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One Stop Service Centre in Pourashava: How Efficient and Transparent?

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Abstract: *This paper attempts an empirical assessment of the various types of services rendered by a modern Pourashova based on quantitative data collected for the first year. The paper particularly applies tools of economics to analyze efficiency and transparency with which the committed services are rendered after the OSSC has been in place. The major determinants of efficiency and transparency selected for investigation include reduction of time needed to provide assistance, reduction of paperwork due to the digitization of services, faster communication between municipality departments, increase in speed, accuracy, and transparency, decrease in office cost and increase in revenues for the municipality. Finally, the paper seeks answer to the question as to how far the efficiency of Pourashova is constrained or facilitated by the allocation of budgetary resources and how far by official's motivation, readiness and availability of digitization facilities in record keeping.*

1. Introduction

Pourashava is the urban local government institution in Bangladesh. It provides service to the citizens of the Pourashava within its jurisdiction. The citizens have to pay holding tax and other charges to Pourashava Authority as service receivers. The service receivers had to face difficulties to get service from service providers as a lack of modern urban facilities. The problem was that citizens had to visit repeatedly and needed to stay longer time in Pourashova office premises to get desired services. Part of the reasons behind such prolonged visits to the offices was lack of right information about who and where to go to for what services and what requirements are there for asking a service from the Pourashava.

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The delayed or no delivery of modern urban facilities is not only tantamount to virtual deprival of the city dwellers from very essential services, but this also brings forth genuine questions about efficiency and credibility of the municipal bodies. It is in this background that a One Stop Service Center (OSSC) was established by the government in Jamalpur Pourashava in 2012 with a view to providing better service to the municipal dwellers.

The One stop service center was introduced in municipalities to improve the service delivery efficiency of the administration and ensure maximum satisfaction of the citizens who are the recipients of services. Thus the aim of this paper is to provide the municipality with a clear picture of how it's investments would look like at the end and what are the tangible and intangible benefits from this new system. The reason for preparing the paper is to researching and rethinking about the future prospect to replicate the OSCC theme to other municipalities in a systematic manner.

This paper attempts an empirical assessment of the various types of services rendered by a modern Pourashova based on quantitative data collected for the first year. The objectives of the study were as follows:

1. To measure cost and benefit of OSCC
2. To measure time savings per service after introducing OSSC
3. To find out problem and prospect of OSCC.

2. Methodology

2.1 Area Selection

Area of the study was Jamalpur Pourashava selected on purposively basis as the one stop service center was established by Jamapur Porshashava under Local Government Division(LGD) funder by GIZ.

2.2 Beneficiary Selection

To measure cost benefit of service receivers, the service receivers who got service under OSCC has been considered as beneficiary of the study. During 2011-12 financial year, the people came to Pourashava to get birth and death certificate, Citizen certificate and warrision certificate are considered as beneficiaries.

2.3 Data sources and its collection procedure:

Both primary and secondary data were used to conduct the study. Primary data were collected from the authority of Jamalpur Pourashava. Secondary data collected from various sources, including policy statements, official and unofficial reports, various comments and figures from published studies in the field, newspapers, reports of conferences, and documents and papers on the Internet and so on

2.4 **Analytical Technique:**

The study firstly reviewed the fundamental issues relating to one stop service center. Then, it focused on descriptive analysis of one stop service center cost-benefit analysis were done. Finally, it will suggest some policy implications for promoting rural non-farm employment in Bangladesh. To do this, they will employ both qualitative and quantitative techniques of analysis.

In order to analyzed the date, both undiscounted and discounted measured were followed.

2.4.1 Undiscounted Cost and Benefit of One Stop Service Center

To analyze the cost and benefit of OSCC first of all cost and benefit of the project were identified and then data were collected on that. The cost stream includes investment and operating cost. The investment cost includes office building and land cost, office decoration cost, IT equipment, furniture, capacity building, launching event and salary of the staff engaged first one year of establishment of OSCC. The operating cost includes salary of staffs, IT equipment spare parts, paper and other logistics.

The benefits of OSSC result from time and cost savings of OSSC system users, such as reductions in repeated visit and processing time (door to door going time savings), improvements in the reliability of OSSC systems or services, quantified as reductions in travel time.

2.4.2 Discounted Benefit-Cost

Streams of benefits, and costs, are needed in order to properly treat the time valuation of resources. Future benefits and costs must be converted into present value terms by applying an appropriate discount rate.

Present value calculations are important since society has the option of using the funds that are being dedicated to the project being evaluated for some other purpose instead. Spending resources on the project in question has an opportunity cost, which represent the benefits foregone by not making some alternative investment. Since financial markets tell us that we could always invest these resources with high probability of some known future returns on the investment (in a low -risk security), future benefits and costs should be discounted relative to benefits and costs experienced today. This is another way of saying that foregoing consumption today must be compensated with an opportunity for higher levels of consumption tomorrow. The choice of discount rate, the factor applied to future benefits and costs in translating them to present values, is an important assumption in any benefit-cost analysis.

