Upgrading the Health System in Benguet Province, An Analysis of the Province's Tertiary Hospital Project

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Abstract

The province of Benguet is lacking in medical health services. The province has 165 public hospital beds, of which no more than 138 are in practical use, and 171 private hospital beds. While total number of beds is 336, the actual number in use is 309 beds. The inadequate number of beds coupled with the lack of tertiary health services have resulted in over 2000 patients a year being sent to the Baguio General hospital and Medical Center in Baguio further increasing the overcrowding in the Baguio hospital and imposing additional costs on patients in Benguet. This study completed an integrated financial, economic, stakeholder, sensitivity and risk analysis of the project which targets to complete the referral structure by raising the quality and quantity of medical services that can be offered at the Benguet General Hospital to the level of a tertiary medical facility.

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Upgrading the Health System in Benguet Province

An Analysis of the Province's Tertiary Hospital Project

A) Introduction

The province of Benguet is lacking in medical health services. The province has 165 public hospital beds, of which no more than 138 are in practical use, and 171 private hospital beds. While total number of beds is 336, the actual number in use is 309 beds. This number translated into about 1,023 persons per bed in 1996 (315,967persons/309beds), a figure worse than both the national average of 870 persons per bed and the ratio desired by NEDA of 500 persons per bed. This situation is expected to get even worse when one considers that private hospital beds are projected to decrease to 90 by the year 2000 resulting in 228 beds for a projected population of 345,000, or 1,513 persons per bed.

Moreover, the quality of health services offered in the Benguet hospitals is not up to the desired standards. The medical health system in the province of Benguet has a referral system with rural health units, primary, secondary and tertiary health units. There are 4 district hospitals with a total of 40 beds offering primary health care, one district hospital (10 beds) offering secondary health care and the Benguet General hospital with a capacity of 100 beds intended for tertiary health care. The general hospital, however, is ill equipped to offer tertiary services due to the inadequacy of the building in the first place (originally an old school), the deterioration of the building, and the shortage of the necessary equipment. For all practical purposes, the hospital can be considered to offer secondary health services at best.

The inadequate number of beds coupled with the lack of tertiary health services have resulted in over 2000 patients a year being sent to the Baguio General hospital and Medical Center in Baguio further increasing the overcrowding in the Baguio hospital and imposing additional costs on patients in Benguet.

B) Project Description

1st. Project Objectives and Scope

The objective of the project is to complete the referral structure by raising the quality and quantity of medical services that can be offered at the Benguet General Hospital to the level of a tertiary medical facility.

This will be carried out by upgrading the existing 100 rooms and the construction of another 100 rooms, by rehabilitating existing departments (medicine, Obstetrics/Gynecology and pediatrics), and by adding new departments (Orthopedic, Eye, ENT, rehabilitation and ICU/CCU, psychiatry). Treatment for brain ailments and cardiovascular diseases will continue to be referred to Baguio General hospital. When the project is completed the number of persons per hospital bed for the year 2000 will improve from the projected 1,513 without the project to 925.

2nd. Project Cost and Financing

Total project cost is estimated to be around 680 million 1998 (year 0) Pesos. About 55% of the project cost accounts for the building construction. Medical equipment represents

28% of the total project cost. Table 1 shows the breakdown of the project cost by year of expenditure.

Table 1
Project Cost (millions of Pesos)

	Year 0	Year 1
Land	36.00	-
Site Development	8.00	3.87
Building Construction	40.84	344.44
Equipment	54.64	138.81
Technical Fees	3.32	92.18
Total Cost (nominal prices)	**142.80**	**579.30**
Total Cost (real year 0 prices)	**142.80**	**536.39**

Sources:

- Japan International Cooperation Agency. Draft Basic Design Study Report on the project for Urgent Upgrading & Strengthening of Health System for the province of Benguet and Cordillera region.
- NEDA.

Most of the financing for the project will come from JICA in the form of a grant with the Government of the Philippines financing the balance. Specifically, JICA will finance the construction, the equipment and the technical fees and the government will contribute the land and the site development work. Table 2 shows the contribution by both sides.

