preference) of the value, using proxy market goods.

The theory of value and economic valuation center on the philosophical viewpoint of anthropocentrism, which says that humans are the central beings in the world, and that natural resources can be used and exploited for the benefit of humankind. This being the case, the value of natural resources—the wildlife that is the subject of this paper's inquiry—lies in the value of the benefits that they generate to human society. The "intrinsic value"[2] of the resource is given scant attention in economic valuation, because this is not part of human welfare. Note, however, that people's needs are quite complex, and that the benefits that people derive from a resource are not necessarily just about use or access, but can include the emotion of joy from knowing that the resource exists.

From the policy-making perspective, the importance of the economic valuation of natural resources lies in its use as a guide to decision-makers choosing among policy alternatives. In most cases, policy decisions are based on the comparison of the benefits of the envisioned program or project, against its costs (or in comparing the net benefits across policy alternatives), thereby highlighting both the importance and need for the correct and complete (to the maximum extent possible)

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[1] Theory of value pertains to the principles and theories in Economics that explain how prices of goods are determined.
[2] Value described as "for its own sake", which is an idea and construct in philosophy.

quantification and monetization of the value of the services provided by natural resources could contribute to society.

I.C. Economic Value as the Driver of Harvest of Natural Resource such as Wildlife

It is not difficult to embrace the point that any activity is pursued because there is an expected and actual gain from the activity that is higher than the expected and actual costs of said activity. One of the main problems in natural resource management is the fact that the rate of harvest is high and pursued to such a degree that it can cause—and in certain cases has caused—the extinction or destruction of the resource. In the case of wildlife harvest, this explains why high-valued wildlife is harvested relentlessly: simply that the harvester expects a net gain from the exercise. Economic reasoning points out that as long as the incremental benefit of harvest is higher than the incremental cost to harvest, then harvest activity will be continuously pursued. Conceptually, this means that a person will continue to engage in an activity—or consume a good—when the tiniest net benefit is positive (or that the benefit is higher than the cost). Once the incremental cost of the harvest activity is equal to the incremental benefit, economic theory predicts that the agent—in this case, the consumer—ceases to engage in the activity.

Subscribing to this line of reasoning, it follows that, by determining the point of resource harvest where the incremental cost of harvest is equal to its incremental benefit, society would be able to reasonably predict the behavior of people (agents) towards a natural resource. One of the basic conditions that economic theory states must be present for the attainment of harvest efficiency (or sustainable harvest) is that the costs and benefits from harvest must be accurately presented. As such, it is incumbent for policy makers to make sure the benefits and costs are as accurate as possible. In the case of natural resources such as wildlife, this means that we must make sure that the benefits and the costs of the harvest or extraction activity are correct and accurately reflects the value of net welfare change (the benefit minus the cost of the activity). If the valuation of either the benefit or the cost is flawed, then the level of harvest is unsustainable, i.e. representing an inefficient level of activity.

The questions that beg to be answered at this point are two: 1) What are the benefits from harvesting the resource; and 2) What are the costs of harvest? To answer these questions appropriately, let us first identify who will benefit and who will bear the costs as these may not be the same entities. For common property or open access natural resources, it would be the harvester(s) who are expected to benefit from the resource either through the value of the income from trading the resource, or from directly consuming it. As such, it is primarily the person who harvested that would benefit from the resource—but other members of society could benefit indirectly as well by way of taxes and purchases that the harvester may have. It is apparent, therefore, that the main beneficiary from harvesting the natural resource is the individual, with society as secondary beneficiary. On the other hand, the bearer of the costs would be those members of society who are affected by the harvest of the resource in terms of lost welfare, resulting from the decline in the quantity of the resource.[3] The decline in the benefits prior to harvest (or the complete loss, for those that are endangered) would be a cost—the opportunity cost—equivalent to the lost benefits that would have otherwise been available to members of society had the resource not been harvested. In this second situation, it is apparent that the bearer of the cost of harvest is mainly society and the individual harvester bears only the private cost arising from the direct cost to harvest such as labor, transportation, and similar costs.

Based on the above discussion, the benefits of harvest would therefore be the value of the gains for the harvester, mostly in terms of revenue generated from selling the harvested resource and its derivative goods. As far as society is concerned, the benefits would be equal to the amount of taxes and other payments to government for royalties, etc. The flipside of this scenario is the value of the trade-off cost[4] of harvest, which pertains to the foregone value of the resources' benefits to society if these resources had not been harvested. One example of this benefit, according to the literature, is the availability of and access to ecological services that would emanate from "unharvested" natural resources. This trade-off may not occur if the population numbers or the size of the resource after harvest is still sufficiently large, so that the ability of the resource to deliver environmental services is not impaired.

I.D. Scope and Limitations of this Study

At this juncture, the limitations of this valuation exercise and the parameters that this study worked off of must be discussed to manage expectations. These are natural external constraints that mark what can be accomplished given the state of information systems, and the constraints that this study worked with given the limitations of the project.

From the planning stage of this research, it was apparent that the limits on the availability of reliable and accessible information on economic values was going to be one of the main challenges for the economic valuation of the *pawikan* and *pikoy* in the Philippines, and it proved correct. Generally, studies of ecosystems and ecological dynamics remain a challenge for researchers, even in countries where there have been a lot of research initiatives; this was certainly one of the main issues encountered throughout the course of this study.

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[3] Note that since the resource is common-property or open-access, every member of society would have access to the resource and would, therefore, be allowed to enjoy the benefits of harvesting the resource.
[4] In the Economics literature, this trade-off cost is better known as the opportunity cost.

In addition, the same difficulties that most valuation studies face are generally the same problems and issues everywhere in the world. It is very difficult, if not impossible, to be able to calculate the total economic value of any resource, and this study is no different. There are several reasons why this is so, but the main challenges are listed as: 1) the incompleteness of the information used in the valuation; 2) the fact that either many of the benefits from the resource are still unknown at this point; 3) the full magnitude of the benefits do not manifest themselves until after a very long time and hence, we cannot make a complete inventory of all benefits that could be included in the calculations; and 4) the lack of scientific models that could link the natural resource with the generation of the ecological services that are of value to society. These are the same challenges that are encountered by any valuator and are creatively addressed to the extent that the funds and time could allow.

There were numerous data challenges that were encountered in the crafting of this report, as much of the data were either old or unavailable; much time and effort were also expended to either extract the data from different sources or extrapolate from other information. Normally, a huge portion of an economic valuation project's funds and time would be devoted to data collection or generation, both primary and secondary, because data is the lifeblood of any economic valuation efforts. This being said, this study would benefit from more funded efforts to generate primary data. For instance, the tourism value was calculated from the estimated level of diving activities in five (5) dive sites and marine turtle watching activities in five (5) major turtle watching sites, all of those being sites where marine turtles were reported to have nested. The calculation could be refined further with more precise data on diving costs and expenditures, and a survey that collects information about tourists' behavior and their spending patterns, and the differences in tourism activities in different locations.

Further, the study was limited to the results of other studies in determining the value of the benefits from environmental and ecological services that were generated by the existence of the *pawikan* and *pikoy.* In the few cases where there were no data (*e.g.* what is the sustainable rate of harvest; what is the contribution of *pawikan* and *pikoy* on the formation of corals and forests respectively; and so on) the author used insights gathered from other studies to make a logical and reasonable estimate to bridge the gaps in the computations. This situation could be addressed fully if there were ecological models and empirical studies that could categorically measure the impact of marine turtles and Blue-naped parrots on the provision of different ecological services—but these are not currently available. The creation of these ecological models is a major research endeavor by itself, requiring much time and funding to accomplish, and, unfortunately, beyond the reach and ability of this project. Without the information from these models, this study relied only on the existing literature to calculate the value of the ecological and environmental goods and services that the marine turtles and Blue-naped parrots could generate. As to be expected, there were gaps in the information from the literature that needed to be filled with estimates from key informants. As an example, the identified ecological service value of marine turtles was based on an article that indicated that marine turtles are attributed as a contributor to the formation of corals in the ocean. The article, however, did not indicate what the magnitude of the link was, and how the link between marine turtles and coral formation could be measured. This was a similar situation for the link between the marine turtles and seagrass, and the Blue-naped parrots and forest formation, which the literature established, but did not (and perhaps, could not) quantify. This type of information would have been necessary to better measure the economic value of the ecological services that marine turtles could generate; these issues could have been addressed if ecological modeling and primary data collection had been part of the research project.

Finally, the existence value calculations could be refined if there were WTP surveys that were solely devoted to the generation of the existence value estimates, where the techniques in response elicitation could have been more fully applied. For this project, the WTP data were collected only from rider questions in a consumer demand survey, which meant that the questions pertaining to the WTP to protect *pawikan* and *pikoy* were limited to a few directly stated questions and could not be expanded to check for potential response bias[5] that WTP surveys are prone to. The existence value estimates could, therefore, have been refined if a devoted survey had been conducted with a bigger sample size and more survey sites to capture different types of situations and types of respondents to get a more accurate representation of the "protectors" of marine turtles and Blue-naped parrots.

I.E. Economic Valuation and Illegal Wildlife Trading

This research paper is intended to be an input to the consumer demand analysis of specific threatened wildlife which is being traded (both illegally and legally) in the market. Some sectors contend that it is illegal wildlife trade that is the threat, while legal trading is not, a matter that is up for debate at this point. One could argue that IWT, being a clandestine operation, is unregulated and has a natural tendency to push the harvest of wildlife to the point of extinction; whereas legal trading is often regulated and limited to a harvest rate that is within the "safety boundaries". We argue, however, that this difference between the outcomes of legal and illegal wildlife trade would only hold true, if the institutions that oversee legal wildlife trade function well, and are able to enforce the rules of legal trade effectively and evenly. If these institutions and the enabling mechanisms were not present, it would be unlikely that legal wildlife trading would be significantly less harmful than IWT.

Both sides of the wildlife trade, however, are driven by the basic push for economic gains, because the impetus for wildlife trade—whether legal or illegal—is primarily to generate income for the trader

[5] These biases have been known to influence the willingness-to-pay and willingness-to-accept estimates, and have been identified to be: starting point bias, strategic bias, hypothetical bias, as well as the question order and temporal embedding effects. To minimize these biases, much care is needed to frame the questions appropriately, to make the sample size large, and to make sure that the execution of the sampling is proper.

or poacher. By calculating the economic value of the lost benefits should the species or even taxonomic group become extinct, members of society and policy makers can be informed of what the social, environmental, and economic costs of trade are, which is challenging but essential, especially for illegal and unregulated trade where information is scant. From the policy perspective, the information regarding the economic value of wildlife would guide policy managers in prioritizing programs and determining the best use of limited public funds to preserve society's welfare.

The focus of this paper was originally on two taxonomic groups of interest to the project, namely, marine turtles and parrots. During the discussion among members of the technical working group (that has been overseeing the activities of this project), it was decided that it would be better to assess the total economic value of these two taxonomic groups because it could better reflect the importance of protecting the collective of species that belong to them. In the conduct of the research and the ensuing calculations, however, it became apparent that this was possible only for the marine turtles because there are only five species of marine turtles present in Philippine waters, while there were more than 12 species of parrots in the Philippines. This fact, along with the wide range of characteristics among different species of parrots (as opposed to the near-similarities in physical and behavioral characteristics of marine turtles) and the dearth of information regarding population and distribution of the parrots, made the taxon-level economic valuation possible for the marine turtles, not for the parrots. As such, the economic valuation for parrots was relegated to one species, Blue-naped parrots.

I.F. Framework Analysis in Economic Valuation and Assumptions Used

The economic valuation of the *pawikan* (marine turtles) and *pikoys* (Blue-naped parrots)—or any natural resource for that matter—requires combining the principles and models in ecology and economics. Knowledge of ecology is needed to map-out the ecosystem structures and detail the relationships and interactions between wildlife and ecosystems, and across wildlife, and how these collectively result in ecological services. Meanwhile, economic principles and tools are used to determine the equivalent value emanating from these services. The primary challenge is attribution, or how much the species/taxa in question contribute to the delivery of the ecological services that will be valued. The literature acknowledges that the major challenge in the valuation of natural resources is the complete, clear, and quantifiable mapping-out of the link between the structure and function of natural systems and the environmental goods and services that humans benefit from (NRC 2005). This highlights the fact that economic valuation requires the collaboration of scientists—*i.e.,* biologists, ecologists, etc. — and natural resource economists.

