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**COST-BENEFIT ANALYSIS OF A SEA AMBULANCE  
PROJECT  
IN THE MUNICIPALITY OF ALABAT  
IN QUEZON PROVINCE, PHILIPPINES**

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## **Executive Summary**

This study conducts an ex-ante cost benefit analysis (CBA) of the planned acquisition of the municipality of Alabat, in Quezon Province, Philippines of a Sea Ambulance. Given the assumptions made with the data gathered, the government is requested to pursue the project since benefits are greater than costs. This is evidenced by the positive Net Present Value (NPV) and greater than 1 Benefit-Cost Ratio (BCR). Sensitivity analysis finds similar results and further validates the argument. Moreover, it is suggested that the municipal government take into consideration the cost-effectiveness ratios found in this study in adherence to the principle of fiscal discipline. The deployment of a Sea Ambulance in the island is necessary in saving lives in the absence of an appropriate treatment facility.

In the municipality of Alabat, offering quality healthcare which meet the needs of those who need medical treatment have been a critical issue for the inhabitants of the island for many years. Until now illnesses and diseases which are time sensitive have not been treated with the appropriate equipment or within an acceptable time frame, leading to a decrease in the wellbeing of the residents of Alabat. Currently, the Alabat Island District Hospital (AIDH) is the only available health facility in the vicinity, however the hospital is lacking in emergency medical equipment used to treat more complex diseases and illnesses. Most common illnesses in Alabat are Acute Respiratory Infection, Hypertension, Gastritis, Acute Gastroenteritis, Infected Wounds, Urinary Tract Infection, Arthritis, and Stroke. Of the most common illnesses, there are approximately 3 patients per month admitted for stroke, however since there are no adequate facilities available at AIDH to treat the patients, the patients are required to cross to the mainland to receive the appropriate treatment. Since stroke is a both time sensitive and life threatening disease, for our analysis we conducted a cost-benefit analysis focused on the impact that the deployment of a sea ambulance would have to save the lives of stroke victims in Alabat.

Further, in the without case, patients who require treatment from emergency medical equipment and need immediate medical attention are

transported from the island towards the mainland by a commercial vessel which runs once in an hour from 5:00 A.M until 1:00 P.M. Patients who need medical attention outside of this time frame are unable to receive treatment unless they are able to find other residents who are in possession of a fishing boat or ship who are willing to transport the patient across to the mainland. Therefore, total time needed for shipping a patient in the without case takes at least 1.5 hours in the best case scenario, however treatment time can be delayed even further if a patient is unable to cross to the mainland because of an absence of a commercial vessel or a vacant fishing boat.

In the with case, a sea ambulance would be implemented and thus would offer a 24-hour service ready to transport patients from Alabat to the mainland where there are larger medical facilities equipped for more intensive care. We project that with the implementation of a sea ambulance, we can decrease the mortality rate from the previous 50% to 16% to 23%. At present, approximately 36 patients are transported from the island to the mainland each year for stroke. With the decrease in mortality rate we can thus save an additional 12 lives in the best with-case scenario, and 9 will be saved in the worst-with case scenario. As our project mainly concerns the decrease in mortality, our main measurement for benefit was the Value of Statistical Life (VSL). As a result of our analysis we found that in our best-with case scenario would be PHP 3,935,909.38 at the maximum level, and PHP 2,716,913.23 at the minimum, and maximum PHP 2,951,932.04 and minimum PHP 2,037,684.93 for our worst-with case scenario.

Included in the Costs of the project were the price of the sea ambulance, labor costs of those in charge of operating the sea ambulance, fuel costs and repair and maintenance cost of the ambulance. Labor costs included the salaries of an emergency doctor, two nurses, and three sea ambulance captains to ensure that the sea ambulance would be operational for 24 hours. In sum, we predicted that annual costs of operating the sea ambulance would be approximately PHP 3,387,135.9 per year in 2016 Philippine Pesos. Additionally, for our Social Discount Rate we used 15%, which is based on a study by the Asian Development Bank (ADB) on Social Discount Rates in Asia.

In terms of Cost to Benefit Ratio, our calculations showed a CBR of 2.12 in the best case scenario, and 1.59 in the worst-case scenario; thus both being over

the value of 1, implying that this project should be implemented in order to raise the wellbeing of the people of Alabat. Within our sensitivity analysis we conducted we considered two different Social Discount Rates: 10% and 20%. For the VSL we considered two options - VSL equalling Average Annual Family Income, or Average Annual Family Income minus the Average Family Poverty Threshold. In all cases we discovered that Benefit Cost Ratio exceeded the value of 1, therefore clearly showing the plausibility and effectiveness of the Sea Ambulance project.

## **Introduction**

### **Overview of the Project**

Provision of quality healthcare remains a challenge for the Philippine government. In 2011, there were only around 1,821 hospitals across the country. Out of this number, 283 are classified as district hospitals that provide only limited healthcare services. In addition, only 137 of these have operating rooms that can accommodate emergency situations.<sup>1</sup> Hospitals of this kind are usually the only healthcare facilities that are available in the poor and far-flung municipalities. Emergency patients are therefore put in a vulnerable situation in which they are left with no choice but be transported to cities where Secondary and Tertiary Hospitals are situated to seek for appropriate medical treatment. It is even more difficult for those who come from island municipalities in which they have to travel across seas by fishing boats or passenger vessels that discomfort patients, and more likely worsen their medical condition, due to the absence of medical staff and facilities and the inappropriateness of the environment.

### **Objective and Scope of the Project**

Alabat is a fifth class<sup>2</sup> municipality in Alabat Island with a population of 1,651 in 3,805 households<sup>3</sup> as of 2013. The island is situated in the Lamon Bay in the eastern part of Quezon Province, in the CALABARZON region, Philippines, approximately 8.10 nautical miles from Atimonan (as presented in Appendix A). Thus, in cases of business transactions outside the island, people take a one-hour boat ride to get to the mainland. In terms of health transactions, Alabat has only 1 district hospital, namely the Alabat Island District Hospital (AIDH) which

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<sup>1</sup> Source: An article by the Department of Health entitled “New Hospital Classification to Improve Health - Ona”

<sup>2</sup> Pursuant to Department Order No. 23-08 issued by the Department of Finance, fifth class municipalities are those which have an average annual income of more than P15 million but less than 25 million. The Bureau of Local Government Finance classifies Alabat as a fifth class municipality.

<sup>3</sup> Numbers are taken from the Department of Interior and Local Government

provides very limited services. Further, it lacks emergency equipment which in turn makes the medical servicing difficult.

