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PERFORMANCE MEASUREMENT: A CASE STUDY FOR INDIAN MUNICIPALITIES

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ABSTRACT
This paper attempts to assess the performances of the Municipalities in the state of West Bengal, India, in service delivery and resource utilization in an integrated manner. They have used a nonparametric frontier (Data Envelopment Analysis-DEA) as the tool to measure technical efficiencies of the said municipalities applying the familiar Banker, Charnes & Cooper model to derive the efficiency level of the municipalities. The result shows that the municipalities on an average can reduce 27 to 30 percent of their expenditure to maintain present level of services. The paper finds that the problem of unproductive spending and under-provision of services is more pronounced in small size class municipalities. The input–output combination shows that the larger municipalities have a greater flexibility of using different efficiency combination than the smaller municipality. Thus, the chance of the larger inefficient municipalities to become efficient is higher than the smaller municipalities in future even with the same input–output combination. The only requirement is to change the proportion.

KEYWORDS
municipalities, data envelopment analysis (DEA), performance measurement, nonparametric efficiency analysis, efficiency score, benchmarking, municipal finance.

INTRODUCTION
As established by the Constitution of India the ULBs are mandatorily required to perform some basic services to its citizens. Such services include the supply of drinking water, providing street lights, maintaining drainage and sewage system, construction and maintenance of road, managing the solid waste of the towns etc. In order to provide such services, they are offered the power of collecting some revenue and taxes other than levied by the respective state governments. The quality and the performance of the ULBs are depending up on the basic necessary services that are provided by them in their jurisdiction. The performance level of the Municipalities can be compared and judged on the basis of the service they provide and on the factors which are required for providing and maintaining these services. The service they are offering to the citizens are termed as the output factor and depending on which factors they are delivering such services are termed as inputs when we are considering the performance level of the Municipalities in an input-output framework. In order to derive the physical performance level of the ULBs on the basis of the service delivery by them the technique of Data Envelopment Analysis is applied.

Measurement of efficiency is not an easy task. Attempts to do so have been going on since 1920s (Ridley, 1927), but the growth in the number of literature over the last few years is a testimony to the overwhelming increase in the interest in measuring performance and, consequently, it has been promoting improvement. In the last decades, measuring efficiency in local governments has become widespread particularly within individual European countries.

Research on efficiency of municipalities and local government services provision may be assembled into two main streams. The first stream includes research studies that focus on the assessment of efficiency of single service delivered by municipalities, i.e. Water management (Storto C. 2013, Nag T. and Garg A. 2013, Tiwari P. & Gulati M. 2011, Byrnes *et al*., 2010, Picazo*et al.*, 2009, Gupta *et al.,* 2011), solid waste and sewage disposal (Worthington & Dollery, 2001), urban public transportation (Boame, 2004, Walter and Cullmann, 2008), public health services (Mbonigaba J. & Oumar B. 2014, Nakayama, 2004).

The second stream includes studies that are aimed at assessing an overall municipal efficiency scores. In this field a number of empirical investigations cover several countries, i.e. Australia (Dollery et al., 2008), Belgium (Geyes & Moesen 2009a, 2009b),), Norway (Borge*et al.* 2008), Portugal (Afonso & Fernandes 2006, 2008), Finland (Loikkanen et al. 2011), Brazil (Scaratti D. et al. 2014, Sampaio de Sousa *et al.*, 2005), Germany (Geys*et al.* 2010; Kalb 2010, Kalb*et al*., 2012), Italy (Storto C. 2013, Boetti*et al.,* 2009), India (Bondyopadhyay, 2012), Japan (Nijkamp& Suzuki, 2009), Turkey (Kutlar*et al*., 2012) and France (Nieswand M. & Stefan S. 2011) Spain (Arcelus*et al.* 2007; Gimenez, Prior 2007, M. T. Balaguer-Coll et al 2004).

The efficiency analysis requires a detail data structure of selected parameters on which the analysis is to be carried on. The Indian data structure at the municipality levels are lacking in completeness and sufficiency and research relating to the efficiency of municipalities and local government service provision are also very limited. Furthermore, the fact about municipalities in West Bengal is worse than the standard level all over India. However, urban population density is the highest in West Bengal considering all India level and hence, the population pressure in these municipalities for this state is a major source of concern for the service providers, but there is no major research work done in the field of efficiency measurement of these municipalities. This paper is an attempt to fill up this research gap on the view of structural efficiency and in finding out the related causes of the low level of efficiency of the municipalities in West Bengal. The paper also attempts to build up an integrated framework for an analysis of performance in these municipalities bringing all the aspects of performance.