Because both human needs and nature are complex, it is unsurprising that there still exist many gaps in understanding ecological processes as well as creating the methodology for the appropriate valuation of the benefits that humans derive from nature. In many instances, the ecosystem service of a natural resource only surfaces when the resource has become extinct, in which case it is already too late for policy to intervene. This is a major challenge for economic valuation, and while there have been strides made toward this end, economic valuation of natural resources remains to be imperfect especially in the context of estimating the total economic value.

Economic valuation is traditionally based on the definition of value as contained in neo-classical economic theory which assigns value to a good based on how many economic agents are willing to pay to acquire it. This is an individual-agent perspective on the idea of economic value, wherein the utility-maximization framework is used to explain the rational agent's behavior given his or her budget constraints. The alternative to this is the more social and less traditional community-type or community-based valuation wherein the value of the good takes into account the potential externalities (both positive and negative) generated by the good, that emanate from its qualities of being a public good (Tesileanu 2008).

These two-types of approaches are observed in the valuation of natural resources, and often a source of tense discussion among valuation economists because these values often differ greatly. This is due mainly to the fact that the social-based approach to valuation embraces the unintended benefits and damages (referred to as externalities) that a community is exposed to, while the individual-welfare approach does not. It is noteworthy to mention that while the inclusion of externalities completes the valuation picture and therefore provides a more accurate perspective for valuation, in reality, it is often only the perspective of the individual that decides on what the value of the resource is because it is the individual's action that is being sought when it comes to protecting the resource. One may even argue that social action materializes only when individuals that comprise society are sufficiently moved to participate in initiatives and actions that will benefit the community.

Traditionally, the economic value of a natural resource is calculated using the value of the benefits from the direct use of the resource; for example, the value of trees is based on the value of the timber produced when they are harvested. More et al. (1996) contends, however, that this approach to valuation understates the value of the natural resource because there are different facets to the benefits being accrued. As such, the definition of economic value has expanded to include the value of indirect use, as well as non-use. Currently, the economic value of a natural resource is composed of two umbrella categories: use value and non-use value. The use value refers to the value of the benefits that society derives from using—either from consumption or income, as examples—the resource, normally in terms of the value of the ecosystem services that the resource provides, plus the market value of the resource when it is traded in the market. The non-use value, on the other hand, pertains to the intrinsic value of the resource based on its role in the non-tangible happiness of people, such as when people are happy that whales are not extinct even if they have no use for whales and perhaps have never seen a whale. To summarize, the economic value of the natural resource is summarized by the simple equation below:

Economic Value *= Use Value + Non-use Value*
= Direct Use Value + Indirect Use Value + Non-use Value

The equation shows that the use value, as defined in this study, is broken down into direct use and indirect use. In some literature, option value is considered a use value, but this is based on an estimate of value at a point in the future and is difficult to calculate. Direct use value pertains to the value of specific benefits arising from the direct use of the resource such as for income generated from trading the resource in the market and value of goods consumed. Indirect use value refers to the value of indirect benefits generated from positive externalities.

Non-use value, on the other hand, is less straightforward and more amorphous due to the fact that it focuses on the intrinsic value of the resource that is captured by the rise in well-being solely from knowing that the resource is not destroyed and continues to be potentially accessible. Conceptually, the non-use value could be split into two: existence value and bequest value. The existence value pertains to the intangible benefit of knowing that the resource exists even if it does not have any use to anyone, while the bequest value refers to the perceived value of the resource to the next generation (Chee 2004). For the readers' reference, the different categories of values in the total economic value approach are presented in Appendix 1.

The economic values are derived calculated per year for the entire stock of the taxonomic group or species of animal—the marine turtles and Blue-naped parrots. This is the flow value of the species/taxa, pertaining to all the values discussed above generated for every year. To determine the stock value, the yearly generated economic value is multiplied by the estimated lifespan of the current batch of the species/taxa. As such, we have two categories of economic values: the flow value, which is the yearly value generated by the species/taxa; and the stock value, which pertains to the net present value of the flow economic value of a batch of species/taxa throughout their entire lifetimes.

I.G. Non-market Valuation Methodologies for Environmental Services

Economic valuators can compute the partial economic worth, the use value, of a resource using market prices by measuring changes in income and the value of economic activities arising: from the use of the resource such as from the revenues from trading the resource directly; or from tourism activities related to visits to natural areas. The value of derived products from these resources that might be sold in the market could also be calculated by determining the contribution of the resource to the value of the derived product and how much the product is sold in the market. Estimating the value of a natural resource from this angle is straightforward, and only requires the use of established market prices to calculate the revenues and expenditures generated because of the natural resource.

The more challenging component of the value of a natural resource to calculate is the one that is not traded in the market—the environmental goods and services—and, therefore, does not generate market data that can be used to assess their price and value. This exercise of determining the non-traded value of the resource is referred to as non-market valuation which, because of the absence of market price data for these services, poses a greater challenge in economic valuation of natural resources than for market valuation. In non-market valuation, two general categories of methods have been developed to compute the value of the resource by estimating the value of consumers' preferences through either of two methods: revealed preference (RP) and stated preference (SP) methods. Revealed preference as a method for estimating value is based on the Revealed Preference Theory, which argues that a consumer’s preferences can be revealed through the bundle of goods that the consumer purchases. Stated preference, on the other hand, pertains to the direct expression of value by a consumer through responses to (primarily survey) questions in the form of prices, value of a good, and other direct measure of preference for a good.

The decision regarding which of the two methods is used—SP or RP—is one that the valuator makes after a review of the availability of information and the ease of acquiring information. A review of the literature regarding the use of these two methods does not indicate that one is necessarily superior to the other, implying that the choice is based on practicality, convenience, and preference of the valuator. In cases where market information has been unavailable, it is the SP that is used, while RP is utilized when such information is accessible. In most valuation studies—especially in valuing environmental goods and services—both are used, depending on the type of value that is being measured. It should be noted that SP is generally the choice when estimating the non-use value, because this value is specific to behavior of the relevant group of users/consumers, while RP is generally used when calculating use values such as changes in income, tourism revenues, and so on. For the readers’ convenience and use, a summary of the differences between these two methods is presented below, from Abdullah et al. (2011) in a table re-created from Louviere et al. (2000):

Table 1: Differences between Revealed Preference (RP) and Stated Preference (SP)

Revealed preference (RP)	Stated preference (SP)
1. Portrays the world as it is 2. Consists of inherent relationship between attributes and assumes that technological constraints are fixed 3. Only existing alternatives are regarded as observables 4. Represents market and personal limitations of decision maker in analysis 5. High reliability on face to face validity 6. Yield one observation per respondent	1. Uses hypothetical or virtual context 2. Controls relationships between attributes (permits utility functions with technologies) 3. Includes existing and/or proposed and/or generic choice alternatives 4. Does not represent changes in market and personal limitations 5. Appears reliable when respondents understand, commit to, and respond to tasks 6. Yield multiple observations per respondent

Source: Adapted from Louviere et al. (2000) by Abdullah et al. (2011)

The most utilized valuation techniques that are based on SP and RP are summarized in the following tables. These were culled from the discussion in the paper by Abdullah et al. (2011).

Table 2: Some Stated Preference-based Valuation Techniques

Valuation Technique	Description
Contingent Valuation (CV)	This is perhaps the most widely used among the valuation techniques for non-market goods, especially for the estimation of indirect use and non-use values. It has the advantage of estimating values even if the benefit has not manifested yet, by asking for responses to hypothetical situations. The main issue with CV, however, is that it is highly susceptible to response-biases.
Choice Experiment/Conjoint Choice	This technique evaluates choices by asking individuals to either: 1) choose among hypothetical alternatives; 2) rank their alternatives by order of preferences; or conjoint rating, which measures the degree of preference.

Source: Author's summary based on the discussion in Abdullah et al. (2011)

The choice as to which of the two SP approaches will be used in a valuation exercise is very much dependent, first and foremost, on information availability, the required level of detail of the value, and the type of welfare estimates that is required. In most cases, both are used as complementing techniques because they measure different types of values (Adbullah et al., 2011).

Table 3: Revealed Preference-based Valuation Techniques

Valuation Technique	Description
Hedonic Pricing	This technique is based on the premise that the price of a good is based on the intrinsic characteristic of the good, as well as external factors surrounding the good. HP is the choice of valuators who wish to measure the value of environmental services and amenities that are tied to land by calculating the differences in land prices.
Travel Cost Method	This is the technique used to estimate the value of recreational sites and the attributes of the sites. The valuation is done by deriving a demand curve for the sites, wherein, the value of the site is calculated by assessing how much respondents are willing to spend to reach and use/stay at the site.
Benefit-transfer	This technique entails the use of benefit estimates made in other studies that examined similar situations and sites. It is often used to estimate the value of ecosystem services, but with little funds to do an expensive full-blown study. It must be noted that since BT only transfers the available information generated from other studies, it also acquires the limitations of those other studies.

Source: Author’s summary based on the discussion in Abdullah et al. (2011)

II. Methodology and Data Collection

This study adopts multiple methods that fall under both the non-stated and revealed preference approaches to valuation, and are used in total economic valuation studies done by development agencies and the Environmental Protection Agency of the United States. This captures the different dimensions of the economic value of natural resources, and (likely) catches the range of economic values emanating from the broad spectrum of benefits accruing to the citizens of the Philippines. It must be noted that the possible global benefits were intentionally not calculated and were considered only if they demonstrated discernible and observable impacts on the welfare of Filipinos.

Following both the framework described earlier and the choice of non-market valuation designs, the calculations of the economic value of *pawikan* and *pikoy* were based on the monetary values of the direct and indirect benefits, and the existence value of each of the two. In the case of the *pikoy*, the direct use value was estimated by calculating the value of a small (sustainable) proportion of the population that could be harvested without endangering the species/taxa. For both the *pawikan* and the *pikoy,* the indirect value was calculated by translating the ecological service attributed to the two wildlife groups into an economic (monetary) value. Finally, the non-use value of these creatures was estimated from the stated willingness of individual members of society to pay for the protection of each group, framed in a situation where the taxa or species had no use to the individuals. As a guide to the reader, the breakdown of the categories of values within the total economic value of the species/taxa is listed below:

Table 4: Summary of Components of Economic Value Used in this study

Categories of Value	**Specific Component of Value**	**Brief Description of the Basis for the Computations**
Use Value		
Direct Use	Traded value	To do this, the price of the species/taxa was collected from individuals and other entities that were selling these in the market. Trade of the species/taxa, however, was only based on what the government allowed under the implementing guidelines of the RA 9147. In accordance with the DENR-BMB regulations, no marine turtle should be harvested.[6] It can be

[6] DENR-BMB estimated the population number of marine turtles encountered in the Philippines between 2005 and 2015 at 7,294. Even though it was decided that there will be no computation of the trade value for marine turtles, this figure can form the basis for future and more detailed computations regarding the value of marine turtles in the Philippines. This figure was also used as the basis for the per specimen economic value of marine turtles in the country.

		assumed, however, that 1% of the total population of Blue-naped parrots (*pikoy*) could be harvested for controlled trading every year as the population growth of the Blue-naped parrot population is much higher. The total traded value of the Blue-naped parrots, therefore, was calculated by multiplying the average market price of each specimen of Blue-naped parrots with 1% of the population of an estimated 8,500 Blue-naped parrots in the country.[7]
Indirect Use	Ecological/Environmental Services	To calculate indirect use, the ecological and ecosystem services that could be affected would have to be identified; afterwards, the value of these services would be estimated using either direct or proxy pricing, or both. Note that primary data collection could not be done for this study as this was beyond its scope, and was included as one of the limitations of the valuation. The bases of the economic value of the ecological services, therefore, were gathered from secondary sources only.
	Tourism	This pertains to the contribution of tourism activities to the economy, as stimulated by the *pawikan* and *pikoy*. This cumulative value is based on the amount of spending of tourists on food, lodging, and travel, plus the multiplier effect of the spending on the gross domestic product. The price and expenditure information were gathered from industry sources and were used to calculate the contribution of the presence of the species/taxa to the

[7] This is based on the lower range of the population estimate made by Peter Widmann of Katala Foundation Inc., which is 8,500 parrots. It must be noted that this population figure for Blue-naped parrots is based on the population estimate in Palawan, where the largest population of the said parrots is located.

		communities' tourism revenues, as well as impact on the communities' aggregate income.
Non-Use Value		
Existence Value	Value not related to use/usefulness of the resource	Contingent valuation was used, asking about the individual's willingness to pay to protect the resource per unit of time.