Discounted measures of project worth for financial and economic analysis were applied analyzing data. As the undiscounted measures of project worth fail to take

into account adequately the timing of benefits and costs, discounted measures of projects are used. By applying this technique future cash flows can be reduced to their present value. The discounted measures which are commonly applied to evaluate the project are Net Present Value (NPV), Benefit-Cost Ratio (BCR) and Internal Rate of Return (IRR).

The formal mathematical statements of the discounted measures of project worth are given below (Gittinger, 1982):

2.4.3.1 Net Present Value - NPV

The net present value (NPV) is the current value of all project net benefits. Net benefits are simply the sum of benefits minus costs. The sum is discounted at the discount rate. Using this method, if the project has a NPV greater than zero then it appears to be a good candidate for implementation. The formula used to calculate the NPV is:

$$NPV = \sum_{t=1}^{T} \frac{\left(Benefit_t - Cost_t\right)}{(1+r)^t}$$

Where Benefi t = Benefit in tine t,

Cost t = Cost in tine t,

T = Number of Years, i.e Life of project

t = Time (1, 2, 3 …….. T)

r = discount rate

2.4.3.2 Benefit-cost ratio (BCR)

The benefit-cost ratio (BCR) is calculated as the NPV of benefits divided by the NPV of costs:

$$BCR = \frac{\sum_{t=1}^{r} \frac{B_t}{(1+r)^t}}{\sum_{t=1}^{r} \frac{C_t}{(1+r)^t}}$$

Where Benefi t = Benefit in tine t,

Cost t = Cost in tine t,

T = Number of Years, i.e Life of project

t = Time (1, 2, 3 …….. T)

r = discount rate

2.4.3.3 Internal rate of return (IRR)

The internal rate of return (IRR) is the maximum interest that could be paid for the project resources, leaving enough money to cover investment and operating costs, which would still allow the investor to break even. In other words, the IRR is the discount rate for which the present value of total benefits equals the present value of total costs:

PV (Benefits) - PV(Costs) = 0.

But, for calculating IRR, interpolation method is used. The rule for interpolating the value of the internal rate of return lying between discount rate too high on the one side and at too low on the other is:

$$IRR = \text{Lower discount rate} + \text{Difference between two discount rates} \times \frac{\text{NPV at lower discount rate}}{\text{Absolute difference between NPV of at two discount rates}}$$

2.4.4 Valuation of Costs and Benefits

The valuation of benefits and costs should reflect preferences revealed by choices which have been made. For example, improvements in transportation frequently involve saving time. The question is how to measure the money value of that time saved. The value should not be merely what transportation planners think time should be worth or even what people say their time is worth. The value of time should be that which the public reveals their time is worth through choices involving tradeoffs between time and money. If people have a choice of parking close to their destination for a fee of 50 cents or parking farther away and spending 5 minutes more walking and they always choose to spend the money and save the time and effort then they have revealed that their time is more valuable to them than 10 cents per minute. If they were indifferent between the two choices they would have revealed that the value of their time to them was exactly 10 cents per minute.

The OSSC cannot be run without money and municipalities are not interested to spend on this project without getting any revenue from it. Any business initiative fails if there is no certain profit. The mayor would easily be convinced if he finds that benefits are much more compared to the costs of setting up a one stop service center and its maintenance, staff salaries and other charges are easily managed from the income of the service center. That is, the cost benefit analysis is an important part of this business model. Cost benefit analysis is a technique that allows people to compare the expected costs of implementing a system along with the expected benefits within a certain period of time. This comparison indicates

whether the project is financially viable or not and whether there will be a financial return on the initial investment.

Again, one should care about the time because it's impossible to get benefits without waiting for a certain period of time. The initial investment might seem great compared to the benefits at the primary stage, but after a certain period of time this situation will be overcome where the benefits will be much higher and costs will be much lower compared to the initial expenses.

2.4.5 Process of Cost Benefit Analysis

The process of cost benefit analysis would involve four steps, such as:

1. Identifying costs by year
2. Calculating benefits by year
3. Comparing the results
4. Analysis on costs and benefits

3. Results and Discussions

3.1 Beneficiaries with Services after OSSC during 2011-12.

After introducing OSSC, month-wise data of service receivers on different services like birth registration, death registration, citizen certificate and warrison certificate were recorded by the Pourashava. From the Table-1, it is found that on an average, birth-registration per month was 1112 numbers and death registration was 63 numbers per month. Birth registration was highest 2360 numbers in the month of December and lowest in the month of August. From July to November it was more or less equal, but in the month of December, it increased more than 3 times. The reason was that the demand of birth registration was more for admission purpose of the students. At very beginning of the academic year that is in the month January children had to get admitted in a new class and for this reason they required birth certificates. After December, the demand again starts to decrease. The demand for citizen certificate and warrision certificates were 1313 and 1526 per month which were more than birth and death registration.