In view of the foregoing, the team suggests that a Sea Ambulance be deployed in the municipality of Alabat.<sup>4</sup> With the deployment of said ambulance, it is expected that emergency situations are addressed in the quickest possible way. This will lead to a reduced number of deaths and/ or reduced medical treatment costs for illnesses. The proposed Sea Ambulance shall comply with the National Policy on Ambulance Use and Services promulgated by the Philippine Department of Health (DOH) under the Administrative Order 2010-0003.<sup>5</sup> This Administrative Order states that ambulance designs must be in accordance with the standards and guidelines set by Bureau of Health Devices and Technology.

Individuals are usually brought to AIDH due to Acute Respiratory Infection, Hypertension, Gastritis, Acute Gastroenteritis, Infected Wounds, Urinary Tract Infection, Arthritis, and Stroke. It was likewise reported that the biggest number of patients admitted in the said hospital in a month was 25. Out of this, 3 were diagnosed to having stroke and were needed to be transported to another hospital where such cases can be accommodated. Thus it is but reasonable to use stroke cases as the main point of analysis in this study.<sup>6</sup>

A study from Spain found that the time-to-treatment-window for moderate strokes (NIHSS 9-15) is  $\leq 120$  minutes.<sup>7</sup> Even though there was no evidence found that faster treatment had an impact on mild and severe strokes, it should be noted that time-to-treatment-time was  $171.98 \pm 88$  minutes for mild strokes and  $164.74 \pm 74.84$  minutes for severe stroke. This indicates that favorable outcome depends on many factors, but time-to-treatment should still be as fast as possible. Time-to-treatment includes the time for transport as well as examination of the patient with procedures as MRI or CT scan.

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<sup>4</sup> The Municipality Mayor mentioned about the acquisition of Sea Ambulance in his "State of the Municipality Address" that was delivered on July 7, 2014. This project is in collaboration with the Provincial Government.

<sup>5</sup> Entitled "National Policy on Ambulance Use and Services" dated January 7, 2010.

<sup>6</sup> This is according to an AIDH medical staff (Facebook Interview).

<sup>7</sup> Muchada, 2014

## **Policy Alternatives**

### **Without Case**

In the occurrence of emergency situations, patients are transported from the island to get to a Secondary Hospital or Tertiary Hospital by a hiring a small fishing boat or taking passenger vessel. The rate of hiring a small fishing vessel depends on the agreement between the fishing boat owners and renters. Fishing boats, however, are found not in the port located in the central of the municipality but usually in barrios. The port serves for trade and transport purposes. Therefore, renting boats can be associated with high search cost. On the other hand, if the emergency occurs at a time passenger vessels are carrying out their daily business operations, which is between 5:00 A.M until 1:00 P.M., the concerned people can take the vessel at PHP 100.00 per person.<sup>8</sup> Estimated travel time from the island to the mainland is approximately 1 hour and another 30 minute-travel time, through a ground ambulance which charges PHP 1,000.00, to get to a Tertiary Hospital where emergency doctors and appropriate medical equipment are available. If the stroke strikes a person after the business hours of the commercial vessel then the possibility of death is high, since stroke is a time-sensitive disease.

### **With Case**

With the deployment of the Sea Ambulance in the municipality, people do not need to hire small fishing boats to transport their patients to the mainland or wait for the scheduled departure trips of the passenger vessels. Sea Ambulance, like any other ambulance, is available 24 hours. The Sea Ambulance, however, charges a fee of PHP 2,075.00.<sup>9</sup>

## **DESCRIPTION OF PARAMETERS**

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<sup>8</sup> Schedule of trips by passenger vessel from Alabat to Atimonan (the mainland) is presented in Appendix B

<sup>9</sup> Estimated with the use of the Willingness to Pay (WTP) to upgrade a hospital in Benguet Province as shown in the paper entitled "Upgrading the Health System in Benguet Province, An Analysis of the Province's Tertiary Hospital Project", authored by Baher El-Hifwani and Glenn P. Jerkins. The 2012 WTP P1,700.00, the 2016 inflated value of which is P3,075.00. Since there will be a cost incurred ground transportation which is P1,000.00 (the current rate), then the fare in Sea Ambulance is P2,075.00.



**Social Discount Rate** – The study uses a 15% social discount rate. This is based on a report by an Asian Development Bank (ADB) study in which social discount rates around the world were published.<sup>10</sup>

**Inflation Rate** – To account for economic growth in valuing future costs and benefits over the timespan of the project, the study uses the average inflation rate in the Philippines for the last 5 years, which is calculated at 3.74%. It is important to note that this figure is consistent with the Bangko Sentral ng Pilipinas' (BSP) inflation target of 3% plus or minus 1% point for the next 3 years.

**Economic Life of the Sea Ambulance** – This study takes the economic life of the Sea Ambulance as 20 years starting from the year 2016. This is based on Philippine Maritime Industry Authority's Memorandum Circular No. 71.<sup>11</sup>

**Number of Patients Transported** – According to a medical staff, in one month-observation, the maximum number of patients transported in a month is 3. Spreading it over a year makes the annual number of patients 36. It is acknowledged, however, that this number is more probably underestimated and keeping it constant through 20 years maybe less appropriate considering the average annual population growth rate projection of 1.46%<sup>12</sup> in in the Philippines from 2010 - 2035 which may positively influence the overall number of patients, and consequently increase the number of those who are transported.

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<sup>10</sup> Entitled "Theory and Practice in the Choice of Social Discount Rate for Cost-Benefit Analysis: A Survey", authored by Juzhong Zhuang, Zhihong Liang, Tun Lin, and Franklin De Guzman

<sup>11</sup> With Subject "Implementing Guidelines on the DOTC Department Order 92-587 Defining the Policy Framework on the regulation of Transport Services"

<sup>12</sup> Data Source: Philippine Statistics Authority

## **Benefit and Cost Components**

### **Costs**

#### **Sea Ambulance Cost**

The cost of the Sea Ambulance is reported to be PHP 1,700,000.00 in 2015.<sup>13</sup> The 2016 value of the vehicle amounts to PHP 1,763,580.00.<sup>14</sup> The initial cost already covers the medical necessities an ambulance is required to have.

#### **Fuel Cost**

Due to the lack of data regarding the fuel cost for Sea Ambulance, this study utilizes the fuel cost of a motorized boat. According to an owner<sup>15</sup>, the fuel cost amounts to PHP 4,500.00. This is enough to run a boat for 5 days which is equivalent to PHP 900.00 per day. The Sea Ambulance is projected to have a total of 36 trips (1 day per trip) for a year. This makes the annual fuel cost of PHP 32,400.00 or equivalently PHP 33,611.76 in 2016.