Source: Author's summary

The economic valuation for each of the categories of value required different approaches and methodologies. The direct use value is the most straightforward calculation because it pertains to the potential income from sustainably harvesting[8] and trading *pawikan*[9] and *piko*y. This is what was referred to as the traded value of the species/taxa, the calculation of which involved several steps including: calculating the sustainable harvest rate of each of the two taxonomic groups, determining their market value, and the calculation of the stream of traded value throughout their lifespans. There is, however, an absolute government ban on the capture and trade of marine turtles so this income benefit is absent for the marine turtles. The income benefit—the traded value benefit—in this study only accrues to the Blue-naped parrots, whose limited harvest (only up to 1% of the estimated population) may potentially be allowed by DENR as parental stocks by legitimate commercial breeder/s. The indirect use value accounts for the non-consumptive value and refers to the value of the species' or taxa's functions and generated benefits from ecological services. In this case, the two indirect use values were calculated from the community's benefits from tourism activities stimulated by the species/taxa, and the value of the ecological services these two generate through the contribution to selected ecosystems, such as coral reefs, seagrass areas (*pawikan*), and forests (*pikoy*). Note that since there were gaps in the information regarding the impact of marine turtles on the ecological services—specifically, on coral reefs and seagrass—the researcher utilized two scenarios, low and high[10], to represent the potential impacts.

Finally, the species/taxa also generated benefits to individuals who valued their physical presence, and not because of anything related to either direct or indirect use benefits. This is what was referred to earlier as the non-use value, and was generated using the WTP survey. Randomly selected respondents from select municipalities in the country were asked how much they were willing to

[8] Sustainable harvesting can be defined as a method of harvesting that provides a constant supply of the natural resource—in this case, *pawikan* and *pikoy*—throughout time, without endangering the "core" population and thus the future yields/harvests remain unaffected by current harvest activities. It must be pointed-out that ecological…
(cont.) … sustainability goes hand in hand with economic sustainability as the former preserves the natural resource's natural functions, and the latter maintains and protects the resource's importance to society.

[9] This is only a description of how traded value would have been calculated for both *pawikan* and *pikoy.* RA 9147 specifically bans the harvest of these two, but the DENR will potentially be allowing the harvest up to 1% of the total number of *pikoy* though not of the *pawikan.*

[10] The low impact was based on the arbitrary assumption that *marine turtles* contribute 0.01% to the formation of corals and seagrass, while the high impact was based on a 0.05% contribution to their formation and preservation.

contribute—in terms of money or hours of volunteer work—to make sure the *pawikan* and *pikoys* in areas outside of their own municipalities were protected.

For the reader's perusal, a matrix of the information collected and sourced for each of the priority taxonomic groups/species in the study is shown below. The basis/references for the following assumptions are listed in Chapters III.1. and III.2.

Table 5: Summary of Information Collected for Marine Turtles (*Pawikan*)

Value	Description	Variable Unit	Variable Raw Unit Value	Basic Assumptions
Tourism	Value of tourism revenues from diving activities	Value per dive, travel costs and tourist revenues	USD31/person/dive and two dives for one boat rental Php5,000 (USD100) airfare (round trip), and Php3,500 (USD70)/person/day for board, lodging and other expenses for divers and non-divers The tourism multiplier is assumed to be 3.5.	Around 38% of the estimated total 21,000 tourists in one of the major marine turtle dive sites (Apo Island) are divers, which is also taken as a basis for the other 4 identified dive sites. An additional 20% of the tourists are assumed to be non-diving turtle watchers who would travel by boat to observe (and take pictures, perhaps) marine turtles in open sea.
Ecological Services	Per hectare of healthy corals in the Philippines Per hectare area of seagrass in the Philippines	Value per hectare of corals attributable to marine turtles Value per of seagrass attributable to marine turtles	Coral reefs were valued at AUD10,924 back in 2006. When adjusting for inflation using a CPI conversion factor, and income differences across countries using a PPP conversion factor, the amount translates to Php205,505 (USD4,110) per hectare per year, with an estimated 2.6 million has of coral reefs in the Philippines. Seagrass was valued at AUD34,172 back in 2006. When adjusting for inflation	0.05%–0.1% of healthy corals are conservatively (and arbitrarily) attributed to the marine turtles' interaction with coral reefs.

			using a CPI conversion factor, and income differences across countries using a PPP conversion factor, the amount translates to Php648,866 (USD12,857) per hectare per year, with 98,800 hectares of seagrass in the Philippines. More information on the ecological values culled from Blackwell (2006) and compared with other ecosystem values reflected in other studies can be found in Appendices 2 and 3.	
Existence Value	Willingness to pay to protect marine turtles	Amount of money set aside for preservation of marine turtles		People do value marine turtles outside of the possible use value

Table 6: Summary of Information Collected for Blue-naped Parrots (*Pikoy*)

Value	Description	Variable Unit	Variable Raw Unit Value	Basic Assumptions
Traded	Value of sustainably harvested specimen	Value per specimen	Php5,000 (USD100)/*pikoy*	The estimate on the population of *pikoy* in the Philippines is based on the population in Palawan which has the largest number of Blue-naped parrots in the country. This is estimated to be 8,500 specimens, according to DENR-BMB, which suggested using this number for the traded value estimates. Further, according to DENR-BMB, although the harvest of Blue-naped parrots is not allowed under RA 9147, the government will potentially allow the controlled harvest of this species for breeding and research purposes of up to 1% of the estimated population.
Tourism	Value of tourism revenues from birdwatching	Value per 3-day birdwatching event	USD346/person for birdwatching package, inclusive of board, lodging and other expenses; tourism multiplier is 3.5	*Pikoys* are part of the attraction of bird watching. There are two birdwatching events in the country every year, wherein there are, on average, 70 birdwatchers per event.
Ecological Services	Per hectare of forest attributed to *pikoys*	Value per hectare	Economic value of a hectare of forest was AUD3,609 back in 2006. When adjusting for inflation using a CPI conversion factor, and income differences across countries using a PPP conversion	Although there is no general agreement regarding the role of the Blue-naped parrot as a seed disperser, the DENR raises the possibility that, in its entire lifetime, one *pikoy* could be responsible for the growth of three trees (DENR-BMB 2020 quoting Widmann).

			factor, the amount translates to Php67,892 (USD1,357) per hectare per year.	One additional assumption is that, based on description of the forests in the literature, one hectare of forest is assumed to be composed of 400 trees. As mentioned, the assumed population of Blue-naped parrots in the Philippines is 8,500, based on the Palawan figure. The experts consulted for this project also estimated that the median lifespan of a parrot is six years, which is used in the lower limit estimate, even as a parrot may live up to 14 years in captivity, which is used in the upper limit estimate.
Existence Value	Willingness to pay to protect *pikoys*	Amount of money set aside for preservation of *pikoys*		People also value *pikoys* even if they have not seen one.

Most of the information used in the calculation were collected through secondary sources and from past studies on the same subject. To the maximum extent possible, primary data were gathered and used—especially unit prices of the traded specimens, travel costs, etc.—and sourced mainly from focus group discussions. Budget and time considerations were major constraints in the data collection process as much of the information used in the valuation calculations had to be sourced from other studies. Moreover, an expert panel of marine turtle and parrot experts was convened to discuss the assumptions of the study and provide additional information on biology, behavior, population numbers, and ecological roles of the taxonomic group/species. The existence value was estimated through a contingent valuation methodology, and the information needed was collected through rider questions in the consumer demand survey. All the monetary values indicated in the table above were adjusted using purchasing power parity to account for and eliminate the differences in prices between the Philippines and the country of origin of the information. By doing so, the calculated economic values in this study would be comparable to estimates in other countries because the prices across the countries have been standardized.

II.A. Computational Assumptions

There are three factors considered in the economic valuation of marine turtles and Blue-naped parrots in the Philippines: 1) tourism value; 2) ecological value; and 3) existence value. Since the DENR-BMB will be allowing a limited harvest of the Blue-naped parrots, traded value is added to the economic valuation of Blue-naped parrots; this is not the case for marine turtles which will continue to be strictly protected. The assumptions used in the valuation were collected and culled from different empirical literature, expert opinions and estimates, and government sources (specifically, the DENR) which were all vetted in various meetings, technical discussions, and forums. From all these rigorous and intense technical discussions, the computational process and technical assumptions were crafted for each of the *pawikan* and *pikoy* and per category of value. These assumptions are listed and described in the succeeding sub-sections.

II.A.1. Marine Turtles (*Pawikan*)

Tourism Value

The main tourism attraction brought about by marine turtles is the scuba diving activities that are attributable to the presence of marine turtles. It is reasonable to assume that a dive site is attractive to divers because marine turtles are in the area, and this is the take-off point of the tourism value for the marine turtle taxon. The average cost for one scuba dive is approximately USD31 in the Philippines according to Cazabon-Mannette, et al. (2017). For the purpose of this study, two dives and a shared boat rental between two divers were assumed to calculate the economic benefits from diving due to the presence of marine turtles.

In Apo Island—one of the major sites for turtle watching in the Philippines—there are about 21,000 tourists per year, 38% of whom scuba dive (Tejero, 2014). Based on the available literature there are five major marine turtle dive sites in the Philippines: El Nido, Palawan (Miclat and Arceo 2018); Tubbataha Reef, Palawan (Miclat and Arceo 2018); Turtle Islands, Tawi-Tawi (Miclat and Arceo 2018), Balabac, Palawan (Miclat and Arceo 2018); and Apo Island, Dumaguete (Tejero, 2014). These were used as a basis for the calculations. In future studies, researchers should try to gather more information on the following: Anilao, Batangas; Pandan Island, Mindoro; Apo Reef, Mindoro; Turtle point, Cebu; Balicasag Island, Bohol; Camiguin Island, Mindanao; and Mantigue Island, Mindanao, among other viable sites. Flight and lodging expenses are added to the dive expenses and using the basic information on the unit cost to dive, the total revenue from scuba diving per year is calculated to be USD3.7 million. We also recognize that not all tourists who flock to a tourist site are divers. There are full turtle-watching tours that visitors can participate in for about USD14.28, as well as, according to unpublished information from tourism sources, about 20% of all tourists that are non-divers who visit sites to simply observe (and take pictures) of the habitats where marine turtles can commonly be found in. These different types of tourists are expected to spend on airfare, board, lodging and other miscellaneous expenses during their trip.

Part of these tourist expenditures are expected to stimulate the local economy, pushing the economic impact of the tourist activities beyond the actual spending. This is referred to as the multiplier effect, which, for tourism, was estimated by Sicat (2019) at 3.25. This means that Php1 (USD0.2) spending by a tourist increases the aggregate income of the community by Php3.25. Adding the multiplier effect to the diving and non-diving expenditures of tourists, the total tourism value of marine turtles in the country is estimated to be USD71M.

Ecological Value

Marine turtles are known to conserve coral reefs by macro-herbivory (Goatley, 2012). Although the actual value of ecological benefit has not yet been measured, an estimate can be made given the following information.

- After adjusting for inflation and differences in the cost of living in two different countries, Australia and the Philippines, the average coral reef value in Southeast Asia is assumed to be USD4,110 per ha. per year (Blackwell, 2006; World Bank, 2005; PSA, 2000–2020).
- The Philippines has about 2,600,000 ha. of coral reefs (BFAR, 2014), resulting in about USD10B per year in value.
- With no information that quantifies the impact of marine turtles on coral health, this report conservatively set it at a range of 0.05%–0.1% conservation of coral reefs or contribution to the formation of coral reefs.

The economic value of the coral reef was multiplied by the area of coral reefs in the Philippines that can be attributed to marine turtles, to come up with the value of ecological services from coral reefs generated by marine turtles, amounting to USD5.3 million to USD10.7 million.

The same procedure and assumption of impact was used to calculate the value of ecological services from seagrass generated by marine turtles. Other assumptions regarding the contribution of marine turtles to seagrass conservation and formation are listed below.

- After adjusting for inflation and differences in the cost of living in Australia and the Philippines, the average value of seagrass is assumed to be USD12,857 per ha. per year (Blackwell, 2006; World Bank, 2005; PSA, 2000–2020).
- The Philippines has a total seagrass area of 97,800 hectares (Azanza, et al., 2017).
- As with the coral reefs, with no information that quantifies the impact of marine turtles on seagrass health, this report conservatively assumes that 0.05%–0.1% of seagrass area could be attributed to marine turtles.