METHODOLOGY
Data envelopment analysis is a technique that can be used to assist in identification of best practice performance in the use of resources, highlight where the greatest gains may be made from improvements in efficiency, and help agencies achieve their potential.

Typically using linear programming, DEA calculates the efficiency of an organization within a group relative to observed best practice within that group. Here in this model we follow Charnes, Cooper and Rhodes (1978) model of DEA where set of linear equations are formed and a suitable weights are selected to solve them.

The basic efficiency concept is defined as the ratio of output and input. In case of multiple inputs and outputs accurate objective relative weights are necessary to determine the efficiency level.

The performance of DMUs (here the municipalities) are assessed in DEA using the concept of efficiency or productivity, which is the ratio of total outputs to total inputs. Efficiencies estimated using DEA are *relative*,that is, relative to the best performing DMU (or DMUs if there is more than one best-performing DMUs). The best-performing DMU is assigned an efficiency score of unity or 100 per cent, and the performance of other DMUs vary, between 0 and 100 per cent or 0 to 1 relative to this best performance.

GENERAL FORM OF CCR DEA MODELS
A general output maximization CCR DEA model can be represented as follows.

Max $Z = \sum_j v_{jm} y_{jm}$, j=1…. J --------(2)

Sub. to;

$\sum_i u_{im} x_{im} = 1,\ i = 1....I$ $n=1,2,K,N$
$\sum_j u_{jm} y_{jn} - \sum_i u_{im} x_{in} \leq 0$ $i=1,2,K,I$
$U_{jm},\ U_{im} \geq \lambda$ $j=1,2,K,J$
In matrix for m
$$Max\ Z' = V_m^T Y_m \quad ----------(3)$$
Sub. to :
$U_m^T X_m = 1$
$V_m^T Y - U_m^T X \leq 0,\ V_m^T,\ U_m^T \geq \lambda.$
Where *X* is the matrix of inputs and *Y* is the matrix of outputs.
The most important point regarding the DEA is:
When we focus on service organizations we generally cannot determine what the engineered, optimum or absolute efficient output-to-input ratio is. This is in contrast to the auto example where it was possible to determine the efficient engine performance. Consequently, we cannot determine whether a service unit is absolutely efficient. We can, however, compare several service unit output-to-input ratios and determine that one unit is more or less efficient than another-benchmarking. The difference in efficiency will be due to the technology or production process used, how well that process is managed, and/or the scale or size of the unit.
The present model is build up with four inputs and six outputs, and two dummy variables that are given as follows:
The model is build up with three inputs and five outputs, variables that are given as follows:
Inputs:
1. No. of permanent employee in the municipalities, in per capita terms (**PCEMPLY)**
2. Per capita revenue expenditure **(PCREVEXP)**
3. Per capita expenditure on salary and wages (**PCSALWGE)**
4. Per capita revenue expenditure excluding salary and wages (**PCREVEXS)**
Outputs:
1. Daily per capita water supply in liter (**PCWATL)**
2. Per capita sewage disposal **(PCSDD)**
3. Per Capita solid waste management service (**PCSWM)**
4. Per Capita road length, surfaced and un-surfaced in km. (**PCRDLN)**
5. Per capita drain length in KM **(PCDRNLN)**
6. Per Capita watt consumption in street lights (**PCWTC)**
The efficiency level of the municipalities is judged on the basis of their financial capabilities, mainly from the point of view of revenue income and revenue expenditure. Here we analyse the financial data of the municipalities on the basis of the Class of the towns. The four different classes are discussed here separately. This will produce a clear picture about the factor lying behind the performance delivery by municipalities.
Dummy:
1. Population more than one lakh we take 1 and 0 otherwise. (**DM1POP)**
2. Established more than 50 years ago, we take 1 and 0 otherwise. (**DM2ESTB)**

RESULTS AND DISCUSSIONS

Table-1 given below shows the summary statistics of the input and output variables. We use the latest data available for the year 2008-09 and 2012- 2013. We have considered 125 municipalities in West Bengal i.e. all municipalities except Kolkata MC and Howrah MC. We have selected 30 samples out of these 125 through the stratified random sampling procedure. Out of 30 municipalities 14 are from Class-I towns, 8 municipalities from Class-II towns, 6 municipalities from Class-III towns and 2 from Class-IV towns.