Table-1: Month wise and Service wise Beneficiaries during 2011-12 after OSSC

Month	Birth Certificate	Death Certificate	Birth-Death Certificate	Citizen Certificate	Warrision Certificate
July	639	69	708		
August	526	61	587		
September	791	61	852		
October	713	58	771		
November	777	74	851		
December	2350	76	2426		
January	2160	79	2239		
February	1068	51	1119		
March	1428	73	1501		
April	1024	61	1085		
May	1052	45	1097		
June	817	53	870		
Total	13345	761	14106	15761	18309
Average	1112	63	1176	1313	1526

3.2 Identifying costs

3.2.1 Investment Cost

The total investment for installing a one stop service center in Jamalpur Pourashava was Taka 130.00 Lakh including the human resource for 12 months. The investment cost includes salaries and allowances of the OSSC operation team for the first year of the project, cost for office renovation, computer and telecommunication services, furniture, capacity building of the officers and staffs, OSSC launching and value of land and other related assets. Details of investment cost are given in Table-2.

Table-2 : Investment Cost of OSCC Jamalpur per year

Item Particulars	Cost in actual BDT	Cost Lakh Taka
Salaries and allowances for the OSSC operation team for the first year of the project	725000	7.25
Local Office renovation cost	185,000	1.85
Computer and Telecommunication devices	1,639,000	16.39
OSSC Office Furniture and Setup	231,390	2.31
Capacity building	100,000	1.00
Launching event	120,000	1.20
	3000390	**30.00**
Value of land, building and other assets	10000000	100.00
Total	10000000	130.00

3.2.2 Operation and Maintenance Cost

The operation and maintenance cost includes salaries and allowances of the staffs who are directly involved with OSSC as customer care service providers, other costs for running the office includes logistics, spare parts of IT equipment and maintenance cost would be remaining until the project ends. But, these costs can be easily managed from the income generated from OSSC by issuing certificates after a certain time.

Table-3: Operation and Maintenance Cost of OSCC

Particulars	Cost per month	Salary per year	Taka in Lakh
Customer Care Officer's salary	10000	120000	1.20
Sub-Assistant Engineer's salary	10000	120000	1.20
Computer and Telecommunication devices	2,000	24000	0.24
Paper and others	2,000	24000	0.24
	24000	288000	2.88

3.3 Identifying Benefits

By establishing one stop service centers, municipal authorities are not the only stakeholders to be benefited; rather it would be the citizens who will experience the essence of transparent and efficient service delivery. The benefits included both tangible and intangible.

3.3.1 Tangible Benefits from Service Fees

After introducing one stop service, Pouroshava authority had raised fees for citizen certificate and warrision certificate, but for birth and death registration they did not raise the fees and folloed the national rules and regulations. The tangible benefits raised and it was Tk. 9.81 Lakh after introducing OSSC.

Table-4: Tangible Benefits from Service Fees

Particulars	Birth Registration	Death Registration	Citizen Certificate	Warisan Certificate	Total
Number of beneficiaries attend per month	1,112	63	1,313	1,503	3,928
Number of beneficiaries attend per year	13344	756	15756	18036	47,136
Service charge per certificate -before Oscc	5	0.00	5	0	10
Service charge per certificate -after Oscc	5	0.00	10	50	65
Reduction of No. of visits per person per service after OSCC	0	0	5	50	55
Increased service charge per service after OSCC in a year	0	0	78780	901800	980,580
Total money increase as fees in a year (Taka in Lakh)	0	0	0.7878	9.018	9.8058

3.3.2 Intangible Benefits

3.3.2.1 Time Savings from Reducing Visits

After establishing OSSC, service seekers or receivers are being able to save time for getting service from Pourashava than before. It was estimated that on average people had to visit the Pourashava at least 2 to 3 visits per service, but it required 1 visit after introduction of OSSC. This indicates that on an average, 50% time had been reduced than before. Because, before introducing OSSC, there were many door for one service. The characteristics of OSSC is one door for many services and peoples need not require to move more time going door to door or the different desks of Pourashava. For this reason, the peoples can avoid tension and require less time to get services. They can save repeated visits and can save time which indicates reduction of cost. The people can save money through reducing visits (coming to the Pourashava and return back) per day than before. The reason was that during 2011-12 year, total beneficiaries for getting birth and death certificate were 1176 and it was 1313 and 1503 for citizen and warrision certificate. Considering average time required 2 hour per visit, it was found that total time saved in a year were 3528, 1970 and 2289 days for respectively. Considering wage rate Taka 200 per day, the benefits from birth-death registration, citizen and warrision certificate were TK. 7.056, 3.939 and 4.578 lakh respectively.

Table-3: Intangible Benefits through Reduction of Visits and Wating timing for Getting different Certificates During 2011-12.