The economic value of the seagrass was multiplied by the area of seagrass in the Philippines and by the conservation impact that can be attributed to marine turtles. The total amounts to USD628,723 to almost USD1.3 million.

Existence Value

As mentioned earlier, the existence value refers to the monetary importance of marine turtles to individuals that is not attached to the benefits accruing to consumption, income, and any other physical benefits that marine turtles generate. Some describe the value as emanating from the intrinsic value of the marine turtles and confirm the emotional importance of the creature. In many cases it has social dimensions as well wherein the role of culture and social interactions come into play. For the estimation of the existence value of marine turtles (and the Blue-naped parrots as well) this study relied solely on the WTP survey, wherein randomly-selected respondents in selected sites were asked how much they were willing to pay to protect turtles in other areas of the Philippines. It must be noted that a WTP survey made to generate an estimate of the existence value is delicate and requires a great deal of care to eliminate potential response bias.

As such, to address the possibility that the respondent may be unemployed and consequently not have any income, the willingness to pay response was asked in terms of either money or in hours of voluntary labor. The number of labor hours to volunteer was then converted to monetary terms using the minimum wage for the area that the survey was conducted in.

II.A.2. Blue-naped Parrot (*Pikoy*)

Traded Value

The population estimate of the Blue-naped parrots in the Philippines is based on the estimated total number of this species in key sites including Palawan, where most of the Blue-naped parrots in the country can be found (DENR-BMB estimates). The estimated population of *pikoys* is 8,500 spread across the island, with an average traded price of USD100 per parrot (based on FGD responses). As mentioned earlier in this report, the DENR is set to allow a limited harvest equivalent to 1% of the estimated population of the *pikoy* as parental stocks by legitimate commercial breeder/s, which is used as the basis for the calculation of its traded value.

Tourism Value

Tour packages for birdwatching all over the Philippines often include the Blue-naped parrot. The price of a 3-day birdwatching tour is about USD350. This is computed by getting the fraction of a birdwatching tour package that includes Blue-naped parrots. Birdquest Tours (2020) offers a 23-day nationwide birdwatching tour worth USD7,970, where only three days of the tour would have the opportunity to see Blue-naped parrots, resulting in an approximation of USD346. Based on the information collected, it is assumed that there are 70 birdwatchers per tour site (there are two). Each birdwatcher is assumed to travel with at least one companion who will not be part of the birdwatching activity but will, like the birdwatcher, spend money on the plane ticket, board and lodging, and other expenses as a tourist. The plane fare to travel to the site was set at Php5,000 (USD100) per person (applicable to both birdwatchers and their companions). The tourism multiplier of 3.25 was also used to calculate the total impact of the tourists' spending on the local economy.

Ecological Value

The role of parrots in flora is not conclusive, according to the literature and the experts consulted for this study. The information regarding parrots indicates that they can have either a predatory or mutual relationship with plants, given that they are seed predators and consumers of flowers. Blanco et al. (2017; 2015) regards parrots as aid in repairing plant tissues, thus assisting in regrowth and reproduction, and also performs the role of genetic linkers, seed facilitators, and a significant player in plant assemblages. In a nutshell, this is the scientific evidence of the role of parrots in the delivery of environmental services from plants, specifically as a contributor in the creation and maintenance of forest ecosystems. As with the value of the *pawikan*'s contribution to the delivery of ecosystem services, the value of the Blue-naped parrots' contribution to these services is a derived value, emanating from the benefits that society derives from the forests' delivery of environmental goods and services. From Blackwell's (2006) calculations, the economic value per hectare per year of forests is AUD3,609. When adjusting for inflation using a CPI conversion factor, and income differences across countries using a PPP conversion factor, the amount translates, this amounts to about USD1,358. To determine the contribution of the *pikoy* to the economic values of the ecosystem services provided by the forest, it is assumed (through discussions with experts such as those from DENR-BMB and Peter Widmann) that in the lifetime of every parrot (assumed to be six years for the purposes of calculations), each Blue-naped parrot is responsible for the growth of three trees (Widmann and DENR-BMB, 2020). Additionally, because there was no information on the rate of deforestation available, this report arbitrarily assumed the deforestation rate that occurs in the Philippines to be 10% (see Appendix 6 for details). The rest of the assumptions pertain to the population of Blue-naped parrots in the Philippines (8,500) and to the number of trees to be considered a forest (400 trees) based on the information from DENR-BMB and the general definition of a forest.

Existence Value

As for marine turtles, the estimation for the existence value of Blue-naped parrots was based on the WTP responses. The methodology used here is the same that was used to calculate the existence value of marine turtles (see Appendix 5 for more details).

III. Economic Valuation Calculation Results

Based on the collected information, the computational results of the economic valuation of marine turtles and Blue-naped parrots yielded the results shown below. It must be mentioned that these values were strictly based on the information that was available at the time of the data collection and estimation. While the calculations strictly followed the conventional methodology in economic valuation, there is room for refinements in the estimates should more information become available.

III.A. Marine turtles (*Pawikan*)

Table 7: Tourism Value Generated by Marine Turtles

TOURISM VALUE	VALUE	SOURCE OR FORMULA
A1. Price of diving trip, 2 dives (USD)	USD62.00	(Cazabon-Mannette, et al., 2017); Assumption that there are at least 2 dives per trip/boat rental at USD31 per dive.
A2. Price of diving trip, 2 dives (Php)	Php3,100.00	
B1. Price of boat rental (USD)	USD30.00	Based on FGDs conducted by NIRAS in 2019.
B2. Price of boat rental (Php)	Php1,500.00	
C. Quantity of divers per year in 5 marine turtle dive sites	39,900	(Tejero, 2014; Miclat and Arceo, 2018)[11]
D1. Total diving expenditure (USD)	USD3,670,800.00	(A1+B1)*C
D2. Total diving expenditure (Php)	Php183,540,000.00	(A2+B2)*C
E1. Turtle watching travel cost (USD)	USD12.20	Anecdotal informational provided by Cecilia Fischer (Illegal Wildlife Trade Coordinator, Asian Development Bank) in discussion with the author. October 2020.[12]
E2. Turtle watching travel cost (Php)	Php610.00	
F1. Turtle watching entrance fee (USD)	USD2.08	Anecdotal informational provided by Cecilia Fischer (Illegal Wildlife Trade Coordinator, Asian Development Bank) in discussion with the author. October 2020.[13]
F2. Turtle watching entrance fee (Php)	Php104.00	

[11] Dive sites required to estimate the quantity of divers include: El Nido, Palawan; Tubbataha Reef, Palawan; Turtle Islands, Tawi-Tawi; Balabac, Palawan (Miclat and Arceo, 2018); Apo Island, Dumaguete (Tejero, 2014).

[12] Quantitative information from five major turtle watching sites: San Juan, La Union (1,500); San Narciso, Zambales (500); Morong, Bataan (500); Mati, Davao (50); Calawit Island, Palawan (500).

[13] Quantitative information from five major turtle watching sites: San Juan, La Union (0); San Narciso, Zambales (0); Morong, Bataan (20); Mati, Davao (0); Calawit Island, Palawan (500).

G1. Overnight stay per person (USD)	USD70.00	Anecdotal informational provided by Cecilia Fischer (Illegal Wildlife Trade Coordinator, Asian Development Bank) in discussion with the author. October 2020.
G2. Overnight stay per person (Php)	Php3,500.00	
H. Quantity of turtle watching tourists per year in 5 marine turtle watching sites	1,710.00	Anecdotal informational provided by Cecilia Fischer (Illegal Wildlife Trade Coordinator, Asian Development Bank) in discussion with the author. October 2020.[14]
I1. Total turtle watching expenditures (USD)	USD24,418.80	(E1+F1)*H
I2. Total turtle watching expenditures (Php)	Php1,220,940.00	(E2+F2)*H
J1. Plane Fare (per head) (USD)	USD100.00	Based on FGDs conducted by NIRAS in 2019.
J2. Plane Fare (per head) (Php)	Php5,000.00	
K1. Board, lodging, and miscellaneous costs for divers and non-turtle watching tourists (USD)	USD210.00	Based on FGDs conducted by NIRAS in 2019.
K2. Board, lodging, and miscellaneous costs for divers and non-turtle watching tourists (Php)	Php10,500.00	
L. Quantity of non-diving tourists	21,000	Based on FGDs conducted by NIRAS in 2019.
M. Multiplier effect	3.25	(Sicat, 2019)
N1. Total non-diving, non-turtle watching expenditure (USD)	USD48,214,275.00	((C+H+L)*J1)+(((C+L)*K1)+(H*G1))*M
N2. Total non-diving, non-turtle watching expenditure (Php)	Php2,410,713,750.00	((C+H+L)*J2)+(((C+L)*K2)+(H*G2))*M
O1. TOTAL (USD)	**USD51,909,493.80**	D1+I1+N1
O2. TOTAL (Php)	**Php2,595,474,690.00**	D2+I2+N2

[14] Quantitative information from five major turtle watching sites: San Juan, La Union (2,500); San Narciso, Zambales (500); Morong, Bataan (1,000); Mati, Davao (1,050); Calawit Island, Palawan (3,500).

Table 8: Estimated Value of Ecological Services of Marine Turtles (from Coral Reefs)

ECOLOGICAL VALUE (CORAL REEF)	VALUE	SOURCE OR FORMULA
P1. Value of coral reefs per ha per year (USD)	USD4,110.09	(Blackwell, 2006; van der Ploeg and De Groot, 2010; World Bank, 2005; PSA, 2000–2020)
P2. Value of coral reefs per ha per year (Php)	Php205,504.63	(Blackwell, 2006; van der Ploeg and De Groot, 2010; World Bank, 2005; PSA, 2000–2020)
Q. Size of coral reefs in the Philippines (hectares)	2,600,000	(Azanza, et al., 2017)
R. Conservation rate (UPPER)	0.10%	Assumption/estimate by A. Arcenas and approved by DENR-BMB.
S. Conservation rate (LOWER)	0.05%	Assumption/estimate by A. Arcenas and approved by DENR-BMB.
T1. TOTAL (UPPER, USD)	**USD10,686,240.71**	P1*Q*R
U1. TOTAL (LOWER, USD)	**USD5,343,120.35**	P1*Q*S
T2. TOTAL (UPPER, Php)	**Php534,312,035.41**	P2*Q*R
U2. TOTAL (LOWER, Php)	**Php267,156,017.70**	P2*Q*S

Table 9: Estimated Value of Ecological Services of Marine Turtles (from Seagrass)

ECOLOGICAL VALUE (SEAGRASS)	VALUE	SOURCE OR FORMULA
V1. Value of seagrass per ha per year (USD)	USD12,857.32	(Blackwell, 2006; van der Ploeg and De Groot, 2010; World Bank, 2005; PSA, 2000–2020)
V2. Value of seagrass per ha per year (Php)	Php642,866.07	(Blackwell, 2006; van der Ploeg and De Groot, 2010; World Bank, 2005; PSA, 2000–2020)
W. Area of seagrass in the Philippines (hectares)	97,800	(Azanza, et al., 2017)
X. Conservation rate (UPPER)	0.10%	Assumption/estimate by A. Arcenas. Approved by BMB.
Y. Conservation rate (LOWER)	0.05%	Assumption/estimate by A. Arcenas. Approved by BMB.
Z1. TOTAL (UPPER, USD)	**USD1,257,446.03**	V1*W*X
AA1. TOTAL (LOWER, USD)	**USD628,723.02**	V1*W*Y
Z2. TOTAL (UPPER, Php)	**Php62,872,301.71**	V2*W*X
AA2. TOTAL (LOWER, Php)	**Php31,436,150.85**	V2*W*Y

Table 10: Existence Value of Marine Turtles

EXISTENCE VALUE	VALUE	SOURCE OR FORMULA
AB1. Willingness-to-pay to protect marine turtles (USD)	USD3.08	Based on the Economic Valuation and Consumer Research survey conducted by NIRAS in 2019–2020.
AB2. Willingness-to-pay to protect marine turtles (Php)	Php154.10	
AC. Quantity of payors/ contributors	60,364,000	(PSA, 2019a; PSA, 2019b)
AD1. TOTAL (USD)	**USD186,041,848.00**	AB1*AC
AD2. TOTAL (Php)	**Php9,302,092,400.00**	AB2*AC