Table 2
Project Financing (millions of Nominal Pesos)

Year	0	1
1. JICA Grant*		
Grant equivalent in millions Pesos	98.80	575.43
Grant in millions of Yen	370.50	2,157.86
2. The Philippines Government**		
Contribution in millions of Pesos	44.00	3.87
Total	**142.80**	**579.30**

* Grant covers, construction, equipment and technical fees

** Government contribution for land and site development. Land is owned by government and will require no expenditure to acquire.

C) Financial Analysis

1st. Assumptions

Most of the assumptions are based on the provided appraisal reports. Outlined below are the important assumptions and those that have been made or changed by the authors of this report.

1. Total number of beds in hospital will be 200. Bed occupancy was assumed to be 100% from the third operating year onwards. Occupancy for the first and second operating years was assumed to be 80% and 90% respectively.
2. The hospital's maximum capacity for outpatients per day was taken as 300. The hospital was assumed to serve 80% and 90% of that number in the first and second operating years respectively. Starting the third year of operation, 300 will be seen daily.
3. It was assumed that 30% of inpatients would pay full cost per visit (5,600 Year 0 Pesos), while the remaining 70% would pay at the subsidized rate of 500 Pesos per visit. Since an average visit is 4 days, these rates translate into a daily rate of 1,400 Year 0 Pesos for full cost inpatients and 125 Year 0 Pesos for subsidized patients.
4. Outpatients were assumed to pay 10 Year 0 Pesos per visit.
5. The breakdown of "site development" and "building construction" into their different components was assumed by the authors.
6. The project was assumed to have accounts payable and cash balance in the order of 5% (each) of the operation and maintenance expenditures.

7. It was assumed that all payments to the project would be in cash and so the project would not have any accounts receivable.

8. The rates of inflation for the Philippines Peso and for the Japanese Yen were taken as 8% and 3% respectively for the duration of the project.

9. The exchange rate in year 0 was taken as 39 Pesos per US Dollar. This rate depreciates by the difference in inflation rates every year according to the purchasing power parity model.

10. The project is exempt from paying any tax on its investment or operating inputs except labor.

11. The project operating life is taken as 15 years after which the residual value of the equipment and 40% of the site development are assumed to be zero. The building is assumed to have a life of 50 years and was depreciated linearly to determine its salvage value.

12. Real wages of skilled labor were taken as 10,000 Pesos per month in year 0 and were to increase at a real rate of 2.5% per annum.

13. Real wages of unskilled labor were taken as 6,000 Pesos per month in year 0 and were to increase at a real rate of 1.5% per annum

14. Real operating costs (except maintenance costs) were held constant from the third year of operations onwards i.e. once the project reached its maximum operating capacity. Non-maintenance operating costs during the first and second operating years were taken as 80% and 90% respectively of the maximum-capacity operating cost.

15. Maintenance costs were assumed to be 40% skilled labor. As a result the real cost of maintenance increased 1% per annum.

16. The real costs of building maintenance and vehicle maintenance were assumed to be independent of operating capacity. The cost of equipment maintenance was assumed to be a function of operating capacity. The real cost (before adjusting for the 1% real increase) in the first and second operating years were 80% and 90% respectively of the cost in the third operating year (full capacity).

17. Half of the water used is for toilet flushing and for sprinkling. The project sources water for these purposes from a well and pays no charge for its use.

2nd. Methodology

The analysis follows the Harberger/Jenkins methodology outlined in detail in the accompanying manual. Working tables are prepared in *nominal* terms to take into account the different impacts of inflation. Cashflows in nominal Pesos are first arrived at before being deflated to real cashflow statements.

Two points of view are considered: one from the total investment perspective and the second from the sponsor's (the government's) perspective. The main objective of the financial analysis is to determine, under the given set of assumptions, the extent of the operating deficit if any and to subsequently determine how it would be financed. The estimation of a financial Net Present Value in this case would be unnecessary.