TABLE 1: SUMMARY STATISTICS OF VARIABLES: INPUT ORIENT EFFICIENCY MODEL FOR 2008-09

2008-09	OUTPUTS						INPUTS				DUMMY	
Statistics	PCWATL	PCSDD	PCSWM	PCWTC	PCRDLN	PCDNLN	PCEMPLY	PCREVEXP	PCASLWGE	PCREVEXS	DM1POP	DM2ESTB
N Valid	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000
Missing	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mean	25.942	91.235	0.366	2.908	0.001	0.001	0.001	440.367	212.284	228.083	0.467	0.733
Median	21.000	86.000	0.170	2.833	0.001	0.001	0.0014	436.135	195.570	193.636	0.000	1.000
Std. Deviation	22.510	37.775	0.213	1.439	0.001	0.001	0.001	192.591	112.692	159.348	0.507	0.450
Variance	506.700	1426.965	0.045	2.070	0.000	0.000	0.000	37091	12700	25392	0.257	0.202
Skewness	1.620	-0.276	0.141	0.819	2.012	0.970	0.606	1.873	0.478	2.104	0.141	-1.112
Std. Error of Skewness	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427
Kurtosis	1.882	-0.421	-2.127	1.273	5.258	0.419	-0.039	6.940	0.205	6.389	-2.127	-0.824
Std. Error of Kurtosis	0.833	0.833	0.833	0.833	0.833	0.833	0.833	0.833	0.833	0.833	0.833	0.833
Minimum	2.800	11.200	0.170	0.743	0.000	0.000	0.000	171.363	11.584	71.030	0.000	0.000
Maximum	89.900	155.610	0.590	7.152	0.005	0.003	0.003	1186.157	503.784	837.282	1.000	1.000

TABLE 2: SUMMARY STATISTICS OF VARIABLES: INPUT ORIENT EFFICIENCY MODEL FOR 2012-13

2012-13	INPUTS						OUTPUTS				DUMMY	
statistics	PCWATL	PCSDD	PCSWM	PCWTC	PCRDLN	PCDNLN	PCEMPLY	PCREVEXP	PCASLWGE	PCREVEXS	DM1POP	DM2ESTB
N Valid	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000
Missing	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mean	50.682	94.068	0.366	3.260	0.002	0.002	0.002	919.460	490.366	429.094	0.467	0.733
Median	39.500	86.000	0.170	3.559	0.002	0.001	0.001	977.523	448.002	416.312	0.000	1.000
Std. Deviation	34.788	36.685	0.213	1.360	0.001	0.001	0.001	319.188	221.967	238.896	0.507	0.450
Variance	1210.176	1345.802	0.045	1.849	0.000	0.000	0.000	101881	49270	57071	0.257	0.202
Skewness	0.298	-0.515	0.141	-0.030	1.353	1.510	1.166	-0.067	0.661	0.086	0.141	-1.112
Std. Error of Skewness	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427
Kurtosis	-1.306	0.055	-2.127	-0.269	1.596	1.961	2.248	-0.190	-0.200	-0.929	-2.127	-0.824
Std. Error of Kurtosis	0.833	0.833	0.833	0.833	0.833	0.833	0.833	0.833	0.833	0.833	0.833	0.833
Minimum	0.750	11.200	0.170	0.692	0.000	0.000	0.000	353.236	128.837	37.257	0.000	0.000
Maximum	109.000	155.610	0.590	6.309	0.005	0.005	0.004	1600.097	974.806	921.348	1.000	1.000

TABLES 1 and 2, show the summary statistics of the variables of the data collected as per the two study periods 2008-09 and 2012-13.We have selected 30 samples out of 125 municipalities in W.B. through simple random sampling procedure. Out of 30 municipalities 14 are from Class-I towns, 8 municipalities from Class-II towns, 6 municipalities from Class-III towns and 2 from Class-IV. Considering the input factor it is seen that the mean value for all the indicators of inputs have increased except PCEMPLY. The PCREVEXP, PCSALWGE and PCREVEXS have been doubled within this five year period. But in all cases the variance and SD value have increased a lot. This indicates that the overall average increase for the input factors is visible but this increase is not uniform. There are a lot of variations in the values of the inputs for the respective municipalities. The inequality of growth in the values of the inputs is the indicator of mal-distribution of resources of the municipalities.

The picture as depicted for the outputs tells a different story. For PCWATL the value has been doubled but with a more than double increase in variance i.e. water supply has increase on an average for the municipalities but this increase is happened at a greater degree of variances. The municipalities are doing better on an average in sewage disposal.in case of PCSWD there is no change in the man value as well as for the SD value. The road length has increased and the SD value have decreased. But for the other two other output variables there is no remarkable change in mean value and the SD value.