III.B. Blue-naped Parrots (*Pikoy*)

Table 11: Traded Value of Sustainably Harvested and Traded Blue-naped Parrots

TRADED VALUE	VALUE	SOURCE OR FORMULA
A1. Price (USD)	USD100.00	Based on FGDs conducted by NIRAS in 2019.
A2. Price (Php)	Php5,000.00	
B. Population of Blue-naped parrots	8,500	P. Widmann (Co-founder, Katala Foundation), with BMB concurrence, in discussion with the author. September 2020.
C. Harvest rate	1%	Assumption/estimate by A. Arcenas. (With BMB concurrence. September 2020.)
D1. TOTAL (USD)	**USD8,500.00**	A1*B*C
D2. TOTAL (Php)	**Php425,000.00**	A2*B*C

Table 12: Tourism Value (Birdwatching and Related Activities) Generated by Blue-naped Parrots

TOURISM VALUE	VALUE	SOURCE OR FORMULA
E1. Price of birdwatching (for a 3-day tour; held twice a year) (USD)	USD246.00	(Birdquest Tours, 2020); Note: The total USD346 price of birdwatching was separated into the tour part (USD246) and the board, lodging and miscellaneous costs (USD100). This was done to account for the multiplier effect which only applies to the latter.
E2. Price of birdwatching (for a 3-day tour; held twice a year) (Php)	USD12,300.00	
F. Quantity of birdwatchers (for the bi-annual event)	140	Based on FGDs conducted by NIRAS in 2019.
G1. Total birdwatching expenditure (USD)	USD34,440.00	E1*F
G2. Total birdwatching expenditure (Php)	Php1,722,000.00	E2*F
H1. Plane fare (per head) (USD)	USD100.00	Based on FGDs conducted by NIRAS in 2019.
H2. Plane fare (per head) (Php)	Php5,000.00	
I1. Board, lodging, and miscellaneous costs (for the 3-day stay) (USD)	USD100.00	Based on FGDs conducted by NIRAS in 2019.
I2. Board, lodging, and miscellaneous costs (for the 3-day stay) (Php)	Php5,000.00	
J. Quantity of Non-birdwatching Tourists in the Philippines per year	140	Based on FGDs conducted by NIRAS in 2019.
K. Multiplier effect	3.25	(Sicat, 2019)
L1. Total non-birdwatching expenditure (USD)	USD119,000.00	((F+J)*H1)+((F+J)*I1*K
L2. Total non-birdwatching expenditure (Php)	Php5,950,000.00	((F+J)*H2)+((F+J)*I2*K
M1. TOTAL (USD)	**USD153,440.00**	G1+L1
M2. TOTAL (Php)	**Php7,672,000.00**	G2+L2

Table 13: Estimated Value of Ecological Services of Blue-naped Parrots (from Forests)

ECOLOGICAL VALUE (FORESTS)	VALUE	SOURCE OR FORMULA
O1. Monetary value of tropical forest per ha per year (USD)	USD1,357.85	(Blackwell, 2006; van der Ploeg and De Groot, 2010; World Bank, 2005; PSA, 2000-2020)
O2. Monetary value of tropical forest per ha per year (Php)	Php67,892.64	
P. Total tree formation attributed to current population of Blue-naped parrot (UPPER LIMIT = 14 year longevity)	1,691,473	Estimate by A. Arcenas. P. Widmann (Co-founder, Katala Foundation), with BMB concurrence, in discussion with the author. September 2020.
Q. Total tree formation attributed to current population of Blue-naped parrot (LOWER LIMIT = 6 year longevity)	165,723	Estimate by A. Arcenas. P. Widmann (Co-founder, Katala Foundation), with BMB concurrence, in discussion with the author. September 2020.
R. Average number of trees per ha	400	Assumption made by A. Arcenas based on general definition of forests.
S. Quantity of trees (ha; UPPER)	4,228.68	P/R
T. Quantity of trees (ha; LOWER)	414.31	Q/R
U1. TOTAL (UPPER; USD)	**USD5,741,927.56**	O1*S
V1. TOTAL (LOWER; USD)	**USD562,570.27**	O1*T
U2. TOTAL (UPPER; Php)	**Php287,096,378.08**	O2*S
V2 TOTAL (LOWER; Php)	**Php28,128,513.43**	O2*T

Table 14: Existence Value of Blue-naped Parrots

EXISTENCE VALUE	VALUE	SOURCE OR FORMULA
W1. Willingness-to-pay to protect Blue-naped parrots (USD)	USD11.06	Based on the Economic Valuation and Consumer Research survey conducted by NIRAS in 2019–2020.
W2. Willingness-to-pay to protect Blue-naped parrots (Php)	Php552.97	
X. Quantity of payors/contributors	60,364,000	(PSA, 2019a; PSA, 2019b)
Y1. TOTAL (USD)	**USD667,589,621.60**	W1*X
Y2. TOTAL (Php)	**Php33,379,481,080.00**	W2*X

IV. Summary of Economic Values

From the adjusted calculations (adjusted for differences in prices) and given two scenarios (low high) for the contribution to ecological services, the results show that marine turtles generate a **total use** value ranging from around USD57.9 million to almost USD63.9 million per year, while the Blue-naped parrots' total use value is only a fraction at around USD724,510 million to USD5.9 million per year. The non-use value of the parrots, however, dwarfs that of the marine turtles by several folds, generating an existence value of USD667.6 million compared with the marine turtles' USD186.0 million. Gathered from the focus group discussions conducted for this research project, the reason for this large discrepancy appears to be that many members of the community view marine turtles as source of food and income, which brought the average WTP to protect them down (because they are desired more for the use value they bring-in). In contrast, the Blue-naped parrots are not consumed directly as food, and are only regarded as pets, indicating that they are more valuable alive. A summary of the estimated economic values of the marine turtles (*pawikan*) and Blue-naped parrots (*pikoy*) is shown below. The results of the calculations for the total use and total non-use values for the marine turtles and Blue-naped parrots are shown separately for the reader to see the difference in values.

Table 15: Total Economic Value of Marine Turtles

Value Categories (USD)	Lower Bound	Upper Bound
Total Flow Use Value (yearly)	USD57,881,337.17	USD63,853,180.54
Total Stock Use Value (lifespan)[15]	USD634,394,523.62	USD699,847,481.62
Per specimen Use Value (lifespan)	USD86,974.85	USD95,948.38
Flow Nonuse Value (yearly, existence)	USD186,041,848.00	
Stock Nonuse Value (lifespan, existence)	USD2,039,067,086.28	

[15] For the purposes of this study, two different discount rates were considered for the computation of the stock or lifespan values of both the *pawikan* and the *pikoy*. The 10% discount rate is employed here in the final calculations as recommended by the National Economic Development Authority (NEDA) and endorsed by the Wildlife Resources Division of BMB and the technical working group on Economic Valuation of DENR-BMB in order to be consistent with the discount rates used by various Philippine government institutions. It must be noted that a 6% discount rate was also considered based on what the ADB uses to evaluate socio-environmental projects (the ADB guidelines specify 9% as the standard discount rate except for projects that have socio-environmental outcomes). A comparative table of the valuations employing these two discount rates can be found in Appendices 7 and 8.

Table 16: Total Economic Value of Blue-naped Parrots

Value Categories (USD)	Lower Bound	Upper Bound
Total Flow Use Value (yearly)	USD724,510.27	USD5,903,867.56
Total Stock Use Value (lifespan)	USD3,879,941.37	USD31,616,749.93
Per specimen Use Value (lifespan)	USD456.46	USD3,719.62
Flow Nonuse Value (yearly, existence)	USD667,589,621.60	
Stock Nonuse Value (lifespan, existence)	USD3,575,116,463.92	

From the results, the per specimen economic use value of a marine turtle at 10% discount rate ranges from USD86,975 to USD95,948. Meanwhile the Blue-naped parrot's use is valued at USD456 to USD3,720 at a 10% discount rate. Note that the even as convention dictates that the total use and total non-use values be combined to determine the total economic value of the species, it is recommended that that the two sets of values be described separately for policy analysis because the non-use value is highly subjective and strictly speaking not a compelling argument for policy reform. For public relations purposes, however, the total economic value, wherein both the use and non-use values are combined, could be used because the intent is to move the public to action, and the representation of the existence value of the resource indicates the intrinsic preservation value of the wildlife.

References

Aabdullah, S., Markandya, A. and P.A.L.D. Nunes. (2011). ‘Introduction To Economic Valuation Methods’ in Amit Batabyal & Peter Nijkamp (Eds.). Research Tools in Natural Resource and Environmental Economics, Chapter 5. World Scientific, US. pp. 143–187.

Abhishek, K. (2008). Why Warren Buffet Suggests- ‘Price Is What You Pay, Value Is What You Get’?. Trade Brains. Retrieved from: https://tradebrains.in/warren-buffet-price-is-what-you-pay-value-is-what-you-get/ (access date: 25 Oct 2020).

Aragones, L., and Marsh, H. (2000). Impact of Dugong grazing and turtle cropping on tropical seagrass communities. Pacific Conservation Biology. pp. 277–288.

Aragones, L., Lawler, I., Foley, W., and Marsh, H. (2006). Dugong grazing and turtle cropping: Grazing optimization in tropical seagrass systems? Oecologia. 149. pp. 635–647.

Arrow, K., Solow, R., Portney, P., Leamer, E., Radner, R., and Schuman, H. (1993). Report of the NOAA Panel on Contingent Valuation. National Oceanic and Atmospheric Administration.

ASEAN Clearing House Mechanism. (2020). Coral Reefs: The marine forest. Accessed on February 1, 2020. Retrieved from: http://chm.aseanbiodiversity.org/index.php?option=com_content &view=article&id=168&Itemid=168

Avens, L., Goshe, L., Coggins, L., Snover, M., Pajuelo, M., Bjorndal, K., Bolten, A. (2015). Age and size at maturation- and adult-stage duration for loggerhead sea turtles in the western North Atlantic. Marine Biology. 162. pp. 1749–1767.

Azanza, R., Alino, P., Cabral, R., Juinio-Menez, M.A., Pernia, E., Mendoza, R., Siriban, C. (2017). Valuing and Managing the Philippines’ Marine Resources toward a Prosperous Ocean-Based Blue Economy. Public Policy. Vol. 18. pp. 1–26.

BirdLife International (2018). Tanygnathus lucionensis . The IUCN Red List of Threatened Species 2018: e.T22685009A132056469. https://dx.doi.org/10.2305/IUCN.UK. 2018-2.RLTS.T22685009A132056469.en. Downloaded on 23 January 2020.

Birdquest Tours. (2020). Classic Philippines (Luzon, Palawan & Mindanao): Birding Tours. Retrieved from: https://www.birdquest-tours.com/birding-tours/philippines-classic/ (access date: 23 January 2020).

Blackwell, B.D. (2006). The economic value of Australia’s natural coastal assets: some preliminary findings. Australian and New Zealand Society for Ecological Economics Conference Proceedings, Ecological Economics in Action, December 11–13, 2005, New Zealand.

Blanco, G., Hiraldo, F., Rojas, A., Dénes, F. V., and Tella, J. L. (2015). Parrots as key multilinkers in ecosystem structure and functioning. Ecology and Evolution, 5(18), 4141–4160. doi:10.1002/ece3.1663

Blanco, G., Hiraldo, F., and Tella, J. (2017). Ecological functions of parrots: an integrative perspective from plant life cycle to ecosystem functioning, Emu 118(1). doi: 10.1080/01584197.2017.1387031

Bureau of Fisheries and Aquatic Resources. (2013). PHILIPPINE CORAL REEFS. (BFAR). Accessed on February 1, 2020. Retrieved from https://www.bfar.da.gov.ph/habitat.jsp?id=4

Casale, P., and Ceriani, S. (2020). Sea turtle populations are overestimated worldwide from remigration intervals: correction for bias. Endangered Species Research. Vol. 41. pp. 141–151.

Casale, P., and Heppell, S. (2016). How much sea turtle bycatch is too much? A stationary age distribution model for simulating population abundance and potential biological removal in the Mediterranean. Endangered Species Research. Vol. 29. pp. 239–254.