Particulars	Birth-Death Registration	Citizen Certificate	Warisan Certificate	Total
Number of beneficiaries attend per month	1,176	1,313	1,526	4,015
Number of beneficiaries attend per year	14112	15756	18312	48,180
No. of visits per person per service before OSCC	3	2	2	7
No. of visits per person per service after OSCC	1	1	1	3
Reduction of No. of visits per person per service after OSCC	2	1	1	4
Total reduction of visits per service after OSCC in a year	28224	15756	18312	62,292
Average time required per visits (hour)	1	1	1	1
Total time saved in a year (hour)	28224	15756	18312	62292
Total time saved in a year (day)	3528	1969.5	2289	7786.5
Per day wage	200	200	200	324.4375
Total money savings in a year (Taka in Lakh)	7.056	3.939	4.578	15.57

Source: Jamalpur Pourashava, 2014

3.3.2.2 Time Savings from Reducing Processing Time

After establishing OSSC, service providers are being able to reduce processing time as because of digitizing the process. This indirectly helped the service seekers or receivers and saved time for getting service from Pourashava than before. It was estimated that on average processing time required 2 to 2.5 hours per service before introducing OSSC and it required 1 hour after OSSC. This indicates that on an average, 50% time had been reduced than before. Because, before introducing OSSC, there were many door for one service. The characteristics of OSSC is one door for many services, peoples need not require to move desk to desk at the time of processing. For this reason, the people can save time which indicates reduction of cost. The time has been reduced for processing (getting birth, death and warrision certificate), per day than before. The reason was that during 2011-12 year, total beneficiaries for getting birth and death certificate were 1176 and it was 1313 and 1503 for citizen and warrision certificate. Considering average time required 2 hour per certificate, it was found that total days saved in a year were 2646, 1970 and 2289 days for respectively. Considering wage rate Taka 200 per day, the benefits from birth-death registration, citizen and warrision certificate were Taka 5.292, 1.969 and 5.494 lakh respectively.

Table-4: Intangible Benefits through Reduction of Processing and Wating timing for Getting Different Certificates During 2011-12.

Particulars	Birth-Death Registration	Citizen Certificate	Warisan Certificate	Total
Number of beneficiaries attend per month	1,176	1,313	1,526	4,015
Number of beneficiaries attend per year	14112	15756	18312	48,180
Service time required per service before OSSC(hour)	2.5	2	2	7
Service time required per service after OSSC(hour)	1	1.5	0.8	3
Time savings (hour)	2	1	1	3
Total time savings in a year (hour)	21168	7878	21974.4	51,020
Total time saved in a year (day)	2646	984.75	2746.8	6377.55
Per day wage	200	200	200	265.7313
Total money savings in a year (Taka in Lakh)	5.292	1.9695	5.4936	12.76

Source: Jamalpur Pourashava, 2014

3.4 Benefit-Cost Analysis

The purpose of benefit –cost analysis is to compare the benefits with the costs of implementing the policy or investment. If the sum of the benefits of the project exceeds the costs, then there is a general economic argument supporting the action to make the investment or implement the project. In its broadest form benefit -cost analysis is a framework for social accounting, where any benefit or cost that can be measured and monetized is weighed against all other benefits or costs. In practice, benefit - cost analysis most often assumes a more limited scope of review due to limits on available information and methods for estimation and monetization of all consequences of the proposed investment or project.

Most of the economic benefits of one stop service centers result from travel time and cost savings to service receivers, such as reductions in travel time (time savings) for reduction of repeated visits and processing mechanisms quantified as reductions in travel time. The benefits of transportation projects may be either positive or negative, as would be the case if travel times were to increase as a result of some intended action. By convention the results of the investment are captured as benefits (whether good or bad), while the accounting of costs of the investment is limited to the actual costs (capital, operating, etc.) associated with implementing the project.

Benefit-cost analysis is designed to provide information that is relevant to the decision process and is not intended to substitute for human judgment.

3.5.1 Financial Analysis

Financial analysis is the process of evaluating businesses, projects, budgets and other finance-related entities to determine their suitability for investment. Typically, financial analysis is used to analyze whether an entity is stable, solvent, liquid, or profitable enough to be invested in. It also compares the costs and benefits over time to determine whether a project is profitable or not.

Financial analysis was done on the basis of available data. The net present value (NPV) was found 203.89 Lakh, Benefit-Cost ratio was 2.47 and internal rate of return was 30.89. The project is profitable because NPV was positive, BCR was more than 1 and IRR was more than 15%. From the above statement it can be say that the project is financially viable. Details are given in Appendix-A.

3.5.2 Economic Analysis

Economic analysis takes into account the opportunity cost of resources employed and attempt to measure in monetary terns the private and social cost and benefits of a project to the community or economy.

Economic analysis was done on the basis of available data. The net present value (NPV) was found 218.04 Lakh, Benefit-Cost ratio was 2.69 and Internal rate of return was 31.62. The project is profitable because NPV was positive, BCR was more than 1 and IRR was more than 15%. From the above statement it can be say that the project is financially viable. From social point of view Details are given in Appendix-A.