Now we consider the efficiency score of the sample municipalities. According to the theory as stated earlier, the efficiency score value, θ ranges from 0 to 1. The 30 sample municipalities are arranger as per class for the two study periods in Table 3 and Table 4, Table 5 depicts the overall summary statistics of the efficiency score value.

TABLE 3: EFFICIENCY SCORE VALUE FOR THE YEAR 2008-09 AND 2012-13

SL. NO.	ULBS	CLASS	SCORE 2008-09	SCORE 2012-13	SL. NO.	ULBS	CLASS	SCORE 2008-09	SCORE 2012-13
1	Kamarhati	I	0.817	0.964	16	Jangipur	II	0.838	0.852
2	Maheshtala	I	1.000	1.000	17	Old Malda	II	1.000	1.000
3	Raiganj	I	1.000	1.000	18	Rampurhat	II	0.868	1.000
4	Baranagar	I	0.765	1.000	19	Suri	II	0.780	0.780
5	Madhyamgram	I	0.853	1.000	20	New Barrackpore	II	0.943	1.000
6	Kulti	I	1.000	1.000	21	Jaiaganj-Azimganj	II	1.000	0.725
7	South Dum Dum	I	0.936	1.000	22	Ghatal	II	0.918	0.855
8	North Barrackpore	I	0.838	0.922	23	Sainthia	III	0.822	0.853
9	Purulia	I	0.793	0.847	24	Dalkhola	III	1.000	1.000
10	Bansberia	I	0.780	0.827	25	Dubrajpur	III	0.871	0.824
11	Bongaon	I	1.000	1.000	26	Dainhat	III	1.000	0.901
12	Bhadreswar	I	0.769	0.889	27	Raghunathpur	III	0.908	0.898
13	Rishra	I	0.703	1.000	28	Murshidabad	III	0.810	1.000
14	Baidyabati	I	1.000	1.000	29	Khirpai	IV	1.000	1.000
15	Contai	II	0.807	0.793	30	Kupers camp	IV	1.000	1.000

The efficiency score value indicates that number of efficient municipalities have increased from 11 to 16. Out of these 9 remained efficient in both the years of the study, and in 2012-13 there are 7 new entrants, so 2 municipalities have shown a deterioration in the score value from 2008-09 to 2012-13, they are Jaiaganj-Ajimganj and Dainhat. Among the 7 new entry, 4 are from Class-I, 2 from Class-II and 1 from Class-III. Suri is the only municipality from which there is no change in the score value over the two study periods. 12 municipalities remained inefficient in both the time periods. Among these, 5 from Class-I, 4 from Class-II, and 3 from Class-III towns. Furthermore, 3 inefficient municipalities in both the time periods have shown a decrease in score value, they are Cantai. Ghatal and Dubrajpur, i.e. 2 from Class-II and 1 from Class-III towns on an overall study shows an increase in the score value of the efficiency score, from 0.7 to 0.73 and the SD value have decreased. Thus there is an equitable development has happened over the time frame analyzed. 36 percent of the Class-I municipalities were efficient in the year 2008-09 and it has been increased to 64 percent in the year 2012-13. In case of Class-II towns the percentage increase was from 25 percent to 37 percent and for the Class-III and Class-IV towns there was no change in the percentage of the efficient municipalities over the total number of samples there. Except the earlier stated two municipalities (Dainhat from Class-III and Jaiaganj-Ajimganj from Class-II) all the efficient municipalities in the year 2008-09 also remained efficient in the year 2012-13. This result has an important interpretation that the deterioration in the performance level is not so remarkable and for Class-I the picture is good. This shows that mis-utilization of resources are much more evident in cases of small towns.

In Table 4 we find that the municipalities on an average can reduce 27 percent in 2012-13 of their expenditure to maintain present level of services and this performance have improved than that of 2008-09 by 3 percent.

TABLE 4: SUMMARY STATISTICS OF THE EFFICIENCY SCORE VALUE

Statistical summary of the Efficiency Scores of the ULBs.								
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**	**Variance**	**Skewness**	**Kurtosis**
score 2008-09	**30**	**0.7**	**1**	**0.9**	**0.09658**	**0.01**	**-0.197**	**-1.383**
score 2012-13	**30**	**0.73**	**1**	**0.9**	**0.08531**	**0.01**	**-0.807**	**-0.674**