3rd. Results

The net cash flows for the project are positive with the exception of 3 years: the first two investment years and the last operating year. Regarding the investment years, 36 of the 44 million Pesos deficit in Year 0 reflect the opportunity cost of the land and will not be required in actual financing. What will require financing by the Government of the Philippines are 8 million Pesos in Year 0 and 3.58 million Pesos in Year 1.

Net cash flows during the operating years are positive with the exception of the last year of operations. This is primarily due to the fact that the labor costs, which account for over 70% of total recurrent costs have been increasing in real terms and have caught up with the fees charged by the hospital. A real increase in the fees may be considered to overcome this problem.

It should be noted however that this situation is a remarkable improvement over existing conditions where LGU covers 90% of the operating costs. This uses about 15% of the LGU's budget.

4th. Sensitivity Analysis on Financial Returns

The sensitivity of the financial net cashflows of the project to changes in a number of variables was tested. Since the bulk of the cost of the project was to be provided by the Japanese government, the most important financial consideration is whether the project will be able to cover its operating and maintenance costs or not if certain variables change.

Percentage Change in All Fees: This variable measures the impact of a percentage change in the hospital's revenues through a cross-the-board change in all charged fees.[1] A 20% decrease in fees (for all inpatients and outpatients) will result in negative net cashflows for all years of the project ending with –8.6 million Pesos in year 16. The magnitude of the annual deficit increases over the life of the project, as the real net cashflows tend to decrease over time due to the real increase in labor costs. A 5% decrease in charged fees will result in operating deficits only in the last 4 years of the project's life. An increase in charged fees of slightly over 1% will result in the project generating positive net cashflows for its entire life.

Percentage Change in Fee of Subsidized Inpatients: At the present time, 70% of hospital inpatients are treated for free. This however is expected to change as patients start paying a share of the cost. This variable tests the sensitivity and robustness of the project's net cashflows to changes in the fee charged to subsidized inpatients. A 20% decrease in the fee will result in negative net cashflows only in the last 4 years of the project's life ending with –2.7 million Pesos in year 16. A 5% increase in the charged fee would erase the project's negative net cashflow in year 16.

Bed Occupancy Yr. 4 –Yr. 16: Bed occupancy from year 4 on was taken as 100% based on previous experience and severe overcrowding. The impact of a drop in the occupancy rate (due to higher fees, for example) on the net cash flows of the project was tested. The

[1] This variable could also be interpreted as measuring the number of non-paying patients. In other words a 20% reduction in charged fees is equivalent to 20% of all patients not paying their bills.

increase in the occupancy rate over 100% was also modeled as previous experience has also showed that extra beds were sometimes used. The sensitivity analysis indicates that the net cashflows are fairly sensitive to changes in bed occupancy. Due to the profiles of decreasing annual net cash flows over the life of the project, lower bed occupancies result in negative net cash flows in the later years of the project. For example, a 95% bed occupancy results in negative net cashflows from Year 13 onwards, while a 90% bed occupancy results in negative net cashflows from Year 10 onwards.

Real Increase in Salaries of Skilled Labor: The project's net cash flows are sensitive to changes in the value of this variable. If the annual increase was 2% instead of the expected 2.5%, the project's net cash flows would be positive for the entire life of the project. A 3% increase in the real wage rate would result in negative net cashflows for the last three years of the project's life.

Cost Overrun: Since the project pays no taxes and has no debt, any cost overrun has no impact on the net cashflows of the project.

Domestic Inflation Rate: Inflation has no impact on the financial cashflows of the project. The project has no debt, and pays no taxes. Inflation may affect the cash flows of the project only through changes in working capital. The hospital will have no accounts receivable (all payments in cash), the amount of accounts payable is equal to the amount of cash balances and as a result, they offset one another negating any impacts that

inflation may have on the net cash flows. In other words, the financial viability of the project is unaffected by the domestic inflation rate.