Cazabon-Mannette, M., Schuhmann, P. W., Hailey, A., and Horrocks, J. (2017). Estimates of the non-market value of sea turtles in Tobago using stated preference techniques. Journal of Environmental Management, 192, 281–291. doi:10.1016/j.jenvman.2017.01.072

Chee, Y.E. (2004). An ecological perspective on the valuation of ecosystem services. Biological Conservation. 120. pp. 549-565.

Department of Environment and Natural Resources-Biodiversity Management Bureau. (2018a). Marine Turtle Nesting Sites. (DENR-BMB).

Fleming, TH., and Kress, WJ. (2013). The ornaments of life. Chicago, IL: University of Chicago Press.

Goatley, C. H. R., Hoey, A. S., and Bellwood, D. R. (2012). The Role of Turtles as Coral Reef Macroherbivores. PLoS ONE, 7(6), e39979. doi:10.1371/journal.pone.0039979

Heppell, S. S., and Crowder, L. B. (1996). Analysis of a Fisheries Model for Harvest of Hawksbill Sea Turtles (Eretmochelys imbricata). Conservation Biology, 10(3), 874–880. doi:10.1046/j.1523-1739.1996.10030874.x

Lam, T., Xu Ling, Takahashi, S., and Burgess, E.A. (2011). Market Forces: An Examination of Marine Turtle Trade in China and Japan. TRAFFIC East Asia, Hong Kong.

Louviere, J., Hensher, D., and Swait, J. (2000). Stated Choice Methods: Analysis and Applications. Cambridge University Press.

Miclat, E. and Arceo, H. (eds) (2018). A sea of safe havens: establishing the marine turtle protected area network in the Philippines. Philippine inputs to the transboundary marine turtle protected area network in the Sulu-Sulawesi Seascape, a priority seascape in the Coral Triangle Initiative Regional Plan of Action. GIZ-CI Support to the Sulu-Sulawesi Seascape Project (Contract No. 81156987). Conservation International Philippines, Quezon City, Philippines. 36p.

More, T.A., Averill, J.R., Stevens, T.H.. (1996). Values and Economics in Environmental Management: A Perspective and Critique. Journal of Environmental Management. 162.

National Research Council. (2005). Valuing ecosystem services: toward better environmental decision-making. (NRC). Washington, DC: National Academy Press. Pompe JJ and Rinehart JR. 1995.

National Wildlife Federation. (2020). Hawksbill Sea Turtle. (NWF). Accessed on February 1, 2020. Retrieved from https://www.nwf.org/Educational-Resources/Wildlife-Guide/Reptiles/Sea-Turtles/Hawksbill-Sea-Turtle

Pearce, D.W. and Moran, D. (1994). The Economic Value of Biodiversity. Earthscan, 1994 – Business & Economics.

Philippine Statistics Authority. (2000–2020). Table 1 Monthly Consumer Price Index for All Income Households in the Philippines by Commodity Group. Consumer Price Index and Inflation Rate. (PSA).

Philippine Statistics Authority. (2010). Projected Population, by Age Group, Sex, and by Single-Calendar Year Interval, Philippines: 2010–2020 (Medium Assumption). 2010 Census based Population Projections in collaboration with the Inter-Agency Working Group on Population Projections. (PSA).

Philippine Statistics Authority. (2019a). 2019 Philippine Statistical Yearbook. (PSA).

Philippine Statistics Authority. (2019b). Total population by geographic location (based on 2000, 2010 and 2015 Censuses). Population and Migration. OpenSTAT. (PSA).

Philippine Statistics Authority. (2019c). Urban Population in the Philippines (Results of the 2015 Census of Population). (PSA).

SeaWorld Parks & Entertainment, Inc. (2020). Sea Turtles: Reproduction. Access: https://seaworld.org/animals/all-about/sea-turtles/reproduction/

Sicat, G. (2019). Tourism as a driver of growth and employment. CROSSROADS (Toward Philippine Economic and Social Progress. Philippine Star. https://www.philstar.com/business/2019/01/09/1883377/tourism-driver-growth-and-employment

Silva, D. (2018). This population of green sea turtles is nearly all female, signaling a major problem. NBC News. Retrieved from https://www.nbcnews.com/science/environment/population-green-sea-turtles-nearly-all-female-signalling-major-problem-n837341

Tejero, W. (2014). An Analysis of Recreational Value of Apo Island, Philippines. Economic and Environment Program for Southeast Asia 1(1).

Tella, J.M Banos-Villalba, A., Hernandez-Brito, D., Rojas, A., Pacifico, E., Diaz-Luque, J., Carrete, M., Blanco, G., and Hiraldo, F. (2015). Parrots as overlooked seed dispersers. Frontiers in Ecology and the Environment. Vol. 13, Issue 6.

Tesileanu R. (2008). Valuing non-market environmental goods: a critical analysis of various valuation methods. Diploma Thesis. University of Freiburg. Feriburg, Germany.

Van der Ploeg, S., and De Groot, D. (2010). The TEEB Valuation Database: a searchable database of 1310 estimates of monetary values of ecosystem services. Foundation for Sustainable Development.

VerticalScope, Inc. (2013). Blue Naped Parrot. Accessed on February 1, 2020. Retrieved from https://www.petguide.com/breeds/bird/blue-naped-parrot/

Widmann, P. (2020, August 12). Personal communication. Katala Foundation Inc.

World Bank. (2020). PPP conversion factor, GDP (LCU per international $). World Development Indicators. World Bank (WB) Open Data. Accessed May 28, 2020.

Yaptinchay, AA. (2016). Endangered Pawikan still at high risk. Philippine Daily Inquirer. Retrieved from https://opinion.inquirer.net/96642/endangered-pawikan-still-at-high-risk

Appendixes

1. Value Types within the TEV approach (TEEB, 2010)

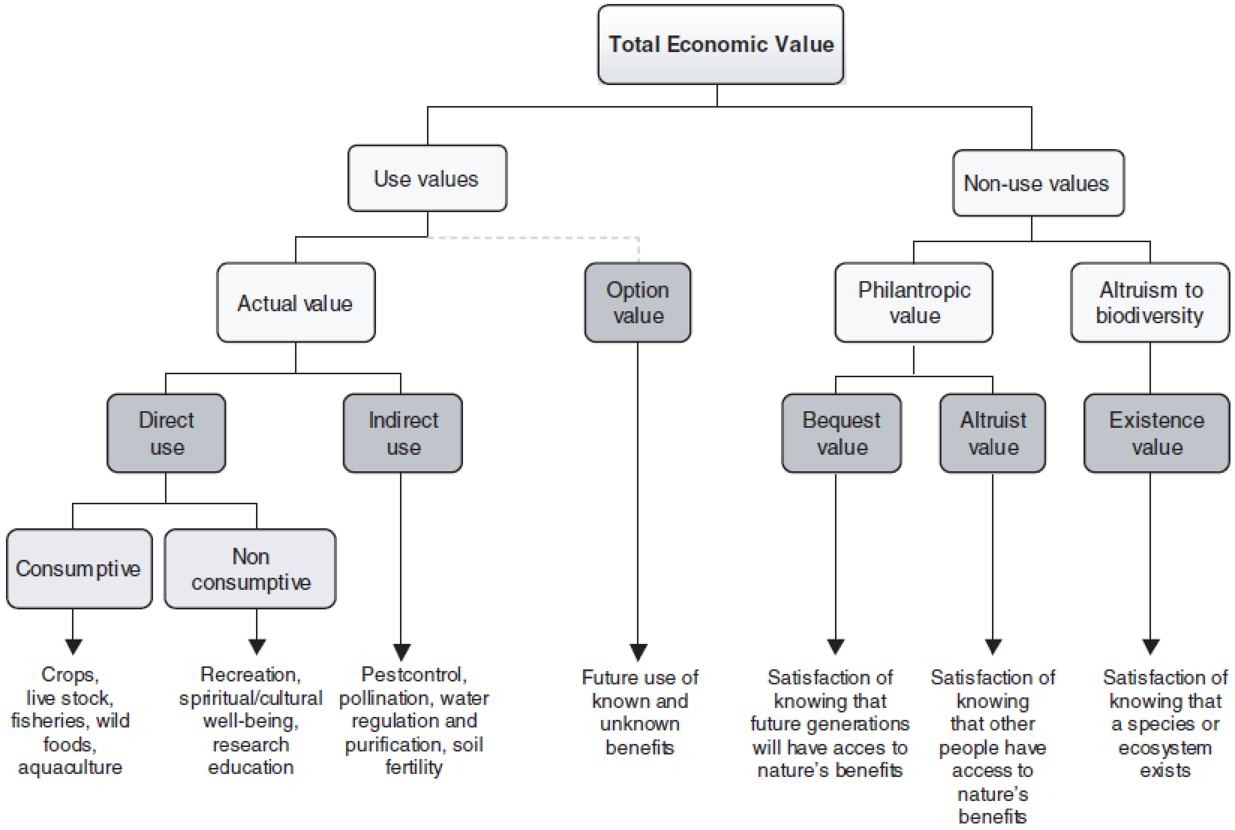

Figure 2: Value Types within the TEV approach (TEEB, 2010)

2. Table 17: Summary of the Technical Descriptions for the Ecological Value of Wildlife (Blackwell 2006)

	ESVD-TEEB Database
ECOLOGICAL VALUE OF TURTLES FROM CORAL REEFS	**USD37,370,997.00**
Variable	Total Economic Value
Calculation Method	= Price (14,373.46 per ha) * Quantity (2,600,000 ha) * Conservation Rate (.10%)
Study Location/Context	Australia
Original Reference/s (if any)	(Blackwell, 2006)
Base Year of Price Level	2005; converted from AUD:USD
ECOLOGICAL VALUE OF TURTLES FROM SEAGRASS	**USD4,397,432.00**
Variable	Total Economic Value
Calculation Method	= Price (44,961.53 per ha) * Quantity (97,800 ha) * Conservation Rate (.10%)
Study Location/Context	Australia
Original Reference/s (if any)	(Blackwell, 2006)
Base Year of Price Level	2005; converted from AUD:USD
ECOLOGICAL VALUE OF PARROTS FROM TROPICAL FORESTS	**USD252,000.00**
Variable	Total Economic Value
Calculation Method	= Price (4,749.57 per ha) * Quantity (53 ha)
Study Location/Context	Australia
Year of Original Study (if any)	(Blackwell, 2006)
Base Year of Price Level	2005; converted from AUD:USD

3. Table 18: Summary of the Literature Review for the Technical Descriptions of the Ecological Values of Wildlife

	(Azanza, et al., 2017)	(de Groot, et al., 2012)	(Blackwell, 2006) ESVD-TEEB Database
ECOLOGICAL VALUE OF TURTLES FROM CORAL REEFS	**USD6,102,000.00**	**USD915,847,400.00**	**USD37,370,997.00**
Variable	Net Annual Benefits	Total Economic Value	Total Economic Value
Calculation Method	= Price (2,347 per ha) * Quantity (2,600,000 ha) * Conservation Rate (.10%)	= Price (352,249 per ha) * Quantity (2,600,000 ha) * Conservation Rate (.10%)	= Price (14,373.46 per ha) * Quantity (2,600,000 ha) * Conservation Rate (.10%)
Study Location/Context	Philippines	Global Average	Australia
Original Reference/s (if any)	(Samonte-Tan, et al., 2007; de Groot, et al., 2012)	94 estimates from as far back as 1992 to as recent as 2009 (ESVD-TEEB)	(Blackwell, 2006)
Base Year of Price Level	2007	2007	2005; converted from AUD:USD
ECOLOGICAL VALUE OF TURTLES FROM SEAGRASS	**USD4,010.00**	None (seagrass is lumped with other blue carbon ecosystems)	**USD4,397,432.00**
Variable	Net Annual Benefits		Total Economic Value
Calculation Method	Price (41 per ha) * Quantity (97,800 ha) * Conservation Rate (.10%)		= Price (44,961.53 per ha) * Quantity (97,800 ha) * Conservation Rate (.10%)
Study Location/Context	Philippines		Australia
Original Reference/s (if any)	(Samonte-Tan, et al., 2007; de Groot, et al., 2012)		(Blackwell, 2006)
Base Year of Price Level	2007		2005; converted from AUD:USD
ECOLOGICAL VALUE OF PARROTS FROM TROPICAL FORESTS	None (study is for marine ecosystems only)	**USD279,000.0f0**	**USD252,000.00**
Variable		Total Economic Value	Total Economic Value
Calculation Method		= Price (5,264 per ha) * Quantity (53 ha)	= Price (4,749.57 per ha) * Quantity (53 ha)
Study Location/Context		Global Average	Australia
Year of Original Study (if any)		96 estimates from as far back as 1983 to as recent as 2009 (ESVD-TEEB)	(Blackwell, 2006)
Base Year of Price Level		2007	2005; converted from AUD:USD

4. Survey Technical Notes

NON-USE VALUE

Survey Instrument Design

The survey is a tablet-based, digital questionnaire using the Kaizala application. It is composed of 151 questions divided into five sections. Part I, General Information asks questions regarding basic information, certain socio-demographic variables, household composition, etc. Part II, Knowledge and Practices for Parrots, is a series of questions regarding respondents' knowledge of the taxa and its importance to the community, purchasing behaviors with respect to the species and its by-products, and the laws and values surrounding the protection of parrots in their community, as well as the Philippines in general. Part III, Knowledge and Practices for Marine Turtles, is a parallel section that investigates consumption and valuation patterns, this time, with regard to marine turtles. Part IV is a brief section on Knowledge and Practices for Other Wildlife, and Part V, Communication, is an investigation into communication preferences, influences on the respondent's purchasing behaviors, and the effectiveness of previous wildlife protection messages and materials. It should be noted that the original framework of the survey focuses on wildlife knowledge and consumer profiling; the economic valuation is a set of rider questions that were added later on due to the time and financial constraints of the project.