FIG. 1: EFFICIENCY SCORE OF THE SAMPLE MUNICIPALITIES OF WEST BENGAL FOR THE YEARS 2008-09 AND 2012-13

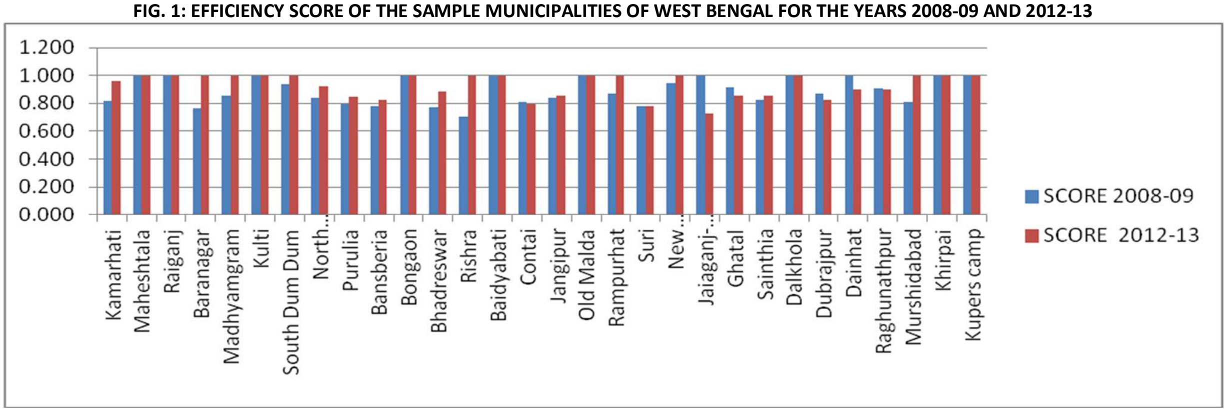

TABLE 5: MUNICIPALITIES WITH SLACK IN INPUT-USED /OUTPUT-PRODUCED AMONG INEFFICIENT MUNICIPALITIES FOR 2008-09

		INEFFICIENT IN CLASS-I			INEFFICIENT IN CLASS-II			INEFFICIENT IN CLASS-III&IV			ALL INEFFICIENT ULBs		
	VARIABLES	NO ULB WITH SLACK	MEAN	SD	NO ULB WITH SLACK	MEAN	SD	NO ULB WITH SLACK	MEAN	SD	TOTAL	GRAND MEAN	GRAND SD
OUT PUT	PCWATL	9	92.692	37.714	6	179.318	55.031	4	223.893	82.635	19	165.301	77.710
	PCSDD	4	13.828	26.022	2	2.497	4.148	2	3.198	5.538	8	6.507	19.057
	PCSWM	2	0.004	0.013	5	0.080	0.055	4	0.070	0.017	11	0.051	0.049
	PCWTC	6	0.637	0.735	2	0.707	1.580	1	0.035	0.061	9	0.459	1.054
	PCRDLN	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000
	PCDRLN	0	0.000	0.000	2	0.231	0.132	2	0.432	0.244	3	0.431	0.331
IN PUT	PCEMPLY	9	0.567	0.190	6	0.600	0.209	4	0.840	0.138	19	0.669	0.215
	PCREVEXP	9	0.484	0.143	6	0.638	0.183	4	0.555	0.105	19	0.559	0.164
	PCSALWAG	9	0.490	0.202	6	0.627	0.284	4	0.500	0.071	19	0.539	0.223
	PCRVEXS	9	0.520	0.218	6	0.724	0.127	4	0.632	0.166	19	0.625	0.204

TABLE 6: ULBs WITH SLACK IN INPUT-USED /OUTPUT-PRODUCED AMONG INEFFICIENT ULBs FOR 2012-13

	VARIABLES	INEFFICIENT IN CLASS-I			INEFFICIENT IN CLASS-II			INEFFICIENT IN CLASS-III&IV			ALL INEFFICIENT ULBs		
		NO ULB WITH SLACK	MEAN	SD	NO ULB WITH SLACK	MEAN	SD	NO ULB WITH SLACK	MEAN	SD	TOTAL	GRAND MEAN	GRAND SD
OUT PUT	PCWATL	2	1.984	3.622	4	20.795	28.895	1	11.697	16.542	7	10.831	22.160
	PCSDD	3	1.530	2.340	2	3.232	7.226	0	0.000	0.000	5	1.077	5.129
	PCSWM	2	0.182	0.258	6	0.212	0.278	3	0.157	0.053	11	0.123	0.250
	PCWTC	4	0.964	1.121	3	0.353	0.483	2	0.433	0.460	9	0.262	0.874
	PCRDLN	0	0.000	0.000	0	0.000	0.000	1	0.000	0.000	1	0.000	0.000
	PCDRLN	0	0.000	0.000	0	0.000	0.000	1	0.000	0.000	1	0.000	0.000
IN PUT	PCEMPLY	5	0.666	0.202	6	0.666	0.161	3	0.731	0.199	14	0.466	0.194
	PCREVEXP	5	0.740	0.081	6	0.468	0.146	3	0.633	0.130	14	0.367	0.174
	PCSALWAG	5	0.579	0.106	6	0.575	0.180	3	0.692	0.163	14	0.422	0.163
	PCRVEXS	5	0.912	0.087	6	0.390	0.220	3	0.686	0.251	14	0.359	0.302