5th. Risk Analysis of Financial Returns

a) Assumptions

While the sensitivity analysis conducted above indicated that the financial net cashflows were sensitive to changes in the hospital fees, these fees were not modeled as risk variables because the government will set the fees. Two variables were modeled as risk variables: the real increase in the wage rate of skilled labor and the bed occupancy. A normal distribution of ± 10% was used to model bed occupancy, and a triangular distribution varying between 2.0% and 3.0% was used for the real increase in the wage rate of skilled labor.

b) Results

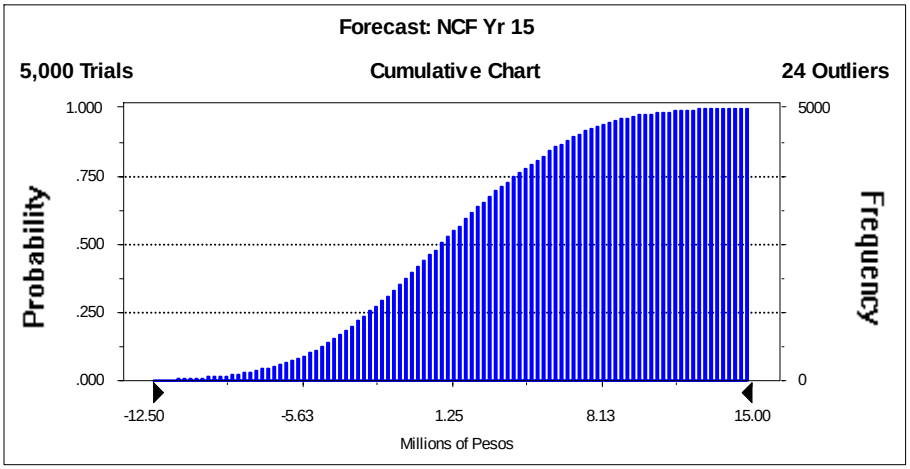
Five thousand simulations were run to determine the impact of the risk variables on the NCFs of the project in select years. Three years were selected in the early operating years (Yrs 2, 4 and 5) together with the last three operating years of the project. The risk analysis indicates that the NCFs of the project in the early years are sufficient to cover the operating and maintenance costs and that there is no probability of a negative return during these years. However, the project may have some difficulty covering its recurrent costs in its final years. The probability of a deficit in Yr. 14 is about 25%. This probability increases to over 40% in year 15 and to over 60% in year 16. The cumulative probability distribution for the NCF in year 15 and some statistics are presented below in

Figure 1 and Table 3 respectively. Needless to say, since the means of the risk variables used in conducting the risk analysis were equal to the values of these variables in the deterministic analysis, the expected value of the NCFs are close to those obtained in the deterministic case.

Table 3
Simulation Results for NCF Yr. 15

Trials	5000
Mean	0.95
Median	0.91
Standard Deviation	4.89
Variance	23.86
Coeff. of Variability	5.13
Range Minimum	-18.87
Range Maximum	19.32
Mean Std. Error	0.07

Figure 1
Cumulative Probabilities for NCF Yr. 15



D) Economic Analysis

Economic values and conversion factors are estimated following the methodology outlined in the accompanying manual. The economic resource flow statement is then

obtained by multiplying the line items in the total investment cashflow statement expressed in real terms by the conversion factors.

1st. Economic Values and Conversion Factors

1. National Parameters

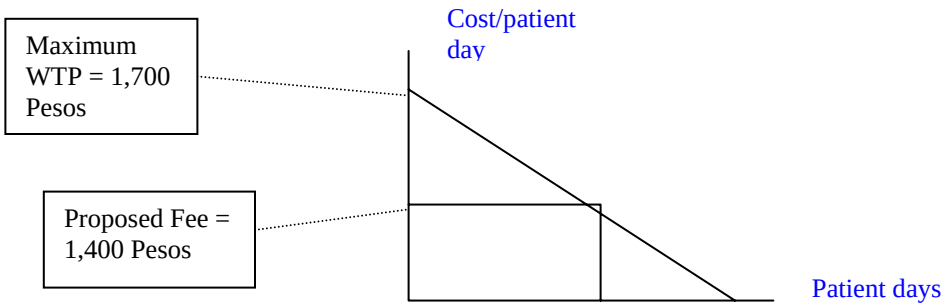
The economic discount rate for the Philippines has been estimated to be 10.30%, while the foreign exchange premium has been estimated to be 15.24%.