#### **Repair and Maintenance Cost**

To ensure the expected functionality of the Sea Ambulance, the municipal government allots money for the repair and maintenance of the Sea Ambulance. The appropriation includes checking and repairing the engine and maintaining adequate medical supplies and equipment in the Ambulance as some of these items are consumables. The estimated repair and maintenance cost takes 29.07% of the purchase value. The purchase value, however, needs to be inflated to 2016. This gives an amount of PHP 512,586.64.<sup>16</sup>

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<sup>13</sup> This is based on the article "Wonder Boat, Cavite's Sea Ambulance", authored by Anthony Giron published on January 27, 2015. Since no further details were reported, this study assumes that the Sea Ambulance cost is in its 2015 value.

<sup>14</sup> This is to assume that the municipal government purchases the Sea Ambulance on January 1, 2016 which is also the day of the start of the operation. All the necessary checks have been made prior to the purchase (check on the engine, check regarding the compliance to the national policy use on ambulances, and the like).

<sup>15</sup> Interview made through an online interview

<sup>16</sup> This is referenced from the "2013 Report of Local Disaster Risk Reduction and Management Fund Utilization" of the City Government of Iligan. The purchase value of an ambulance is declared to be P2,500,000.00 while the repair of ambulance amounts to P726,628.00. (Source: <http://www.iligan.gov.ph/wp-content/uploads/downloads/2014/06/Local-Risk-Reduction-Management-Fund-2013-Quarter-4.pdf>)

## Labor Cost

The emergency crew who will accompany patients during the transport include 1 emergency doctor and 2 nurses.<sup>17</sup> These trained emergency personnel will be hired by the municipal government.

In addition, the government needs to hire Sea Ambulance captains. The standard number of working hours in the Philippines, as mentioned in the Philippine Labor Code, is 8 hours.<sup>18</sup> The 24-hour service of the Sea Ambulance implies that the municipal government needs to hire 3 individual captains.

The table below presents the salary of the transport group. Values were taken from the “2012 Occupational Wages Survey” conducted by the Philippine Bureau of Labor and Employment Statistics<sup>19</sup> and were inflated to 2016 figures. The total annual labor cost associated with the operation of Sea Ambulance is computed to be PHP 1,110,969.21 as shown in Table 1.

**Table 1. Computation of 2016 Total Labor Cost**

| Labor Classification (A)                           | Number (B) | Monthly Salary per Labor Classification (in PHP) (C) | Total Annual Labor Cost per Labor Classification (in PHP) (D) |
|--|------------|--|---|
| Emergency Doctor                                   | 1          | 26,390.98  | 316,691.79 (1)  |
| Nurse  | 2          | 13,256.65  | 318,159.63 (2)  |
| Sea Ambulance Captain                              | 3          | 13,225.49  | 476,117.79 (3)  |
| <b>Total Annual Labor Cost (in PHP) 1)+(2)+(3)</b> |            |  | <b>1,110,969.21 (4)</b>                                       |

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<sup>17</sup> According to a local private provider of ambulatory services, its emergency crew includes 2 licensed nurses. However, the medical doctor only provides online back-up services to the transport crew. In this study, the medical doctor joins the transport team (<http://www.lifeline.com.ph/>). The emergency doctor and nurses who will be hired are on-call medical staff, however, since they will be receiving the same salary as of those who work as regular doctor and nurses, they need to lend their professional service in AIDH whenever there are no patients to be transported. The arrangement of schedule shall be clarified by the AIDH management.

<sup>18</sup> Article 83 of the Philippine Labor Code states *“The normal hours of work of any employee shall not exceed eight (8) hours a day”*.

<sup>19</sup> Data Source: <http://www.bles.dole.gov.ph/>

## Benefits

### Value of a Statistical Life (VSL)

To measure the social benefits the Sea Ambulance Project will bring, it is necessary to make use of the Value of Statistical Life (VSL). This captures the willingness to pay of individuals to reduce the risk of death. It is just but right to adopt this parameter since the very goal of the project is to avoid the incident of deaths. We assume that waiting cost, travel cost and inpatient treatment cost are all included in the VSL, since all these costs have the same purpose as to reduce the risk of death.

This study assumes that the maximum VSL equals annual family income. In the Philippines, families can be characterized as altruistic towards their members.<sup>20</sup> Therefore we can assume that if a member is sick, everybody in the family is willing to contribute to help him/her get the appropriate medical treatment. Data from the Philippine Statistical Authority (PSA) indicates that the 2016 average annual family income in the CALABARZON region is PHP 327,992.45. In a more realistic sense, this study takes the minimum value equals annual family income less the annual poverty threshold<sup>21</sup> of PHP 101,583.01 which gives a VSL of PHP 226,409.44.

To calculate the total VSL for the region of Alabat in the with case, the lives saved in the with case have to be estimated. As researched by Muchada (2014) the time-to-treatment window for favorable outcome is within 3 hours. However, as stated by Keat Loo and Siew Gan (2012), only 35% of patients get treatment within this limited time frame.<sup>22</sup> Additionally they found that of all admitted stroke patients the mortality rate is 50%. Even in developed countries with good infrastructure and where patients get proper treatment within 3 hours the mortality rate is between 16% and 23%.<sup>23</sup> We establish that with the implementation of the sea ambulance 100% of patients get treatment within this

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<sup>20</sup> This is evident in the findings of the study of Ernesto M. Pernia entitled "Diaspora, Remittances, and Poverty RP's Region"

<sup>21</sup> The Philippine Statistical Authority defines *Poverty Threshold* as the minimum income/expenditure required for a family/individual to meet the basic food and non-food requirements

<sup>22</sup> Keat Loo, Siew Gan, 2012

<sup>23</sup> Edwardson and Dromeric, "Ischemic stroke prognosis in adults", Web, Jul 2015

time frame, thus changing the mortality rate to 16% in the best case, and 23% in the worst case.

In the case of Alabat this relates to 18 deaths of 36 stroke patients in the without case. For a best case scenario only 6 patients would die and 12 patients will be saved if the sea ambulance is implemented, and 9 patients would die and 9 will be saved in the worst case scenario with a sea ambulance, see Table 2. The total annual VSL for 2016 is PHP 3,935,909.38 at the maximum and PHP 2,716,913.23 at the minimum for the best scenario, while total VSL is estimated to be PHP 2,951,932.04 at the maximum and PHP 2,037,684.93 at the minimum.