From Table 5 and Table 6 it is seen that smaller towns have more slacks in Input than in outputs. In cases of Inputs highest slacks are recorded in all the inputs, in cases of class II it is 100 per cent, i.e. for all the Class II municipalities, they are mis- utilizing their resources, as well as there are scopes for reducing their input used to achieve the same level of output. Slack represents only the leftover portion of inefficiencies. After proportional reduction in inputs or outputs, if a municipality cannot reach the efficiency frontier, slacks are needed to push the municipality to the frontier target. The slack report describes the specific decrease in input or increase in output for each of the sample municipality. The slack values have reduced a lot from 2008-09 to 2012-13. It shows an improvement in the efficiency score. The average slack for class I is much lower than the other classes.

TABLE 7: SLACKS IN INPUT-USED/ OUTPUT –PRODUCES AMONG INEFFICIENT ULBs IN 2008-09 AND 2012-13

AVERAGE SLACKS		CLASS I		CLASS II		CLASS III & V	
FACTORS	VARIABLES	2008-09	2012-13	2008-09	2012-13	2008-09	2012-13
OUTPUTS	PCWATL	9.269	1.984	17.932	24.648	22.389	9.155
	PCSDD	13.828	1.530	2.497	3.878	3.198	0.000
	PCSWM	0.004	0.182	0.080	0.244	0.070	0.130
	PCWATC	0.637	0.964	0.707	0.414	0.035	0.338
	PCRDLN	0.926	1.022	0.735	0.897	0.684	0.748
	PCDRNL	0.875	2.435	0.543	0.783	0.342	0.231
INPUTS	PCEMPLY	0.567	0.666	0.600	0.655	0.000	0.000
	PCREVEXP	0.484	0.740	0.638	0.441	0.555	0.626
	PCSALWAG	0.490	0.579	0.627	0.569	0.500	0.670
	PCRVEXS	0.520	0.912	0.724	0.347	0.632	0.665

With a close investigation an interesting information can be derived from Table 7. The inefficient municipalities in Class-I category require much more increase their outputs and to decrease their inputs than the Class-II or Class-III towns, though the overall efficient number of municipalities are far more higher in Class-I towns. In other words, the inefficient municipalities in Class-I category have a greater degree of inefficiency than their counterparts in other two categories.

BENCHMARK ANALYSIS

Table 8 shows the efficiency score and the benchmark levels along with optimal Lambda. This is the most important contribution of the DEA. Form this table the planner of inefficient municipalities can observe the benchmark municipalities that they need to catch up to. Obviously the efficient municipalities may consider themselves to be their own benchmark. So, benchmark for Kamarhati is Mohestola., Kulti, Baidyabati and Dainhat in the year 2008-09, but the benchmark level has changed to Maheshtala, Raiganj, Rishrah and New Barrackpore in 2012-13. These are Lambda weights obtained from the dual version of the linear programme that is solved to estimate these values. Here in our example Kamarhati is more likely to become Kulti than the others, in 2008-09 as the lambdas for Kulti is 0.79 and the lambdas for other benchmark municipalities for Kamarhati is less than that for Kulti.

From the bench mark analysis, we can derive the hypothetical DMU for an inefficient one to convert it in an efficient one. If the proportion of input used and output produced of the benchmarked DMUs of a specific inefficient DMU the later will transform itself into an efficient DMU in the group. From the Benchmark table it is clear that Kulti benchmarks for most of the inefficient municipalities, for 14 municipalities in 2008-09 and for 10 municipalities in 2012-13.