2. Economic Benefits of Project Output

There are several ways to determine the willingness to pay (WTP) for the services being offered. The measure of WTP used in this analysis was the fees patients pay for comparable services in private hospitals. WTP is used as a measure of the economic benefits of the project. Project beneficiaries were divided into three categories: full-cost inpatients (30% of total inpatients), subsidized inpatients (70% of total inpatients) and outpatients.

Full-cost inpatients: Fees paid by inpatients at private hospitals offering comparable services were taken as the maximum willingness to pay for full-cost inpatients. This value was taken as 1,700 Pesos per day. The average willingness to pay for this category was taken as the average of the maximum value of 1,700 Pesos and the actual fee of 1,400 Pesos. This gives an economic value of 1,550 Pesos and a conversion factor of 1.11 (1,550/1,400). This is demonstrated in Figure 2 below.

Figure 2
Economic Benefits to Full-Cost Inpatients



Average WTP for full-cost Inpatients = (1,700 + 1,400)/2 = 1,550
Conversion Factor for full cost Inpatients = 1,550/1,400 = 1.11

Subsidized inpatients: For the 70% of the inpatients that pay subsidized fees, it was assumed that their maximum WTP would be less than the fees paid in private hospitals. It was assumed that the maximum willingness to pay for this group would be 70% of the fees paid in private hospitals i.e. 70% of the maximum WTP for the full-cost inpatients. Accordingly, the maximum WTP per day for this group is 1,190 Pesos (70% of 1,700) and the average willingness to pay is the average of the maximum value of 1,190 Pesos and the subsidized fee of 125 Pesos. This gives an economic value of 658 Pesos and a conversion factor of 5.26 (1,190/125).

Outpatients: Fees paid by outpatients at private hospitals offering comparable services are 1,300 Pesos per visit. This value was taken as the maximum WTP for 30% of the outpatients. For this sub group, the WTP was the average of the 1,300 and the charged fee of 10 Pesos. The economic benefit for this subgroup was 655 Pesos and its conversion factor was 65.5. For the remaining 70% of the outpatients, it was again

assumed (similar to inpatients) that their maximum WTP would be 70% of the fees charged by private hospitals. Consequently, the maximum WTP per visit for this sub-group is 910 Pesos (70% of 1,300) and the average willingness to pay is the average of the maximum value of 910 Pesos and the actual fee of 10 Pesos. For this subgroup, the economic value is 460 Pesos and the conversion factor is 46 (460/10). The conversion factor for outpatients is then a weighted average of both subgroups and is calculated as follows:

Conversion factor for outpatients = 30% * 65.5 + 70% * 46 = 51.85.

3. Economic Cost and Conversion Factors for Inputs

The conversion factors for the inputs were estimated following the methodology outlined in the accompanying manual. Table 4 shows the conversion factors for all cost items. The conversion factor for freight (0.96) and its tradeable content (44%) have been estimated in the chapter on non-tradeables (Tables 11.3 and 11.4 respectively).

i). Investment Cost Items

Investment cost items were broken down into land, site development, building construction, equipment and technical fees. The economic cost of each of these items was estimated and then a conversion factor was determined by dividing the economic cost by the financial cost. Each conversion factor was then applied to the financial price of its corresponding item for all years of the project.