Sampling Design and Survey Format

After lengthy discussions with institutional partners, relevant government agencies and law enforcement, as well as experts of the natural and social sciences related to wildlife protection and conservation, sites were selected on the basis of either the presence of any of the specified wildlife being studied, and/or reports of illegal trade activity relating to these taxonomic groups. After this preliminary screening, two barangays were selected for each of the cities and municipalities that fulfilled the previous criteria. The first barangay would serve as a target area where the trading of wildlife and the consumption of their by-products is said to occur with some degree of regularity; in contrast, the second barangay would serve as a randomly-selected control area. Below is a full list of the final survey sites and the target number of responses per location.

Table 19: Site Selection and Corresponding Target Sample Size

General Location	**City/Municipality**	**Barangay**	**Target Sample Size**
Metro Manila	Manila City	Brgy. 216 (Tondo District)	40
		Brgy. 458 (Sampaloc District)	40
	San Juan City	Brgy. Batis	40
		Brgy. San Perfecto	40
Cebu Province	Cebu City	Brgy. Suba	40
		Brgy. Kalunasan	40
	Minglanilla	Brgy. Guindaruhan	40
		Brgy. Linao	40
Surigao del Sur, CARAGA	San Miguel	Brgy. San Roque	40
		Brgy. Polacion	40
	Barobo	Brgy. San Vicente	40
		Brgy. Amaga	40
Surigao Del Norte, CARAGA	Taganaan	Brgy. Cawilan	40
		Brgy. Sampaguita	40
	Tubod	Brgy. Del Rosario	40
		Brgy. San Pablo	40

Priority Area: Confiscation Location for Parrots
Priority Area: Confiscation Location for Marine Turtles

Through the cooperation of both the Barangay Captain and city or municipality Mayor, lists of all households were obtained from each of the relevant barangay offices. A table of non-repeating, randomly-generated numbers equal to more than thrice the sample size was constructed for each barangay; each number was matched to the list of provided names and respective addresses in order to produce an initial list of households to be interviewed, as well as a secondary list of substitute households.

These lists were given to the respective field supervisors in each province; a pre-test of the survey questionnaire and equipment involved were conducted by the supervisors before proceeding to the training of the enumerators, and finally, the survey proper.

During the survey, enumerators were given their assignments, household lists, allowances, and survey equipment at the start of each week. They would meet with their supervisors and any officials such as the Barangay Captain, *tanod*, or barangay health worker at 8:00am before splitting up to conduct their individual interviews. Households on the initial list were approached for an interview first; in case an enumerator had gone through the entire initial list but was still unable to meet their daily or weekly interview quota, they would then proceed to surveying those on the secondary list. The survey would continue until 5:00pm each day; for security purposes, they would then report to and discuss their concerns with their supervisors being dismissed. At the end of each week, the issues and concerns of the past week were discussed by the entire team before the next set of barangay assignments and reminders were given.

In Metro Manila, the original survey period was set for Dec. 7 to Dec. 15, 2019. However, due to complications such as technical issues relating to the survey equipment used and low response rate because of the holiday season, the survey period was extended to Jan. 11 to Jan. 12, 2020. During their exit interview, a number of enumerators reported having difficulty pursuing questions regarding the purchasing of illegal wildlife. Either because respondents, understandably, were careful not to incriminate themselves, or because respondents did not have any experience engaging in these illicit activities, those interviewed would skip questions or sections of the survey, or outright refuse to participate in it.

The Cebu City and Minglanilla surveys were conducted from Dec. 16 to Dec. 20, 2019; similar to the Metro Manila situation, upon further assessment by the team of experts and the Cebu province field supervisor, an extension of the survey was scheduled some time between February and March, 2020. It should be noted that, because of COVID-19, the on-going global pandemic, the continuation of the Cebu province survey, as well as the surveys of Surigao del Norte and Surigao del Sur, have been postponed indefinitely.

Summary Statistics and Profile of Respondents

Location: Overall, there were 81 respondents from Manila City and 80 respondents from San Juan City. This could be further broken down to 43 respondents from Brgy. 216 and 38 respondents from Brgy. 458, Manila City, and 40 respondents from Brgy. Tibagan, and 40 respondents from Brgy. Batis, San Juan City. In Minglanilla, Cebu, 39 respondents came from Brgy. Guindaruhan, and 34 respondents resided in Brgy. Linao. An additional 44 respondents from Brgy. Kalunasan, Cebu City await processing and cleaning.

Profile: In terms of age, respondents in Metro Manila were fairly evenly spread across the different age groups; the 45–54 age group had the most number of respondents at 36, followed by the 25–34 group at 32. While most of the age groups had somewhere between 26–36 respondents, the 65 and above category had the fewest number of interviews at 13. A majority of those surveyed were female; 99 of the respondents were women, 60 were men, and three did not answer, or identified as a different gender. With regard to the educational attainment, 107 or more than half of the respondents completed their high school degree; 44 of those surveyed had an education level lower than high school graduate, and 11 respondents did not answer the question.

For Cebu respondents, the age group with the highest number of respondents came from the 55–64 category, followed by the 25–34 category. They had 23 and 15 respondents, respectively. The majority of the interviewees were women; there were 44 female respondents, 24 male respondents, and five respondents who either identified otherwise or declined to answer. Unlike the profile of those in the more highly urbanized areas of Metro Manila, 43 respondents or a majority of those interviewed in Minglanilla did not finish high school; 17 respondents answered having a high school level education, 18 answered having elementary graduate education, and eight answered having elementary level education. In comparison, 25 people in total responded to having high school graduate education or higher.

Household Composition: 77 or almost half of the respondents in Metro Manila were married, 57 were single, and 15 reported as either widowed or annulled; the remaining 13 opted not to answer the question. Pertaining to family size, 53 respondents belonged to a household of about one to four people, 51 were from a household of five to six people, and 46 were from a household of seven or more people.

As for income, 33 respondents reported having earnings from between Php0 to Php10,000 a month, 67 respondents earned somewhere between Php10,001 to Php20,000 a month, and 25 were in the following bracket of Php20,001 to Php30,000. Only 18 respondents answered earning more than Php30,000 a month. Due to the nature of the question, as well as the survey as a whole, the section may benefit from having a side-by-side at monthly household income and expenditure. 100 respondents, or about 59.9% of those surveyed reported having a monthly income of Php0–Php20,000, but 128 or 79.0% reported having a monthly expenditure of the same range. Increasing this threshold to Php30,000 and below, 125 interviewees or about 74.9% earned somewhere in that range, while 136 or 84.0% of survey respondents answered having total monthly expenses in that same range.

In Minglanilla, a majority of respondents, 49 people to be exact, were married; 11 were single, eight were widowed, and five declined to answer. In terms of family size, 50 respondents had households of about three to six people, while 18 reported having more than six people living in their home.

Minglanilla respondents share a similar spread with Metro Manila respondents in terms of monthly income and expenditure. Five respondents had incomes of more than Php30,000, seven respondents had incomes ranging from between Php20,001 to Php30,000, 28 respondents had incomes within the Php10,001 to Php20,000 range, and 29 had incomes less than Php10,000. However, the number of those with monthly expenses less than Php10,000 increases to about 53; only 14 respondents had monthly household expenditures within the Php10,001 to Php20,000 range, while only one other respondent spent more than Php20,000 on a monthly basis.

Existence Value

The survey data was ordered by city or municipality before the respective average monetary contributions for both parrots and marine sea turtles were calculated based on the willingness-to-pay (WTP) responses of interviewees in each area. Individually for the two forms of wildlife in question, the average weighted monetary contribution of urban residents was calculated using the average WTP values from Manila City and San Juan City weighted by their respective population ratios (PSA, 2019a; PSA, 2019b). Because of the survey limitations discussed previously, the average weighted monetary contribution of rural residents was drawn simply from the WTP values of interviewed Minglanilla residents. The final average weighted monetary contributions statistic was estimated using the individual rural and urban contributions weighted by percent of rural and urban residents to total Philippine population (PSA, 2019c).

$$WTP^{i}_{urban\ average} = \left\{\left(\frac{\sum WTP^{i}_{SanJuan\ responses}}{number\ of\ San\ Juan\ responses}\right)\left(\frac{population_{San\ Juan}}{population_{San\ Juan+Manila}}\right) + \left\{\left(\frac{\sum WTP^{i}_{Manila\ responses}}{number\ of\ Manila\ responses}\right)\left(\frac{population_{Manila}}{population_{San\ Juan+Manila}}\right)\right\}\right\} \quad (1)$$

$$WTP^{i}_{rural\ average} = \left(\frac{\sum WTP^{i}_{Minglanilla\ responses}}{number\ of\ Minglanilla\ responses}\right) \quad (2)$$

$$WTP^{i}_{country\ average} = \left\{\left(WTP^{i}_{urban\ average}\right)(MM\ population)\left(\frac{population_{urban}}{population_{country}}\right)\right\} + \left\{\left(WTP^{i}_{rural\ average}\right)(CBU\ population)\left(\frac{population_{rural}}{population_{country}}\right)\right\} \quad (3)$$

where i is the species or taxa in question. Multiplying the final average weighted monetary contributions to the working adult population in the country resulted in the total existence values of marine sea turtles and parrots per year (PSA, 2010). Multiplying the respective total valuations by the average lifespans of each taxa, and then dividing the statistics by the total global population of the wild animals yielded the final result of existence value per unit. Unfortunately, no global population of parrots has yet been estimated, and so only the existence value per unit of marine sea turtles has been provided.

$$Existence\ Value^{i} = WTP^{i}_{country\ average} * population_{country}\ (4)$$

5. Notes on the Calculation of the Ecological Values

Grazing activities by certain species of marine sea turtles have been linked to an increase in the forage quality (in terms of species composition and nutritional quality) of certain types of seagrass, which in turn affects the feeding of these turtles as well as other marine herbivores (Aragones, et al. 2006). They are also key components in the resilience of coral reefs through the removal of algae and maintenance of algal communities competing with reef-building corals for benthic space (Goatley, et al., 2012). On the other hand, these grazing disturbances cause by sea turtles competing or at least existing with other marine herbivores such as dugongs necessitate, at least for seagrass, a period of recovery largely dependent on the scale of grazing, and the timing and location of the disturbance (Aragones & Marsh 2000). The issue of how to measure and appraise the true value of these ecosystem dynamics were brought up; unfortunately, without any formal models to evaluate and attribute the exact impact of macroherbivory on coral reefs and sea turtle grazing on seagrass growth, all while isolating the influence of grazing activities by other sea animals, any economic valuation of these ecosystem service will be limited at best.