4. Conclusion

One stop service center has a positive impact on service receivers and providers. It is found that the project has benefited more after introducing OSSC. It has reduced the repeated visit of the citizens, wating time and processing time. At present, the people need not go door to door for having services. The tangible and intangible benefit have increased which indicates positive situation. The benefit from time saving through reduction of visits is a good important factor for the service receivers. After OSSC, it has become possible to reduce processing time. Time saving was possible because of reduction of processing formalities or mechanism also a positive impact on OSSC service providers and receivers. In financial analysis, the net present value (NPV) was found 198.16 Lakh, Benefit-Cost ratio was 2.43 and internal rate of return was 33.88. The project is profitable because NPV was positive, BCR was more than 1 and IRR was more than 15%. The project is viable from individual point of view. In economic analysis, the net present value (NPV) was found Tk. 210.38 Lakh, Benefit-Cost ratio was Tk. 2.43 and internal rate of return was Tk. 33.88. The project is profitable because NPV was positive, BCR was more than 1 and IRR was more than 15%. The project is viable from social point of view. From the facts and findings it can be stated that one stop service center is useful and beneficial for the Pourashava.

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Appendix Table : Financial Analysis

Taka In lakh

Year	Cost (Financial)		Total Cost	Income from fees of services	Income from visit-timing reduction	Income from processs time reduction	Total Benefit	15% Discount Factor	Discounted Value at 15%		25% Discount Factor	Discounted Value at 25%	
	Investment	Operating							Total Cost	Total Benefit		Total Cost	Total Benefit
2011-12	130.00	0.00	130.00	0.00	0.00	0.00	0.00	0.870	113.04	0.00	0.7407	96.296	0.00
2012-13	0.00	2.88	2.88	9.81	15.57	12.76	38.13	0.756	2.18	28.83	0.5487	1.580	20.92
2013-14	0.00	3.17	3.17	9.90	16.35	13.39	39.65	0.658	2.08	26.07	0.4064	1.288	16.11
2014-15	0.00	3.33	3.33	10.00	17.17	14.06	41.23	0.572	1.90	23.58	0.3011	1.001	12.41
2015-16	0.00	3.49	3.49	10.10	18.03	14.77	42.90	0.497	1.74	21.33	0.2230	0.779	9.57
2016-17	0.00	3.67	3.67	10.20	18.93	15.50	44.64	0.432	1.59	19.30	0.1652	0.606	7.37
2017-18	0.00	3.85	3.85	10.31	19.88	16.28	46.46	0.376	1.45	17.47	0.1224	0.471	5.69
2018-19	0.00	4.04	4.04	10.41	20.87	17.09	48.37	0.327	1.32	15.81	0.0906	0.366	4.38
2019-20	0.00	4.25	4.25	10.51	21.91	17.95	50.37	0.284	1.21	14.32	0.0671	0.285	3.38
2020-21	0.00	4.46	4.46	10.62	23.01	18.85	52.47	0.247	1.10	12.97	0.0497	0.222	2.61
2021-22	0.00	4.68	4.68	10.72	24.16	19.79	54.67	0.215	1.01	11.75	0.0368	0.172	2.01
2022-23	0.00	4.91	4.91	10.83	25.37	21.77	57.96	0.187	0.92	10.83	0.0273	0.134	1.58
2023-24	0.00	5.16	5.16	10.94	26.64	23.94	61.52	0.163	0.84	10.00	0.0202	0.104	1.24
2024-25	0.00	5.42	5.42	11.05	27.97	26.34	65.35	0.141	0.77	9.24	0.0150	0.081	0.98
2025-26	0.00	5.69	5.69	11.16	29.37	28.97	69.50	0.123	0.70	8.54	0.0111	0.063	0.77
2026-27	0.00	5.97	5.97	11.27	30.83	31.87	73.97	0.107	0.64	7.91	0.0082	0.049	0.61
2027-28	0.00	6.27	6.27	11.38	32.38	35.05	78.81	0.093	0.58	7.32	0.0061	0.038	0.48
2028-29	0.00	6.59	6.59	11.50	33.99	38.56	84.05	0.081	0.53	6.79	0.0045	0.030	0.38
2029-30	0.00	6.92	6.92	11.61	35.69	42.42	89.72	0.070	0.49	6.30	0.0033	0.023	0.30
2030-31	0.00	7.26	7.26	11.73	37.48	46.66	95.86	0.061	0.44	5.86	0.0025	0.018	0.24