**Table 2. Computation of # of deaths, additional lives saved and VSL in total for Alabat in 2016**

| Mortality Rate (Without Case)           |                                    | Mortality Rate (With Case)              |                                    |                                  |   |                                    |                                  |
|---|------------------------------------|---|------------------------------------|----------------------------------|---|------------------------------------|----------------------------------|
|   |                                    | Best Scenario                           |                                    |                                  | Worst Scenario                          |                                    |                                  |
| Percentage of the Total Stroke Patients | est. # of Deaths due to Stroke (1) | Percentage of the Total Stroke Patients | Est. # of Deaths due to Stroke (2) | Additional Lives Saved (1) – (2) | Percentage of the Total Stroke Patients | Est. # of Deaths due to Stroke (3) | Additional Lives Saved (1) – (3) |
| 50%                                     | 18                                 | 16%                                     | 6                                  | 12                               | 23%                                     | 8                                  | 9                                |

### Summary of Costs and Benefits

The structure of cost and benefits are presented in Table 3. Values are all in 2016 figures.

**Table 3. Summary of Costs and Benefits**

| Cost (in PHP)               |   |   | Benefits (in PHP) |   |   |
|-----------------------------|---|---|-------------------|---|---|
|                             | Best Scenario<br><i>(12 Additional Lives Saved)</i> | Worst Scenario<br><i>(9 Additional Lives Saved)</i> |                   | Best Scenario<br><i>(12 Additional Lives Saved)</i> | Worst Scenario<br><i>(9 Additional Lives Saved)</i> |
| Sea Ambulance Cost          | 1,763,580.00  | 1,763,580.00  | Maximum VSL       | 3,935,909.38  | 2,951,932.04  |
| Fuel Cost                   | 33,611.76   | 33,611.76   |                   |   |   |
| Repair and Maintenance Cost | 512,586.64  | 512,586.64  | Minimum VSL       | 2,716,913.23  | 2,037,684.93  |
| Labor Cost                  | 1,110,969.21  | 1,110,969.21  |                   |   |   |

## Results

This study utilizes NPV and BCR methods to analyze whether or not the project is worth implementing with SDR set to 15%. As can be seen in the tables presented below, NPVs for both cases and scenarios are positive. Accordingly, BCRs are all greater than 1. These results suggest that the project should be implemented.

**Table 4. CBA Results for VSL Equals Average Annual Family Income**

| Best Scenario<br>(12 Additional Lives Saved)<br>SDR = 15% |      | Worst Scenario<br>(9 Additional Lives Saved)<br>SDR = 15% |      |
|---|------|---|------|
| NPV<br>(in million PHP)                                   | BCR  | NPV<br>(in million PHP)                                   | BCR  |
| 18.34   | 2.12 | 9.94  | 1.59 |

**Table 5. CBA Results for VSL Equals Average Annual Family Income Less Average Family Poverty Threshold**

| Best Scenario<br>(12 Additional Lives Saved)<br>SDR = 15% |      | Worst Scenario<br>(9 Additional Lives Saved)<br>SDR = 15% |      |
|---|------|---|------|
| NPV<br>(in million PHP)                                   | BCR  | NPV<br>(in million PHP)                                   | BCR  |
| 7.82  | 1.47 | 1.68  | 1.10 |

Further, this study uses cost-effectiveness ratio that is formulated by dividing the total costs by the additional lives saved with the Sea Ambulance. Total present value of cost of the project for 20 years is estimated to be PHP 16,744,264.92 giving a cost-effectiveness ratio, under the SDR of 15% of PHP 1,395,355.41 for the best scenario of 12 additional lives saved and PHP 1,860,473.88 for the worst scenario of 9 additional lives saved. This implies that the municipal government must implement the project before any other similar project costs more than these values. Data from the government show that the

municipal government had a net income of PHP 2,690,000.00 in 2006 which went down in 2007, but managed to increase it up to PHP 5,200,000.00 again in 2008.<sup>24</sup> The cost-effectiveness ratio must be taken into consideration given the fluctuations in Alabat's net income.

## Sensitivity Analysis

This study further explores the sensitivity of NPVs and BCRs to SDR. In particular, this study looks 10% and 20% SDRs aside from the baseline SDR of 15%. Tables 6 and 7 present the results for VSL equals average annual family income and VSL equals average annual family income less average family poverty threshold, respectively.

**Table 6. Sensitivity Analysis Results for VSL Equals Average Annual Family Income**

| Best Scenario<br>(12 Additional Lives Saved) |      |                            |      | Worst Scenario<br>(9 Additional Lives Saved) |      |                            |      |
|--|------|----------------------------|------|--|------|----------------------------|------|
| SDR = 10%                                    |      | SDR = 20%                  |      | SDR = 10%                                    |      | SDR = 20%                  |      |
| NPV<br>(in million<br>PHP)                   | BCR  | NPV<br>(in million<br>PHP) | BCR  | NPV<br>(in million<br>PHP)                   | BCR  | NPV<br>(in million<br>PHP) | BCR  |
| 26.58  | 2.19 | 14.26                      | 2.06 | 14.34  | 1.64 | 7.34                       | 1.55 |

**Table 7. Sensitivity Analysis Results for VSL Equals Average Annual Family Income Less Average Family Poverty Threshold**

| Best Scenario<br>(12 Additional Lives Saved) |      |                            |      | Worst Scenario<br>(9 Additional Lives Saved) |      |                            |      |
|--|------|----------------------------|------|--|------|----------------------------|------|
| SDR = 10%                                    |      | SDR = 20%                  |      | SDR = 10%                                    |      | SDR = 20%                  |      |
| NPV<br>(in million<br>PHP)                   | BCR  | NPV<br>(in million<br>PHP) | BCR  | NPV<br>(in million<br>PHP)                   | BCR  | NPV<br>(in million<br>PHP) | BCR  |
| 11.42  | 1.51 | 5.69                       | 1.42 | 2.97   | 1.13 | 0.91                       | 1.07 |

<sup>24</sup> Data Source: Bureau of Local Government Finance



NPVs are positive and BCRs are greater than 1 for both cases with SDRs 10% and 20%. This implies that the Sea Ambulance Project is worth implementing because the benefits outweigh the costs. The present value of cost is found to be PHP 22,375,490.63 which gives a cost-effectiveness ratio PHP 1,864,624.22 for the best scenario and PHP 2,486,165.63 for the worst scenario under an SDR of 10% while the present value of cost stands at PHP 13,418,831.95 which gives a cost-effectiveness ratio of PHP 1,118,236.00 for the best scenario and PHP 1,490,981.33 for the worst scenario under an SDR of 20%. It is strongly recommended that the government should pursue this project before any other project costs more than these amounts in consideration to fiscal discipline.

## **Conclusion**

This report provides a cost-benefit analysis of a sea ambulance project in the municipality of Alabat in the Philippines. The main goal of the sea ambulance project is to improve health care services for inhabitants of the island of Alabat. Medical diagnostics for severe medical accidents such as stroke are only available on the mainland. The number of patients does not provide for an upgrade of the hospital on the island to a stroke center, but the transport to the stroke center on the mainland can be improved by the sea ambulance.