TABLE 8: EFFICIENCY SCORE WITH BENCHMARK

SL.NO.	DMU	Score 2008-09	Benchmarks 2008-09	Score 2012-13	Benchmarks 2012-13
1	Kamarhati	0.8174	2 (0.08) 6 (0.79) 14 (0.03) 26 (0.35)	0.964	2 (0.43) 3 (0.68) 13 (0.12) 20 (0.28)
2	Maheshtala	1.0000	7	1.000	8
3	Raiganj	1.0000	0	1.000	1
4	Baranagar	0.7649	6 (0.93) 26 (0.26)	1.000	0
5	Madhyamgram	0.8530	2 (0.90) 29 (0.36)	1.000	1
6	Kulti	1.0000	14	1.000	10
7	South Dum Dum	0.9364	2 (0.11) 6 (0.79) 29 (0.34)	1.000	0
8	North Barrackpore	0.8376	2 (0.03) 6 (0.75) 11 (0.02) 14 (0.15) 26 (0.15)	0.922	2 (0.15) 6 (0.70) 20 (0.28) 30 (0.24)
9	Purulia	0.7932	6 (0.87) 26 (0.46)	0.847	2 (0.11) 6 (0.81) 20 (0.10) 29 (0.18)
10	Bansberia	0.7800	2 (0.27) 6 (0.56) 14 (0.12) 26 (0.18)	0.827	2 (0.29) 6 (0.65) 29 (0.18)
11	Bongaon	1.0000	2	1.000	0
12	Bhadreswar	0.7692	6 (0.95) 24 (0.19) 26 (0.20)	0.889	2 (1.24) 6 (1.01)
13	Rishra	0.7028	2 (0.37) 6 (0.54) 24 (0.24) 30 (0.07)	1.000	1
14	Baidyabati	1.0000	3	1.000	1
15	Contai	0.8069	6 (0.41) 24 (0.16) 30 (0.22)	0.793	6 (0.34) 17 (0.33) 24 (0.35)
16	Jangipur	0.8383	2 (0.06) 24 (0.13) 26 (0.66)	0.852	2 (0.30) 17 (0.87) 24 (0.11) 29 (0.02)
17	Old Malda	1.0000	0	1.000	3
18	Rampurhat	0.8675	6 (0.17) 24 (0.35) 30 (0.43)	1.000	0
19	Suri	0.7797	6 (0.33) 24 (0.11) 26 (0.66)	0.780	6 (0.04) 30 (1.05)
20	New Barrackpore	0.9430	24 (0.65) 26 (0.51) 29 (0.10)	1.000	4
21	Jaiaganj-Azimganj	1.0000	0	0.725	24 (0.87) 30 (0.36)
22	Ghatal	0.9176	6 (0.16) 24 (0.52) 29 (0.22) 30 (0.09)	0.855	2 (1.08) 5 (0.11) 6 (0.48) 30 (0.03)
23	Sainthia	0.8220	11 (0.23) 24 (0.05) 26 (0.47)	0.853	6 (0.14) 24 (0.55) 30 (0.22)
24	Dalkhola	1.0000	11	1.000	4
25	Dubrajpur	0.8710	6 (0.23) 24 (0.00) 26 (0.64) 30 (0.16)	0.824	6 (0.35) 14 (0.14) 17 (0.62) 29 (0.01)
26	Dainhat	1.0000	13	0.901	2 (0.29) 20 (0.45) 30 (0.50)
27	Raghunathpur	0.9076	6 (0.11) 26 (0.97)	0.898	6 (0.29) 29 (0.55)
28	Murshidabad	0.8099	24 (0.08) 26 (1.27)	1.000	0
29	Khirpai	1.0000	4	1.000	5
30	Cooper's camp	1.0000	5	1.000	6

STATISTICAL MODEL WITH EFFICIENCY SCORE

Now we consider the relationship of the Efficiency Score with the indicators that are applied to derive the score. The relationship is supposed to be a linear one. The efficiency score is taken as dependent variable and all the ten indicators, (inputs and outputs) [mention the variables] along with the two dummy variables are treated as independent variables to derive the relations among them. Here we have the model summary for the two study periods. In Table 8, for the year 2008-09 the Adjusted R square value is 0.558, i.e. 58.8 per cent variations in the score value is explained by the independent variables considered. The Adjusted R square value for the year 2012-13 is calculated as 0.747, thus there is a higher level of prediction possibility than the earlier time period. In both the years the relationship is quite strong and dependable. Table 9 describes the summary statistics of the models selected for the two periods.

TABLE 9: SUMMARY STATISTICS OF THE MODELS

MODEL SUMMARY					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
2008-09	.855[a]	0.73	0.588	0.061743	1.725
2012-13	.909[a]	0.826	0.747	0.043053	1.825

Dependent Variable: EFFSCORE

Now consider the F-test for the model selected. The F-test is used to test the significance of the regression model as whole. The significant F-value tells us whether the r-square is greater than zero because of sampling error. The Null hypothesis of the F-test is that there is no linear relationship of the dependent variable to the independent variables. The F-test result is shown in the table 10 below.