2031-32	0.00	7.62	7.62	11.85	39.35	51.32	102.52	0.053	0.41	5.45	0.0018	0.014	0.19
2032-33	0.00	8.01	8.01	11.96	41.32	56.46	109.74	0.046	0.37	5.07	0.0014	0.011	0.15
2033-34	0.00	8.41	8.41	12.08	43.39	62.10	117.57	0.040	0.34	4.72	0.0010	0.008	0.12
2034-35	0.00	8.83	8.83	12.21	45.56	68.31	126.07	0.035	0.31	4.40	0.0007	0.007	0.09
2035-36	0.00	9.27	9.27	12.33	47.83	75.14	135.30	0.030	0.28	4.11	0.0006	0.005	0.07
2036-37	0.00	9.73	9.73	12.45	50.22	82.66	145.33	0.026	0.26	3.84	0.0004	0.004	0.06
2037-38	0.00	10.22	10.22	12.58	52.74	90.92	156.23	0.023	0.23	3.59	0.0003	0.003	0.05
2038-39	0.00	10.73	10.73	12.70	55.37	100.01	168.09	0.020	0.21	3.36	0.0002	0.002	0.04
2039-40	0.00	11.26	11.26	12.83	58.14	110.02	180.99	0.017	0.20	3.14	0.0002	0.002	0.03
2040-41	0.00	11.83	11.83	12.96	61.05	121.02	195.02	0.015	0.18	2.95	0.0001	0.001	0.02
2041-42	0.00	12.42	12.42	13.09	64.10	133.12	210.31	0.013	0.16	2.76	0.0001	0.001	0.02
2042-43	0.00	13.04	13.04	13.22	67.31	146.43	226.95	0.011	0.15	2.59	0.0001	0.001	0.02
2043-44	0.00	13.69	13.69	13.35	70.67	161.07	245.09	0.010	0.14	2.43	0.0001	0.001	0.01
2044-45	0.00	14.38	14.38	13.48	74.20	177.18	264.87	0.009	0.12	2.29	0.0000	0.001	0.01
2045-46	0.00	15.10	15.10	13.62	77.91	194.90	286.43	0.008	0.11	2.15	0.0000	0.000	0.01
2046-47	0.00	15.85	15.85	13.75	81.81	214.39	309.95	0.007	0.10	2.02	0.0000	0.000	0.01
2047-48	0.00	16.64	16.64	13.89	85.90	235.83	335.62	0.006	0.09	1.91	0.0000	0.000	0.01
2048-49	0.00	17.47	17.47	14.03	90.20	259.41	363.64	0.005	0.09	1.80	0.0000	0.000	0.00
2049-50	0.00	18.35	18.35	14.17	94.71	285.35	394.23	0.004	0.08	1.69	0.0000	0.000	0.00
2050-51	0.00	19.27	19.27	14.31	99.44	313.89	427.64	0.004	0.07	1.60	0.0000	0.000	0.00
2051-52	0.00	20.23	20.23	14.45	104.41	345.28	464.15	0.003	0.07	1.51	0.0000	0.000	0.00
2052-53	0.00	21.24	21.24	14.60	109.63	379.81	504.04	0.003	0.06	1.42	0.0000	0.000	0.00
2053-54	0.00	22.30	22.30	14.75	115.12	417.79	547.65	0.002	0.05	1.34	0.0000	0.000	0.00
2054-55	0.00	23.42	23.42	14.89	120.87	459.56	595.33	0.002	0.05	1.27	0.0000	0.000	0.00
2055-56	0.00	24.59	24.59	15.04	126.91	505.52	647.48	0.002	0.05	1.20	0.0000	0.000	0.00
2056-57	0.00	25.82	25.82	15.19	133.26	556.07	704.53	0.002	0.04	1.14	0.0000	0.000	0.00

2057-58	0.00	27.11	27.11	15.34	139.92	611.68	766.95	0.001	0.04	1.08	0.0000	0.000	0.00
2058-59	0.00	28.46	28.46	15.50	146.92	672.85	835.27	0.001	0.03	1.02	0.0000	0.000	0.00
2059-60	0.00	29.89	29.89	15.65	154.27	740.13	910.05	0.001	0.03	0.97	0.0000	0.000	0.00
2060-61	0.00	31.38	31.38	15.81	161.98	814.15	991.93	0.001	0.03	0.92	0.0000	0.000	0.00
Sum	**130.00**	**567.16**	**697.16**	**616.15**	3090.10	777.14	12604.62	6.66	**138.87**	**337.03**	**2.86**	103.67	91.96

PV of Total Revenue at 15% = 337.03

PV of Total Cost at 15% = 138.87

Net Present Value(NPV) at 15% = 198.16

BCR

PV of Total Revenue / PV of Total Expenditure = 337.03 / 138.87 = **2.43**

$$\textbf{Internal Rate of Return(IRR)} = 15 + \frac{198.16}{209.86} \times (35-15)$$

$$= 15 + 0.94 \times 20$$

$$= 15 + 18.88$$

$$= 33.88$$

Assumptions;

1. Costs and benefits have been forcasted over a 50 yrs horizon, i.e life considered 60 trs.
3. Revenue income from service fees increasing 10 % over year
3. Revenue from time saving from reduction of visits and processing of ossc.