With the implementation of the sea ambulance the transport of stroke patients is guaranteed 24 hours a day. This will assure that all patients get the necessary treatment within the critical timeframe for stroke treatment. Different scenarios for the CBA were adopted. Due to the transportation with the sea ambulance the mortality rate decreases from 50% to either 16% in best case or 23% in worst case. This helps to save 12 additional lives in best case and 9 additional lives in worst case.

Saved lives are accounted as the value of statistical life (VSL), which is assumed to equal the annual family income in the Philippines. To adopt different scenarios as well the minimum VSL equals the average annual family income less the annual poverty threshold and the maximum VSL equals the average annual family income.

Additionally the CBA was calculated with a SDR of 15% and in the sensitivity analysis also with values of 10% and 20%. In all calculated cases the Benefit-Cost-Ratios (BCR) are greater than 1 and it is therefore strongly recommended that the government should pursue this project.

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# Appendix

## APPENDIX A. Geographical Location of Alabat, Quezon, Philippines <sup>25</sup>



## APPENDIX B. Schedule of Trips of Vessels from Alabat to Atimonan<sup>26</sup>

| Vessel             | Departure | Arrival  |
|--------------------|-----------|----------|
| M/V Nhelsea        | 5:00 AM   | 6:00 AM  |
| M/V Viva America 2 | 6:00 AM   | 7:00 AM  |
| M/V Pinoy Roro 1   | 7:00 AM   | 8:00 AM  |
| M/V Nhelsea        | 11:00 AM  | 12:00 PM |
| M/V Pinoy Roro 1   | 12:00 PM  | 1:00 PM  |
| M/V Viva America 2 | 1:00 PM   | 2:00 PM  |

<sup>25</sup> Picture was taken from Google Maps

<sup>26</sup> Source: Port of Atimonan

APPENDIX C. Computation of NPVs and BCR - Best Case (12 Additional Lives Saved), VSL Equals Family Income

| Best Case (12 Additional Lives Saved), VSL Equals Family Income |           |                |               |                      |                  |                      |                  |                      |                  |
|---|-----------|----------------|---------------|----------------------|------------------|----------------------|------------------|----------------------|------------------|
| Year  | Inflation | Benefit        | Cost          | SDR = 15%            |                  | SDR = 10%            |                  | SDR = 20%            |                  |
|   |           |                |               | PV Benefit (in PhP)  | PV Cost (in PhP) | PV Benefit (in PhP)  | PV Cost (in PhP) | PV Benefit (in PhP)  | PV Cost (in PhP) |
| 2016 (initial cost)   | 3.74      |                | 1,763,580.00  |                      | 1,763,580.00     |                      | 1,763,580.00     |                      | 1,763,580.00     |
| 2016  | 3.74      | 3,935,909.38   | 1,657,167.61  | 3,935,909.38         | 1,657,167.61     | 3,935,909.38         | 1,657,167.61     | 3,935,909.38         | 1,657,167.61     |
| 2017  | 3.74      | 4,083,112.39   | 1,719,145.68  | 3,550,532.51         | 1,494,909.29     | 3,711,920.36         | 1,562,859.71     | 3,402,593.66         | 1,432,621.40     |
| 2018  | 3.74      | 4,235,820.80   | 1,783,441.73  | 3,202,889.07         | 1,348,538.17     | 3,500,678.34         | 1,473,918.79     | 2,941,542.22         | 1,238,501.20     |
| 2019  | 3.74      | 4,394,240.49   | 1,850,142.45  | 2,889,284.45         | 1,216,498.70     | 3,301,457.92         | 1,390,039.41     | 2,542,963.25         | 1,070,684.29     |
| 2020  | 3.74      | 4,558,585.09   | 1,919,337.78  | 2,606,385.82         | 1,097,387.61     | 3,113,574.95         | 1,310,933.53     | 2,198,391.73         | 925,606.57       |
| 2021  | 3.74      | 4,729,076.17   | 1,991,121.01  | 2,351,186.65         | 989,939.05       | 2,936,384.23         | 1,236,329.49     | 1,900,509.65         | 800,186.88       |
| 2022  | 3.74      | 4,905,943.62   | 2,065,588.94  | 2,120,974.81         | 893,011.10       | 2,769,277.27         | 1,165,971.11     | 1,642,990.59         | 691,761.56       |
| 2023  | 3.74      | 5,089,425.91   | 2,142,841.97  | 1,913,303.71         | 805,573.67       | 2,611,680.22         | 1,099,616.75     | 1,420,365.37         | 598,027.87       |
| 2024  | 3.74      | 5,279,770.44   | 2,222,984.26  | 1,725,966.32         | 726,697.50       | 2,463,051.88         | 1,037,038.56     | 1,227,905.86         | 516,995.09       |
| 2025  | 3.74      | 5,477,233.85   | 2,306,123.87  | 1,556,971.71         | 655,544.33       | 2,322,881.83         | 978,021.64       | 1,061,524.62         | 446,942.26       |
| 2026  | 3.74      | 5,682,082.40   | 2,392,372.90  | 1,404,523.87         | 591,357.99       | 2,190,688.74         | 922,363.32       | 917,688.03           | 386,381.58       |
| 2027  | 3.74      | 5,894,592.28   | 2,481,847.65  | 1,267,002.66         | 533,456.33       | 2,066,018.63         | 869,872.46       | 793,341.30           | 334,026.88       |
| 2028  | 3.74      | 6,115,050.03   | 2,574,668.75  | 1,142,946.57         | 481,224.00       | 1,948,443.39         | 820,368.81       | 685,843.56           | 288,766.23       |
| 2029  | 3.74      | 6,343,752.90   | 2,670,961.36  | 1,031,037.20         | 434,105.89       | 1,837,559.25         | 773,682.37       | 592,911.75           | 249,638.41       |
| 2030  | 3.74      | 6,581,009.26   | 2,770,855.31  | 930,085.21           | 391,601.26       | 1,732,985.42         | 729,652.81       | 512,572.21           | 215,812.40       |
| 2031  | 3.74      | 6,827,139.01   | 2,874,485.30  | 839,017.73           | 353,258.39       | 1,634,362.80         | 688,128.93       | 443,118.68           | 186,569.82       |
| 2032  | 3.74      | 7,082,474.01   | 2,981,991.05  | 756,866.95           | 318,669.79       | 1,541,352.70         | 648,968.14       | 383,076.10           | 161,289.61       |
| 2033  | 3.74      | 7,347,358.54   | 3,093,517.52  | 682,759.81           | 287,467.86       | 1,453,635.72         | 612,035.95       | 331,169.28           | 139,434.87       |
| 2034  | 3.74      | 7,622,149.74   | 3,209,215.07  | 615,908.72           | 259,321.01       | 1,370,910.63         | 577,205.54       | 286,295.85           | 120,541.45       |
| 2035  | 3.74      | 7,907,218.14   | 3,329,239.72  | 555,603.22           | 233,930.10       | 1,292,893.35         | 544,357.30       | 247,502.76           | 104,208.08       |
| 2036  | 3.74      | 8,202,948.10   | 3,453,753.28  | 501,202.42           | 211,025.29       | 1,219,315.97         | 513,378.42       | 213,966.14           | 90,087.88        |
| <b>Total</b>  |           | 122,294,892.56 | 53,254,833.22 | 35,580,358.79        | 16,744,264.92    | 48,954,982.99        | 22,375,490.63    | 27,682,181.97        | 13,418,831.95    |
|   |           |                |               | <b>NPV</b>           |                  | <b>NPV</b>           |                  | <b>NPV</b>           |                  |
|   |           |                |               | <b>18,836,093.87</b> |                  | <b>26,579,492.36</b> |                  | <b>14,263,350.02</b> |                  |
|   |           |                |               | <b>BCR</b>           |                  | <b>BCR</b>           |                  | <b>BCR</b>           |                  |
|   |           |                |               | <b>2.12</b>          |                  | <b>2.19</b>          |                  | <b>2.06</b>          |                  |