The ecological value of marine turtles derived from coral reefs and from seagrass are a function of their respective prices, quantities, and a set of assumed conservation rates (under high, medium, and low regimes) quantifying the impact of the taxa on the two ecosystems. The price of a hectare of coral reefs was derived from the study of Blackwell (2006) as presented in The Economics of Ecosystems and Biodiversity (TEEB) ecosystem services valuation database (van der Ploeg and De Groot, 2010). Adjustments were made by way of applying the Purchasing Power Parity (PPP) conversion factor onto the per hectare value of coral reefs, resulting in a 2005 Philippine price from the original 2005 Australian data (World Bank, 2020). These were then updated to current 2020 price levels using the Consumer Price Indices (CPI) reported by PSA (2000–2020). The same process was used to obtain the updated Philippine price of a hectare of seagrass.

$$Ecological\ Value^{turtles} = \left[\sum_j \left\{\left(price_j * quantity_j\right)\left(conservation\ rate_j^{turtles}\right)\right\}\right] * [PPP\ conversion\ factor] * [CPI\ conversion\ factor] \quad (6)$$

where j is the type of ecosystem impacted by the natural functions of marine sea turtles, i.e. coral reefs or seagrass. For parrots in general, some discussion can be had regarding whether the taxa can be counted as having either a mutualistic or antagonistic relationship with plants. According to Tella, et al. (2015), there is this pervasive assumption that parrots are merely seed predators and therefore do not participate in seed-dispersal activities (Fleming and Kress, 2013). There are studies that would rebut this claim, considering parrots are found to be genetic linkers, seed facilitators, and plant protectors (Blanco, et al., 2015). According to their study, “If parrots have a pervasive impact on the ecosystem as linked in multiple processes, we should expect an increasing interaction index with the dominance of plant growth forms, especially with woody plants (trees and shrubs) representing a major proportion of forest biomass.” Given this, Blue-naped parrots can be thought of as contributing to the maintenance of a portion of the tropical forests they reside in (measured in hectares). Because the literature could not provide statistics for the extent of the interaction between the wild animal (whether on the species or on the taxa level) and the forest, a set of high, medium, and low assumptions for their per hectare contribution to forests were employed. The price of a hectare of tropical forest was derived again from Blackwell (2006; van der Ploeg and De Groot, 2010). Similar to the process described previously, the 2005 Australian price was converted into its corresponding Philippine price levels using the PPP conversion factor, and then updated to current prices using the CPI (World Bank, 2020; PSA (2000–2020).

$$Ecological\ Value^{parrots} = \left[\sum_{j} \left\{ \left(price_j * quantity_{j\ attributed\ to\ parrots} \right) \right\} \right] * [PPP\ conversion\ factor] * [CPI\ conversion\ factor] \quad (7)$$

6. Table 20: Summary of the Calculations for the Number of Trees Contributed by Blue-naped Parrots

Time Step (in years)	t	0	1	2	3	4	5	6	7
Total Population	P	8,500.00	8,500.00	14,696.50	20,893.00	31,606.75	46,837.75	69,879.07	97,827.28
Mature pop	M	-	-	8,500.00	8,500.00	14,696.50	20,893.00	31,606.75	38,337.75
Nesting Pairs	N	-	-	4,250.00	4,250.00	7,348.25	10,446.50	15,803.37	19,168.87
Newborns	A	-	-	6,196.50	6,196.50	10,713.75	15,231.00	23,041.32	27,948.22
Change in pop	\delta_p		0.0000000	0.7290000	0.4216310	0.5127913	0.4818907	0.4919391	0.3999512
Trees (without Harvest)				18,589.50	18,589.50	32,141.25	45,692.99	69,123.96	83,844.65
Trees Lost to Deforestation				1,858.95	1,858.95	3,214.12	4,569.30	6,912.40	8,384.46
Contributed Trees with Harvest				16,730.55	16,730.55	28,927.12	41,123.69	62,211.56	75,460.18

Time Step (in years)	t	8.00	9.00	10.00	11.00	12.00	13.00	14.00
Total Population	P	136,376.12	184,585.46	245,665.91	318,849.64	400,112.80	496,178.07	603,274.85
Mature pop	M	52,879.07	66,130.78	83,786.62	100,389.21	123,131.91	143,436.58	167,068.96
Nesting Pairs	N	26,439.53	33,065.39	41,893.31	50,194.61	61,565.96	71,718.29	83,534.48
Newborns	A	38,548.84	48,209.34	61,080.45	73,183.74	89,763.16	104,565.27	121,793.27
Change in pop	\delta_p	0.39	0.35	0.33	0.30	0.25	0.24	0.22
Trees (without Harvest)		115,646.52	144,628.02	183,241.34	219,551.21	269,289.49	313,695.80	365,379.82
Trees Lost to Harvest or Deforestation		11,564.65	14,462.80	18,324.13	21,955.12	26,928.95	31,369.58	36,537.98
Contributed Trees with Harvest		104,081.86	130,165.22	164,917.20	197,596.08	242,360.54	282,326.22	328,841.84

0.3048	Average population growth (under extremely unrealistic assumptions)
165,723.48	Total Trees by Year 6
1,691,472.64	Total Trees by Year 14
10%	Tree Deforestation Rate
0.486	Survival rate

7. Table 21: Summary of the *Pawikan* Value Categories at the Two Recommended Discount Rates

Value Categories (USD)	Lower Bound	Upper Bound
Total Flow Use Value (yearly)	USD57,881,337.17	USD63,853,180.54
Total Stock Use Value (lifespan; discount rate = 6%)	USD989,711,836.48	USD1,091,824,267.86
Total Stock Use Value (lifespan; discount rate = 10%)	USD634,394,523.62	USD699,847,481.62
Per specimen Use Value (based on stock value; DR = 6%)	USD135,688.49	USD149,688.00
Per specimen Use Value (based on stock value; DR = 10%)	USD86,974.85	USD95,948.38
Flow Nonuse Value (yearly, existence)	USD186,041,848.00	
Stock Nonuse Value (lifespan, existence; DR = 6%)	USD3,181,125,869.67	
Stock Nonuse Value (lifespan, existence; DR = 10%)	USD2,039,067,086.28	

8. Table 22: Summary of the *Pikoy* Value Categories at the Two Recommended Discount Rates

Value Categories (USD)	Lower Bound	Upper Bound
Flow Use Value (yearly)	USD724,510.27	USD5,903,867.56
Stock Use Value (lifespan; discount rate = 6%)	USD4,287,162.24	USD34,935,099.14
Stock Use Value (lifespan; discount rate = 10%)	USD3,879,941.37	USD31,616,749.93
Per specimen Use Value (based on stock value; DR = 6%)	USD504.37	USD4,110.01
Per specimen Use Value (based on stock value; DR = 10%)	USD456.46	USD3,719.62
Flow Nonuse Value (yearly, existence)	USD667,589,621.60	
Stock Nonuse Value (lifespan, existence; DR = 6%)	USD3,950,344,307.68	
Stock Nonuse Value (lifespan, existence; DR = 10%)	USD3,575,116,463.92	

Additional References for the Appendixes

Aragones, L., Lawler, I., Foley, W., and Marsh, H. (2006). Dugong grazing and turtle cropping: Grazing optimization in tropical seagrass systems? Oecologia. 149. pp. 635–647.

Aragones, L., and Marsh, H. (2000). Impact of Dugong grazing and turtle cropping on tropical seagrass communities. Pacific Conservation Biology. pp. 277–288.

Avens, L., Goshe, L., Coggins, L., Snover, M., Pajuelo, M., Bjorndal, K., Bolten, A. (2015). Age and size at maturation- and adult-stage duration for loggerhead sea turtles in the western North Atlantic. Marine Biology. 162. pp. 1749–1767.

Azanza, R., Alino, P., Cabral, R., Juinio-Menez, M.A., Pernia, E., Mendoza, R., Siriban, C. (2017). Valuing and Managing the Philippines' Marine Resources toward a Prosperous Ocean-Based Blue Economy. Public Policy. Vol. 18. pp. 1–26.

BirdLife International. (2018). Tanygnathus lucionensis . The IUCN Red List of Threatened Species 2018: e.T22685009A132056469. https://dx.doi.org/10.2305/IUCN.UK. 2018-2.RLTS.T22685009A132056469.en. Downloaded on 23 January 2020.

Birdquest Tours. (2020). Classic Philippines (Luzon, Palawan & Mindanao): Birding Tours. Retrieved from: <https://www.birdquest-tours.com/birding-tours/philippines-classic/> (access date: 23 January 2020).

Blackwell, B.D. (2006). The economic value of Australia's natural coastal assets: some preliminary findings. Australian and New Zealand Society for Ecological Economics Conference Proceedings, Ecological Economics in Action, December 11–13, 2005, New Zealand.

Blanco, G., Hiraldo, F., Rojas, A., Denes, F., and Tella, J. (2015). Parrots as key multilinkers in ecosystem structure and functioning. Ecology and Evolution. 5(18). pp. 4141–4160.

Casale, P., and Ceriani, S. (2020). Sea turtle populations are overestimated worldwide from remigration intervals: correction for bias. Endangered Species Research. Vol. 41. pp. 141–151.

Casale, P., and Heppell, S. (2016). How much sea turtle bycatch is too much? A stationary age distribution model for simulating population abundance and potential biological removal in the Mediterranean. Endangered Species Research. Vol. 29. pp. 239–254.

Cazabon-Mannette, M., Schuhmann, P., Hailey, A., and Horrocks, J. (2017). Estimates of the non-market value of sea turtles in Tobago using stated preference techniques. Journal of Environmental Management. Vol. 192. pp. 281–291.

Department of Environment and Natural Resources-Biodiversity Management Bureau. (2018). Marine Turtle Nesting Sites. (DENR-BMB).

Fleming, TH., and Kress, WJ. (2013). The ornaments of life. Chicago, IL: University of Chicago Press.

Goatley, C., Hoey, A., and Bellwood, D. (2012). The Role of Turtles as Coral Reef Macroherbivores. PLoS One. Vol. 7(6).

Heppell, S.S., and Crowder, L. (1996). Analysis of a Fisheries Model for Harvest of Hawksbill Sea Turtles (Eretmochelys imbricata). Conservation Biology. Vol. 10, No. 3. pp. 874–880.

Lam, T., XU, L., Takahashi, S., and Burgess, E.A. (2011). Market forces: An examination of marine turtle trade in China and Japan. TRAFFIC East Asia, Hong Kong.

Miclat, E. and Arceo, H. (eds) (2018). A sea of safe havens: establishing the marine turtle protected area network in the Philippines. Philippine inputs to the transboundary marine turtle protected area network in the Sulu-Sulawesi Seascape, a priority seascape in the Coral Triangle Initiative Regional Plan of Action. GIZ-CI Support to the Sulu-Sulawesi Seascape Project (Contract No. 81156987). Conservation International Philippines, Quezon City, Philippines. 36p.

Philippine Statistics Authority. (2000–2020). Table 1 Monthly Consumer Price Index for All Income Households in the Philippines by Commodity Group. Consumer Price Index and Inflation Rate. (PSA).

Philippine Statistics Authority. (2010). Projected Population, by Age Group, Sex, and by Single-Calendar Year Interval, Philippines: 2010–2020 (Medium Assumption). 2010 Census-based Population Projections in collaboration with the Inter-Agency Working Group on Population Projections. (PSA).

Philippine Statistics Authority. (2019a). 2019 Philippine Statistical Yearbook. (PSA).

Philippine Statistics Authority. (2019b). Total population by geographic location (based on 2000, 2010 and 2015 Censuses). Population and Migration. OpenSTAT. (PSA).

Philippine Statistics Authority. (2019c). Urban Population in the Philippines (Results of the 2015 Census of Population). (PSA).

Tejero, W. (2014). An Analysis of Recreational Value of Apo Island, Philippines. Economic and Environment Program for Southeast Asia 1(1).

Tella, J.M Banos-Villalba, A., Hernandez-Brito, D., Rojas, A., Pacifico, E., Diaz-Luque, J., Carrete, M., Blanco, G., and Hiraldo, F. (2015). Parrots as overlooked seed dispersers. Frontiers in Ecology and the Environment. Vol. 13, Issue 6.

Van der Ploeg, S., and De Groot, D. (2010). The TEEB Valuation Database: a searchable database of 1310 estimates of monetary values of ecosystem services. Foundation for Sustainable Development.

World Bank. (2020). PPP conversion factor, GDP (LCU per international $). World Development Indicators. World Bank Open Data. (WB). Accessed May 28, 2020.

Yaptinchay, A.A. (2016). Endangered Pawikan still at high risk. Philippine Daily Inquirer. Retrieved from <https://opinion.inquirer.net/96642/endangered-pawikan-still-at-high-risk>.