Appendix Table : Economic Analysis

Year	Cost (Economic)				Total Cost	Income			Total Benefit	15% Discount Factor	Discounted Vale at 15%		30% Discount Factor	Discounted Vale at 30%	
	Investment		Operating			Income from fees of services	Income from visit-timing reduction	Income from processs time reduction			Total Cost	Total Benefit		Total Cost	Total Benefit
	Present Value	Account Value	Present Value	Account Value											
2011-12	130.00	117.00	0.00	0	117.00	0.00	0.00	0.00	0.00	0.870	101.74	0.00	0.7407	86.67	0.00
2012-13	0.00	0.00	0.00	2.88	2.88	9.81	15.57	12.76	38.13	0.756	2.18	28.83	0.5487	1.58	20.92
2013-14	0.00	0.00	0.00	3.17	3.17	9.90	16.35	13.39	39.65	0.658	2.08	26.07	0.4064	1.29	16.11
2014-15	0.00	0.00	0.00	3.33	3.33	10.00	17.17	14.06	41.23	0.572	1.90	23.58	0.3011	1.00	12.41
2015-16	0.00	0.00	0.00	3.49	3.49	10.10	18.03	14.77	42.90	0.497	1.74	21.33	0.2230	0.78	9.57
2016-17	0.00	0.00	0.00	3.67	3.67	10.20	18.93	15.50	44.64	0.432	1.59	19.30	0.1652	0.61	7.37
2017-18	0.00	0.00	0.00	3.85	3.85	10.31	19.88	16.28	46.46	0.376	1.45	17.47	0.1224	0.47	5.69
2018-19	0.00	0.00	0.00	4.04	4.04	10.41	20.87	17.09	48.37	0.327	1.32	15.81	0.0906	0.37	4.38
2019-20	0.00	0.00	0.00	4.25	4.25	10.51	21.91	17.95	50.37	0.284	1.21	14.32	0.0671	0.29	3.38
2020-21	0.00	0.00	0.00	4.46	4.46	10.62	23.01	18.85	52.47	0.247	1.10	12.97	0.0497	0.22	2.61
2021-22	0.00	0.00	0.00	4.68	4.68	10.72	24.16	19.79	54.67	0.215	1.01	11.75	0.0368	0.17	2.01
2022-23	0.00	0.00	0.00	4.91	4.91	10.83	25.37	21.77	57.96	0.187	0.92	10.83	0.0273	0.13	1.58
2023-24	0.00	0.00	0.00	5.16	5.16	10.94	26.64	23.94	61.52	0.163	0.84	10.00	0.0202	0.10	1.24
2024-25	0.00	0.00	0.00	5.42	5.42	11.05	27.97	26.34	65.35	0.141	0.77	9.24	0.0150	0.08	0.98
2025-26	0.00	0.00	0.00	5.69	5.69	11.16	29.37	28.97	69.50	0.123	0.70	8.54	0.0111	0.06	0.77
2026-27	0.00	0.00	0.00	5.97	5.97	11.27	30.83	31.87	73.97	0.107	0.64	7.91	0.0082	0.05	0.61
2027-28	0.00	0.00	0.00	6.27	6.27	11.38	32.38	35.05	78.81	0.093	0.58	7.32	0.0061	0.04	0.48
2028-29	0.00	0.00	0.00	6.59	6.59	11.50	33.99	38.56	84.05	0.081	0.53	6.79	0.0045	0.03	0.38
2029-30	0.00	0.00	0.00	6.92	6.92	11.61	35.69	42.42	89.72	0.070	0.49	6.30	0.0033	0.02	0.30
2030-31	0.00	0.00	0.00	7.26	7.26	11.73	37.48	46.66	95.86	0.061	0.44	5.86	0.0025	0.02	0.24
2031-32	0.00	0.00	0.00	7.62	7.62	11.85	39.35	51.32	102.52	0.053	0.41	5.45	0.0018	0.01	0.19
2032-33	0.00	0.00	0.00	8.01	8.01	11.96	41.32	56.46	109.74	0.046	0.37	5.07	0.0014	0.01	0.15
2033-34	0.00	0.00	0.00	8.41	8.41	12.08	43.39	62.10	117.57	0.040	0.34	4.72	0.0010	0.01	0.12