APPENDIX D. Computation of NPVs and BCR - Worst Case (9 Additional Lives Saved), VSL Equals Family Income

| Worst Case (9 Additional Lives Saved), VSL Equals Family Income |           |               |               |                     |                  |                      |                  |                     |                  |
|---|-----------|---------------|---------------|---------------------|------------------|----------------------|------------------|---------------------|------------------|
| Year  | Inflation | Benefit       | Cost          | SDR = 15%           |                  | SDR = 10%            |                  | SDR = 20%           |                  |
|   |           |               |               | PV Benefit (in PhP) | PV Cost (in PhP) | PV Benefit (in PhP)  | PV Cost (in PhP) | PV Benefit (in PhP) | PV Cost (in PhP) |
| 2016 (initial cost)   | 3.74      |               | 1,763,580.00  |                     | 1,763,580.00     |                      | 1,763,580.00     |                     | 1,763,580.00     |
| 2016  | 3.74      | 2,951,932.04  | 1,657,167.61  | 2,951,932.04        | 1,657,167.61     | 2,951,932.04         | 1,657,167.61     | 2,951,932.04        | 1,657,167.61     |
| 2017  | 3.74      | 3,062,334.29  | 1,719,145.68  | 2,662,899.39        | 1,494,909.29     | 2,783,940.27         | 1,562,859.71     | 2,551,945.24        | 1,432,621.40     |
| 2018  | 3.74      | 3,176,865.60  | 1,783,441.73  | 2,402,166.80        | 1,348,538.17     | 2,625,508.76         | 1,473,918.79     | 2,206,156.66        | 1,238,501.20     |
| 2019  | 3.74      | 3,295,680.37  | 1,850,142.45  | 2,166,963.34        | 1,216,498.70     | 2,476,093.44         | 1,390,039.41     | 1,907,222.44        | 1,070,684.29     |
| 2020  | 3.74      | 3,418,938.82  | 1,919,337.78  | 1,954,789.36        | 1,097,387.61     | 2,335,181.21         | 1,310,933.53     | 1,648,793.80        | 925,606.57       |
| 2021  | 3.74      | 3,546,807.13  | 1,991,121.01  | 1,763,389.99        | 989,939.05       | 2,202,288.17         | 1,236,329.49     | 1,425,382.24        | 800,186.88       |
| 2022  | 3.74      | 3,679,457.71  | 2,065,588.94  | 1,590,731.11        | 893,011.10       | 2,076,957.96         | 1,165,971.11     | 1,232,242.94        | 691,761.56       |
| 2023  | 3.74      | 3,817,069.43  | 2,142,841.97  | 1,434,977.78        | 805,573.67       | 1,958,760.17         | 1,099,616.75     | 1,065,274.02        | 598,027.87       |
| 2024  | 3.74      | 3,959,827.83  | 2,222,984.26  | 1,294,474.74        | 726,697.50       | 1,847,288.91         | 1,037,038.56     | 920,929.39          | 516,995.09       |
| 2025  | 3.74      | 4,107,925.39  | 2,306,123.87  | 1,167,728.78        | 655,544.33       | 1,742,161.37         | 978,021.64       | 796,143.46          | 446,942.26       |
| 2026  | 3.74      | 4,261,561.80  | 2,392,372.90  | 1,053,392.90        | 591,357.99       | 1,643,016.55         | 922,363.32       | 688,266.02          | 386,381.58       |
| 2027  | 3.74      | 4,420,944.21  | 2,481,847.65  | 950,252.00          | 533,456.33       | 1,549,513.98         | 869,872.46       | 595,005.98          | 334,026.88       |
| 2028  | 3.74      | 4,586,287.52  | 2,574,668.75  | 857,209.93          | 481,224.00       | 1,461,332.54         | 820,368.81       | 514,382.67          | 288,766.23       |
| 2029  | 3.74      | 4,757,814.68  | 2,670,961.36  | 773,277.90          | 434,105.89       | 1,378,169.44         | 773,682.37       | 444,683.82          | 249,638.41       |
| 2030  | 3.74      | 4,935,756.95  | 2,770,855.31  | 697,563.91          | 391,601.26       | 1,299,739.07         | 729,652.81       | 384,429.16          | 215,812.40       |
| 2031  | 3.74      | 5,120,354.26  | 2,874,485.30  | 629,263.30          | 353,258.39       | 1,225,772.10         | 688,128.93       | 332,339.01          | 186,569.82       |
| 2032  | 3.74      | 5,311,855.51  | 2,981,991.05  | 567,650.22          | 318,669.79       | 1,156,014.52         | 648,968.14       | 287,307.07          | 161,289.61       |
| 2033  | 3.74      | 5,510,518.90  | 3,093,517.52  | 512,069.86          | 287,467.86       | 1,090,226.79         | 612,035.95       | 248,376.96          | 139,434.87       |
| 2034  | 3.74      | 5,716,612.31  | 3,209,215.07  | 461,931.54          | 259,321.01       | 1,028,182.97         | 577,205.54       | 214,721.89          | 120,541.45       |
| 2035  | 3.74      | 5,930,413.61  | 3,329,239.72  | 416,702.41          | 233,930.10       | 969,670.01           | 544,357.30       | 185,627.07          | 104,208.08       |
| 2036  | 3.74      | 6,152,211.08  | 3,453,753.28  | 375,901.81          | 211,025.29       | 914,486.97           | 513,378.42       | 160,474.60          | 90,087.88        |
| <b>Total</b>  | 3.74      | 91,721,169.42 | 53,254,383.22 | 26,685,269.10       | 16,744,264.92    | 36,716,237.24        | 22,375,490.63    | 20,761,636.48       | 13,418,831.95    |
|   |           |               |               | <b>NPV</b>          |                  | <b>NPV</b>           |                  | <b>NPV</b>          |                  |
|   |           |               |               | <b>9,941,004.17</b> |                  | <b>14,340,746.61</b> |                  | <b>7,342,804.53</b> |                  |
|   |           |               |               | <b>BCR</b>          |                  | <b>BCR</b>           |                  | <b>BCR</b>          |                  |
|   |           |               |               | <b>1.59</b>         |                  | <b>1.64</b>          |                  | <b>1.55</b>         |                  |