Table 4
Conversion Factors for Cost Items

Item	Conversion Factor
Land	1.07
Site Development	1.05
Skilled labor	0.95
Unskilled labor	0.97
Equipment	1.15
Aggregate	1.06
Reinforcing Steel	1.15
PVC	1.15
Other material	1.05
Building Construction	1.08
Skilled labor	0.95
Unskilled labor	0.97
Equipment	1.15
Aggregate	1.06
Reinforcing Steel	1.15
Cement	1.15
Lumber	1.07
Other material	1.05
Technical Fees	1.10
Electricity	1.04
Drinking Water	1.00
Water for flushing	*
Fuel	1.15
Maintenance	1.07
Miscellaneous	1.05
Changes in Acc. Payable	0.98
Changes in Cash balance	0.98

*. The economic value of water for toilet flush and sprinkler use was assumed to be 30% of the economic value of drinking water.

Land is a pure non-tradeable and the only distortion in that market is the value added tax. The economic price of land will be calculated as the weighted average of the supply price (price net of tax) and the demand price (price gross of tax). The weights are based on the relative elasticities of demand and supply. The supply elasticity was assumed smaller than the demand elasticity indicating that the supply is less responsive to changes in price than demand. Both elasticities were assumed to be less than one. Since the project pays no taxes, the financial price paid by the project will be the price net of tax. Consequently,

the financial price will be less than the economic price and the conversion factor will be greater than one (1.07).[2]

The economic cost of *site development* and *building construction* and their conversion factors were estimated as weighted averages of their various components. The components for site development include skilled labor, unskilled labor, equipment, aggregates, steel bars, PVC and other materials. The components for building construction include skilled labor, unskilled labor, equipment, aggregates, steel bars, cement, lumber, and other materials. The weighting of each component is based on its share in the total cost of the item. The conversion factors for site development and building construction were estimated to be 1.05 and 1.08 respectively.

Two broad types of *labor* are used in the site development and building construction: skilled and unskilled. The economic cost for each type was estimated as the private supply price in the project area adjusted for the tax externality. Since unskilled workers typically do not pay taxes, it was assumed that only 10% of unskilled workers are drawn to the project from tax-paying activities. This is quite different from skilled labor where 85% of the workers are drawn from tax-paying activities. The balance of the project's demand for skilled labor (15%) is met from a new supply of labor hours. The conversion factors for skilled and unskilled labor are 0.95 and 0.97 respectively.

[2] The fact that land is exempt from tax does not imply that its economic price is equal to the financial price and the conversion factor is equal to one. When the project demands land (or any non-tradeable input), its demand is met in part by an increase in supply and in part by a cutback in demand. The new supply is valued at the supply price (price net of tax) and the cutback in demand is measured by the value of that land to those who give it up. This value includes all taxes paid by the consumer. Consequently, the fact that the project pays no tax will have no bearing on the estimation of the economic price but will only affect the financial price paid by the project and the conversion factor.

Equipment, steel, cement, and PVC materials are importable items. Converting the financial prices of these items into their economic equivalents involved two steps. 1) The foreign exchange premium was applied to the CIF prices of these items. 2) An adjustment was made for the handling and freight components associated with moving these items from the port to the project site. This adjustment involved netting out direct distortions in the freight and handling markets and adding the foreign exchange premium to the tradeable proportion of these items. Note that since the project is exempt from taxation on its direct inputs, no adjustment was necessary for import duties and other taxes on these inputs.

Aggregates are a pure non-tradeable item and the only distortion affecting this market is the VAT. However the project does not pay the tax. Consequently, the economic price is greater than the financial price paid by the project and the conversion factor is 1.06. The supply weight was assumed twice the demand weight to indicate that consumers of aggregates are less responsive to changes in prices than the suppliers because aggregates are readily available and the supply can be increased without much difficulty to meet any surges in demand.

Lumber, an exportable item, was treated as a non-tradeable item due to a ban on exports. Similar to aggregates, the economic price was greater than the financial demand price due to the presence of the VAT and the exemption of the project from all taxes. The

conversion factor was 1.07. The supply of lumber is tight compared to the demand for it, hence its supply elasticity was assumed to be 0.5, and its demand elasticity to be -0.9.