2034-35	0.00	0.00	0.00	8.83	8.83	12.21	45.56	68.31	126.07	0.035	0.31	4.40	0.0007	0.01	0.09
2035-36	0.00	0.00	0.00	9.27	9.27	12.33	47.83	75.14	135.30	0.030	0.28	4.11	0.0006	0.01	0.07
2036-37	0.00	0.00	0.00	9.73	9.73	12.45	50.22	82.66	145.33	0.026	0.26	3.84	0.0004	0.00	0.06
2037-38	0.00	0.00	0.00	10.22	10.22	12.58	52.74	90.92	156.23	0.023	0.23	3.59	0.0003	0.00	0.05
2038-39	0.00	0.00	0.00	10.73	10.73	12.70	55.37	100.01	168.09	0.020	0.21	3.36	0.0002	0.00	0.04
2039-40	0.00	0.00	0.00	11.26	11.26	12.83	58.14	110.02	180.99	0.017	0.20	3.14	0.0002	0.00	0.03
2040-41	0.00	0.00	0.00	11.83	11.83	12.96	61.05	121.02	195.02	0.015	0.18	2.95	0.0001	0.00	0.02
2041-42	0.00	0.00	0.00	12.42	12.42	13.09	64.10	133.12	210.31	0.013	0.16	2.76	0.0001	0.00	0.02
2042-43	0.00	0.00	0.00	13.04	13.04	13.22	67.31	146.43	226.95	0.011	0.15	2.59	0.0001	0.00	0.02
2043-44	0.00	0.00	0.00	13.69	13.69	13.35	70.67	161.07	245.09	0.010	0.14	2.43	0.0001	0.00	0.01
2044-45	0.00	0.00	0.00	14.38	14.38	13.48	74.20	177.18	264.87	0.009	0.12	2.29	0.0000	0.00	0.01
2045-46	0.00	0.00	0.00	15.10	15.10	13.62	77.91	194.90	286.43	0.008	0.11	2.15	0.0000	0.00	0.01
2046-47	0.00	0.00	0.00	15.85	15.85	13.75	81.81	214.39	309.95	0.007	0.10	2.02	0.0000	0.00	0.01
2047-48	0.00	0.00	0.00	16.64	16.64	13.89	85.90	235.83	335.62	0.006	0.09	1.91	0.0000	0.00	0.01
2048-49	0.00	0.00	0.00	17.47	17.47	14.03	90.20	259.41	363.64	0.005	0.09	1.80	0.0000	0.00	0.00
2049-50	0.00	0.00	0.00	18.35	18.35	14.17	94.71	285.35	394.23	0.004	0.08	1.69	0.0000	0.00	0.00
2050-51	0.00	0.00	0.00	19.27	19.27	14.31	99.44	313.89	427.64	0.004	0.07	1.60	0.0000	0.00	0.00
2051-52	0.00	0.00	0.00	20.23	20.23	14.45	104.41	345.28	464.15	0.003	0.07	1.51	0.0000	0.00	0.00
2052-53	0.00	0.00	0.00	21.24	21.24	14.60	109.63	379.81	504.04	0.003	0.06	1.42	0.0000	0.00	0.00
2053-54	0.00	0.00	0.00	22.30	22.30	14.75	115.12	417.79	547.65	0.002	0.05	1.34	0.0000	0.00	0.00
2054-55	0.00	0.00	0.00	23.42	23.42	14.89	120.87	459.56	595.33	0.002	0.05	1.27	0.0000	0.00	0.00
2055-56	0.00	0.00	0.00	24.59	24.59	15.04	126.91	505.52	647.48	0.002	0.05	1.20	0.0000	0.00	0.00
2056-57	0.00	0.00	0.00	25.82	25.82	15.19	133.26	556.07	704.53	0.002	0.04	1.14	0.0000	0.00	0.00
2057-58	0.00	0.00	0.00	27.11	27.11	15.34	139.92	611.68	766.95	0.001	0.04	1.08	0.0000	0.00	0.00
2058-59	0.00	0.00	0.00	28.46	28.46	15.50	146.92	672.85	835.27	0.001	0.03	1.02	0.0000	0.00	0.00
2059-60	0.00	0.00	0.00	29.89	29.89	15.65	154.27	740.13	910.05	0.001	0.03	0.97	0.0000	0.00	0.00
2060-61	0.00	0.00	0.00	31.38	31.38	15.81	161.98	814.15	991.93	0.001	0.03	0.92	0.0000	0.00	0.00
Sum	**130.00**	**117.00**	**0.00**	**598.54**	**715.54**	**616.15**	**3090.10**	**8898.38**	**12604.62**	**6.66**	**127.57**	**337.94**	**2.86**	**94.04**	**91.96**

PV of Total Revenue at 15% =	337.94
PV of Total Cost at 15% =	127.57
Net Present Value(NPV) at 15% =	210.38

BCR PV of Total Revenue / PV of Total Expenditure = 337.94 / 127.57 = **2.65**

Internal Rate of Return(IRR) = 15+ 210.38 / 212.45 **x (30-15)**

15+ **0.99** **x15**

15+ **14.85**

= 29.85

Assumptions;

1. Costs and benefits have been forcasted over a 50 yrs horizon, i.e life considered 50 yrs.
2. Annual operating cost considered 5% of the investment cost and increasing 10% per year
3. Revenue income from road users increasing 10 % over year
4. Revenue from time saving of construction /repaied of drain and footpath increasing 10% over year
5. Revenue from time saving construction/repair of road increasing 10% over year
6. Revenue from fuel saving increasing 5% over year