APPENDIX E. Computation of NPVs and BCR - Best Case (12 Additional Lives Saved), VSL Equals Family Income Less Family Poverty Threshold

| Best Case (12 Additional Lives Saved), VSL Equals Family Income Less Family Poverty Threshold |           |               |               |                     |                  |                      |                  |                     |                  |
|---|-----------|---------------|---------------|---------------------|------------------|----------------------|------------------|---------------------|------------------|
| Year  | Inflation | Benefit       | Cost          | SDR = 15%           |                  | SDR = 10%            |                  | SDR = 20%           |                  |
|   |           |               |               | PV Benefit (in PhP) | PV Cost (in PhP) | PV Benefit (in PhP)  | PV Cost (in PhP) | PV Benefit (in PhP) | PV Cost (in PhP) |
| 2016 (initial cost)   | 3.74      |               | 1,763,580.00  |                     | 1,763,580.00     |                      | 1,763,580.00     |                     | 1,763,580.00     |
| 2016  | 3.74      | 2,716,913.23  | 1,657,167.61  | 2,716,913.23        | 1,657,167.61     | 2,716,913.23         | 1,657,167.61     | 2,716,913.23        | 1,657,167.61     |
| 2017  | 3.74      | 2,818,525.79  | 1,719,145.68  | 2,450,891.99        | 1,494,909.29     | 2,562,296.17         | 1,562,859.71     | 2,348,771.49        | 1,432,621.40     |
| 2018  | 3.74      | 2,923,938.65  | 1,783,441.73  | 2,210,917.70        | 1,348,538.17     | 2,416,478.23         | 1,473,918.79     | 2,030,512.95        | 1,238,501.20     |
| 2019  | 3.74      | 3,033,293.96  | 1,850,142.45  | 1,994,440.02        | 1,216,498.70     | 2,278,958.65         | 1,390,039.41     | 1,755,378.45        | 1,070,684.29     |
| 2020  | 3.74      | 3,146,739.15  | 1,919,337.78  | 1,799,158.32        | 1,097,387.61     | 2,149,265.18         | 1,310,933.53     | 1,517,524.67        | 925,606.57       |
| 2021  | 3.74      | 3,264,427.20  | 1,991,121.01  | 1,622,997.26        | 989,939.05       | 2,026,952.45         | 1,236,329.49     | 1,311,900.08        | 800,186.88       |
| 2022  | 3.74      | 3,386,516.77  | 2,065,588.94  | 1,464,084.66        | 893,011.10       | 1,911,600.43         | 1,165,971.11     | 1,134,137.62        | 691,761.56       |
| 2023  | 3.74      | 3,513,172.50  | 2,142,841.97  | 1,320,731.67        | 805,573.67       | 1,802,812.99         | 1,099,616.75     | 980,461.97          | 598,027.87       |
| 2024  | 3.74      | 3,644,565.15  | 2,222,984.26  | 1,191,414.81        | 726,697.50       | 1,700,216.54         | 1,037,038.56     | 847,609.37          | 516,995.09       |
| 2025  | 3.74      | 3,780,871.89  | 2,306,123.87  | 1,074,759.76        | 655,544.33       | 1,603,458.76         | 978,021.64       | 732,758.30          | 446,942.26       |
| 2026  | 3.74      | 3,922,276.50  | 2,392,372.90  | 969,526.76          | 591,357.99       | 1,512,207.38         | 922,363.32       | 633,469.55          | 386,381.58       |
| 2027  | 3.74      | 4,068,969.64  | 2,481,847.65  | 874,597.45          | 533,456.33       | 1,426,149.04         | 869,872.46       | 547,634.43          | 334,026.88       |
| 2028  | 3.74      | 4,221,149.10  | 2,574,668.75  | 788,962.95          | 481,224.00       | 1,344,988.19         | 820,368.81       | 473,429.96          | 288,766.23       |
| 2029  | 3.74      | 4,379,020.08  | 2,670,961.36  | 711,713.19          | 434,105.89       | 1,268,446.14         | 773,682.37       | 409,280.20          | 249,638.41       |
| 2030  | 3.74      | 4,542,795.43  | 2,770,855.31  | 642,027.18          | 391,601.26       | 1,196,260.02         | 729,652.81       | 353,822.74          | 215,812.40       |
| 2031  | 3.74      | 4,712,695.98  | 2,874,485.30  | 579,164.35          | 353,258.39       | 1,128,181.95         | 688,128.93       | 305,879.75          | 186,569.82       |
| 2032  | 3.74      | 4,888,950.81  | 2,981,991.05  | 522,456.60          | 318,669.79       | 1,063,978.14         | 648,968.14       | 264,433.05          | 161,289.61       |
| 2033  | 3.74      | 5,071,797.57  | 3,093,517.52  | 471,301.29          | 287,467.86       | 1,003,428.11         | 612,035.95       | 228,602.37          | 139,434.87       |
| 2034  | 3.74      | 5,261,482.80  | 3,209,215.07  | 425,154.74          | 259,321.01       | 946,323.93           | 577,205.54       | 197,626.75          | 120,541.45       |
| 2035  | 3.74      | 5,458,262.26  | 3,329,239.72  | 383,526.55          | 233,930.10       | 892,469.49           | 544,357.30       | 170,848.32          | 104,208.08       |
| 2036  | 3.74      | 5,662,401.26  | 3,453,753.28  | 345,974.30          | 211,025.29       | 841,679.87           | 513,378.42       | 147,698.38          | 90,087.88        |
| <b>Total</b>  |           | 84,418,765.74 | 53,254,383.22 | 24,560,714.77       | 16,744,264.92    | 33,793,064.90        | 22,375,490.63    | 19,108,693.63       | 13,418,831.95    |
|   |           |               |               | <b>NPV</b>          |                  | <b>NPV</b>           |                  | <b>NPV</b>          |                  |
|   |           |               |               | <b>7,816,449.85</b> |                  | <b>11,417,574.27</b> |                  | <b>5,689,861.69</b> |                  |
|   |           |               |               | <b>BCR</b>          |                  | <b>BCR</b>           |                  | <b>BCR</b>          |                  |
|   |           |               |               | <b>1.47</b>         |                  | <b>1.51</b>          |                  | <b>1.42</b>         |                  |