Technical fees are for project studies. These studies are carried out in part by locals and in part by foreigners. Consequently, the economic cost is estimated separately for the foreign part and for the local part. The local part in all these items is assumed to be carried out by skilled labor and hence will have the same conversion factor as that of skilled labor (0.95). The economic cost of the foreign component is obtained by adding the foreign exchange premium to the proportion of foreign income that is repatriated. The conversion factor for the item is a weighted average of the conversion factors of the two components. The weights are the relative shares of the components in the total financial cost of the technical fees. The percentage repatriated was assumed to be 90% as most of work on the studies is done overseas.

b) Recurrent Cost Items

Recurrent cost items are: electricity, water, fuel, chemical and medical supplies, maintenance, labor and miscellaneous items.

The conversion factor for *electricity* has been estimated in the accompanying manual and is equal to 1.04 (Table 11.16, Chapter 11).

Two kinds of *water* were used by the project: drinking water and water for toilet flush and sprinklers. The financial price per cubic meter of *drinking water* paid by the project

is 34.5 Pesos. This price appears to be in the range of the economic price of drinking water. Consequently, the conversion factor for drinking water was taken as 1.00. As for the *water for toilet flush and sprinklers*, the economic value of the water was assumed to be 30% of the economic value of drinking water.

Fuel, and chemical and medical supplies are importable items. Their conversion factors have been estimated as explained above by adding the foreign exchange premium to the CIF prices of these items and then by adjusting for the handling and freight components associated with moving these items from the port to the project site.

Maintenance was assumed to be made up of 40% skilled labor and 60% equipment. Its conversion factor was a weighted average of the conversion factors of these items using the weights in Table 4 above. Its conversion factor came to 1.07.

Since *accounts payable and cash balance* are estimated as a fraction of total recurrent costs, their conversion factors are weighted averages of these costs. The conversion factor for these two items was 0.98.

2nd. Results

The conversion factors discussed above are multiplied by the real financial cash flows in the total investment cash flow statement to obtain the economic resource flow statement. The Net Present Value of the project is 41 million Pesos and it has an IRR of 11.2%.

3rd. Sensitivity on Economic Results

The sensitivity of the economic returns to an overrun in investment costs and to the real increase in the wage rate of skilled labor were tested. In addition, the robustness of the economic returns under different values and assumptions regarding the maximum willingness to pay and the income distribution of the population of the province were examined. The results of the analysis indicate that the viability of the project may be impaired with small changes in certain variables or changes in the assumptions regarding the economic benefits of the project.

The economic net present value of the project is extremely sensitive to the investment cost of the project. A 5% increase in the investment cost of the project results in a 77% decrease in its economic NPV. A 6.6% cost overrun would undermine the viability of the project. The economic NPV of the project is not very sensitive to changes in the increase in the real wage rate of skilled labor as a change in the projected real rate of increase from 2.5% to 3% would lower the economic NPV from 41 million Pesos to 35 million Pesos. This variable is unlikely to affect the economic viability of the project.

The project's viability is extremely sensitive to the assumptions regarding the maximum willingness to pay (WTP) for the different groups of patients. If the maximum WTP for full-cost inpatients and for subsidized inpatients were 10% less than the values used, the economic NPV would drop 98.5% almost approaching zero. If the maximum WTP for outpatients was 10% less than the values used, the economic NPV would drop 90%. It was also assumed that 30% of the population was in a high-income group that had a

certain maximum WTP, and the remaining 70% of the population had a maximum WTP equal to 70% of that of the high-income group. If the maximum WTP for the non high-income group was 64% instead of 70% the project would seize to be economically viable. The economic returns are also sensitive to changes in the bed occupancy where a decline in the bed occupancy from 100% to 98% results in a 26% in the economic NPV. The economic NPV turns negative when the occupancy rate drops to 90% or less.