APPENDIX F. Computation of NPVs and BCR - Worst Case (9 Additional Lives Saved), VSL Equals Family Income Less Family Poverty Threshold

| Worst Case (9 Additional Lives Saved), VSL Equals Family Income Less Poverty Threshold |           |               |               |                     |                  |                     |                  |                     |                  |
|--|-----------|---------------|---------------|---------------------|------------------|---------------------|------------------|---------------------|------------------|
|  |           |               |               | SDR = 15%           |                  | SDR = 10%           |                  | SDR = 20%           |                  |
| Year   | Inflation | Benefit       | Cost          | PV Benefit (in PhP) | PV Cost (in PhP) | PV Benefit (in PhP) | PV Cost (in PhP) | PV Benefit (in PhP) | PV Cost (in PhP) |
| 2016 (initial cost)  | 3.74      |               | 1,763,580.00  |                     | 1,763,580.00     |                     | 1,763,580.00     |                     | 1,763,580.00     |
| 2016   | 3.74      | 2,037,684.93  | 1,657,167.61  | 2,037,684.93        | 1,657,167.61     | 2,037,684.93        | 1,657,167.61     | 2,037,684.93        | 1,657,167.61     |
| 2017   | 3.74      | 2,113,894.34  | 1,719,145.68  | 1,838,168.99        | 1,494,909.29     | 1,921,722.13        | 1,562,859.71     | 1,761,578.62        | 1,432,621.40     |
| 2018   | 3.74      | 2,192,953.99  | 1,783,441.73  | 1,658,188.27        | 1,348,538.17     | 1,812,358.67        | 1,473,918.79     | 1,522,884.72        | 1,238,501.20     |
| 2019   | 3.74      | 2,274,970.47  | 1,850,142.45  | 1,495,830.01        | 1,216,498.70     | 1,709,218.98        | 1,390,039.41     | 1,316,533.84        | 1,070,684.29     |
| 2020   | 3.74      | 2,360,054.36  | 1,919,337.78  | 1,349,368.74        | 1,097,387.61     | 1,611,948.89        | 1,310,933.53     | 1,138,143.50        | 925,606.57       |
| 2021   | 3.74      | 2,448,320.40  | 1,991,121.01  | 1,217,247.94        | 989,939.05       | 1,520,214.34        | 1,236,329.49     | 983,925.06          | 800,186.88       |
| 2022   | 3.74      | 2,539,887.58  | 2,065,588.94  | 1,098,063.49        | 893,011.10       | 1,433,700.32        | 1,165,971.11     | 850,603.21          | 691,761.56       |
| 2023   | 3.74      | 2,634,879.38  | 2,142,841.97  | 990,548.75          | 805,573.67       | 1,352,109.74        | 1,099,616.75     | 735,346.48          | 598,027.87       |
| 2024   | 3.74      | 2,733,423.86  | 2,222,984.26  | 893,561.11          | 726,697.50       | 1,275,162.41        | 1,037,038.56     | 635,707.03          | 516,995.09       |
| 2025   | 3.74      | 2,835,653.92  | 2,306,123.87  | 806,069.82          | 655,544.33       | 1,202,594.07        | 978,021.64       | 549,568.73          | 446,942.26       |
| 2026   | 3.74      | 2,941,707.37  | 2,392,372.90  | 727,145.07          | 591,357.99       | 1,134,155.54        | 922,363.32       | 475,102.16          | 386,381.58       |
| 2027   | 3.74      | 3,051,727.23  | 2,481,847.65  | 655,948.09          | 533,456.33       | 1,069,611.78        | 869,872.46       | 410,725.82          | 334,026.88       |
| 2028   | 3.74      | 3,165,861.83  | 2,574,668.75  | 591,722.21          | 481,224.00       | 1,008,741.14        | 820,368.81       | 355,072.47          | 288,766.23       |
| 2029   | 3.74      | 3,284,265.06  | 2,670,961.36  | 533,784.89          | 434,105.89       | 951,334.60          | 773,682.37       | 306,960.15          | 249,638.41       |
| 2030   | 3.74      | 3,407,096.57  | 2,770,855.31  | 481,520.39          | 391,601.26       | 897,195.01          | 729,652.81       | 265,367.05          | 215,812.40       |
| 2031   | 3.74      | 3,534,521.99  | 2,874,485.30  | 434,373.26          | 353,258.39       | 846,136.46          | 688,128.93       | 229,409.82          | 186,569.82       |
| 2032   | 3.74      | 3,666,713.11  | 2,981,991.05  | 391,842.45          | 318,669.79       | 797,983.60          | 648,968.14       | 198,324.79          | 161,289.61       |
| 2033   | 3.74      | 3,803,848.18  | 3,093,517.52  | 353,475.96          | 287,467.86       | 752,571.08          | 612,035.95       | 171,451.78          | 139,434.87       |
| 2034   | 3.74      | 3,946,112.10  | 3,209,215.07  | 318,866.06          | 259,321.01       | 709,742.95          | 577,205.54       | 148,220.06          | 120,541.45       |
| 2035   | 3.74      | 4,093,696.69  | 3,329,239.72  | 287,644.91          | 233,930.10       | 669,352.12          | 544,357.30       | 128,136.24          | 104,208.08       |
| 2036   | 3.74      | 4,246,800.95  | 3,453,753.28  | 259,480.72          | 211,025.29       | 631,259.90          | 513,378.42       | 110,773.78          | 90,087.88        |
| <b>Total</b>   |           | 63,314,074.31 | 53,254,383.22 | 18,420,536.08       | 16,744,264.92    | 25,344,798.67       | 22,375,490.63    | 14,331,520.22       | 13,418,831.95    |
|  |           |               |               | <b>NPV</b>          |                  | <b>NPV</b>          |                  | <b>NPV</b>          |                  |
|  |           |               |               | <b>1,676,271.15</b> |                  | <b>2,969,308.04</b> |                  | <b>912,688.28</b>   |                  |
|  |           |               |               | <b>BCR</b>          |                  | <b>BCR</b>          |                  | <b>BCR</b>          |                  |
|  |           |               |               | <b>1.10</b>         |                  | <b>1.13</b>         |                  | <b>1.07</b>         |                  |