4th. Uncertainty of Economic Returns

The economic returns are sensitive to the values of the maximum willingness to pay used to estimate the economic benefits as well as the bed occupancy rate and the investment cost. The distribution and range for the variable bed occupancy was specified earlier when conducting the risk analysis on the financial returns. The cost overrun factor was assigned a normal distribution with a 3.3% standard deviation. Two triangular distributions were selected for the maximum willingness to pay: one for full-cost high-income inpatients and one for high-income outpatients. The ranges for each of these two variables were taken as ± 10%. The maximum willingness for non-high-income patients was taken as 70% of that of the high income group. This percentage was modeled as uniform distribution with a range of 60% to 80%. Table 5 shows the risk variables used, their distributions and ranges.

Table 5
Risk Variables, Distributions and Ranges

1. Bed Occupancy Yr. 4-16	Normal distribution	
	Mean	100%
	Standard Dev.	3.33%

2. Investment Cost Overrun	Normal distribution	
	Mean	0%
	Standard Dev.	3.33%
3. Maximum WTP of subsidized inpatients as a % of the maximum WTP of full-paying inpatients.	Uniform distribution	
	Minimum	60%
	Maximum	80%
	Mean value	70%
4. Maximum WTP of full-paying inpatients	Triangular distribution	
	Minimum	1,530
	Likeliest	1,700
	Maximum	1,870
5. Maximum willingness to pay of outpatients	Triangular distribution	
	Minimum	1,170
	Likeliest	1,300
	Maximum	1,430

The analysis indicates that the probability of a negative economic return is around 25%. The expected value of the NPV is close to the deterministic value as one would expect.

E) Distributional Analysis

A distributional analysis is conducted to determine the externalities generated by the project and to identify the major beneficiaries and losers. The externalities are measured as the differences between the economic and financial cashflows. Total externalities are estimated as follows:

$\sum$ PV(externalities) = NPV (economic) – NPV_{re} (financial)

Where:

$\sum$ PV(externalities) are the present value of the externalities discounted at the economic discount rate,

NPV (economic) is the net present value of the economic resource flows; &

NPV_{re} (financial) is the net present value of financial cash flows (total investment) at the economic discount rate.

Applying the above formula, the project generates 584.5 million Pesos in externalities {41. –(-544)}. The stakeholders in this case are the full-cost inpatients, the subsidized inpatients, outpatients, the government, and the economy at large.

The largest group of beneficiaries from the project is outpatients. They stand to gain 364 million Pesos from the project. This is due to the fact that they pay 10 Pesos per visit for services that private hospitals would charge around 1,300 Pesos for. The analysis of uncertainty indicates that the probability that this group will lose is zero.

The second largest gainers are subsidized inpatients who stand to net 254 million Pesos from the project as a result of the subsidized services they are receiving. Full paying inpatients also gain from the project (21.5 million Pesos). The analysis of uncertainty indicates a zero probability that either of the two groups will lose.

The government stands to lose 53 million Pesos from the project in terms of extinguished tax revenues. The project pays no taxes so there is no direct government gain. However the project's demand for its different inputs results in displacing the demand of other tax-paying projects, hence resulting in a loss to the government. Other government externalities reflect the indirect losses in import duties associated with the foreign exchange premium. The only gain to the government was the taxes paid by the project's labor. The analysis of uncertainty indicates that the government will lose with a probability of 100% with the loss ranging between 45 million Pesos and 60 million Pesos.

The economy at large stands to lose about 2 million Pesos as the project uses well water for toilet flushing and sprinkling and does not pay the cost of that water.

F) Conclusion

The project is financially sustainable as it can finance all its operating costs through its fees with the exception of the last operating year. There was no adjustment in the real fees charged over the life of the project. However, this assumption may be relaxed particularly that skilled labor, the largest recurrent cost component is expected to increase at the real rate of 2.5% per annum. The investment cost being largely borne by the Japanese government removes the associated financial and risk burden from the Philippines government.

The economic returns of the project are very susceptible to the values used for maximum willingness to pay for the services offered. It is, hence, advisable to carry out a further analysis of the willingness to pay for these services before a final decision regarding the project is made.