TABLE 10: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
2008-09	Regression	0.196	10	0.02	5.142	.001[b]
	Residual	0.072	19	0.004		
	Total	0.268	29			
2012-13	Regression	0.176	9	0.02	10.534	.000[b]
	Residual	0.037	20	0.002		
	Total	0.213	29			

According to this table the F-value for the two study year are 5.142 and 10.534 respectively, and the p-values are .001 and .000, smaller than 0.05. Thus the null hypothesis of no linear relationship is rejected. Therefore, the regression model is significant at the 0.000 level as a whole for both the years.

Let us consider the significance of the testing parameters. t-test is used to examine the significance of the individual coefficients. The null hypothesis of the t-test is that the regression coefficient of an independent variable is 0 when the other predictors are present in the model. The unstandardized coefficients and the direction of the relationship of the individual variables were analyzed using a statistical significance of 10 percent. The table 11 below provides the information about the coefficient of each independent variable, t-statistics and p-values.

TABLE 11: COEFFICIENT OF EACH INDEPENDENT VARIABLE

	2008-09				2012-13			
	Unstandardized Coefficients		t	Sig.	Unstandardized Coefficients		t	Sig.
	B	Std. Error			B	Std. Error		
(Constant)	0.885	0.057	15.583	0	0.951	0.045	21.29	0
PCEMPLY	0.007	0.001	0.377	0.12	0.006	0	0.462	0.064
PCREVEXP	0.011	0	0.604	0.053	0.019	0.009	2.132	0.04
PCASLWGE	0.05	0.02	0.783	0.011	0.034	0.033	0.874	0.02
PCRVEXS	0.03	0.012	2.547	0.02	0.054	1.92	1.457	0.016
PCWATL	0.619	0.354	1.154	0.063	0.032	2.053	2.852	0.01
PCSDD	0.4312	0.251	1.077	0.095	0.0361	0.946	2.763	0.023
PCSWM	0.48	0.244	0.206	0.039	0.372	0.0766	2.126	0.046
PCWTC	0.223	2.123	0.146	0.022	0.332	0.182	0.342	0.032
PCRDLN	0.0034	0.002	1.646	0.116	0.011	0.035	1.84	0.056
PCDRLN	0.0023	0.001	1.894	0.001	0.082	0.023	3.525	0.002
DM1POP	0.059	0.036	1.65	0.015	0.058	0.026	1.509	0.014
MD2ESTB	-0.014	0.032	-0.442	0.064	-0.039	0.026	-1.509	0.064

Dependent variable: EFFSCORE.

Based on the coefficients in table 10the regression equation for the two periods are:

1.EFFSCRE08=0.885+0.007PCEMPLY+0.011PCREVEXP+.05PCASLWGE+.03PCRVEXS+.619PCWATL+.4312PCSDD+.48PCSWM+.223PCWTC+.0034PCRDLN+.0023PCDRLN+0.059DM1POP – 0.014DM2ESTB.

2.EFFSCRE12=0.951+0.006PCEMPLY+0.019PCREVEXP+.034PCASLWGE+.054PCRVEXS+.032PCWATL+.0361PCSDD+.372PCSWM+.332PCWTC+.011PCRDLN+.082PCDRLN+ 0.058DM1POP – 0.039DM2ESTB.

The regression equations shows the linear relationship between the EFFSCRE and the independent variables, the factors affecting the efficiency scores of the ULBs. The population dummy (1 for population greater than 1 lakh, 0 otherwise) has a positive impact on the efficiency score of the municipalities, i.e. as the population size increases the revenue collection also increases and the this is reflected in the service delivered by the respective municipality which directly has appositive impact on the efficiency level of the municipalities.

On the contrary the dummy for the year of establishment shows a negative impact on the efficiency level of the municipalities. The coefficient of dummy 2 (1 for the municipalities established more than 50 years ago, and 0 otherwise) indicates that as the municipalities are getting older, the maintenance cost for the infra-structure are getting higher, so they are left with a lesser amount of resource for providing better services to its citizens. Thus combining these two it is concluded that the larger new municipalities are more efficient than the smaller and older municipalities.

CONCLUSION

This paper thus analyses the performance of the municipalities in the state of West Bengal in India. It throws light on different aspects of performance in Indian municipalities, be it the expenditure management or the service delivery. The paper has attempted to build up an integrated framework for interpreting the of performance in these municipalities bringing all the aspect of performance. Here we derive the technical efficiency scores of the municipalities. These scores can give us an indication of the possible overspending or under-provision of services by those municipalities in a benchmarking framework. We find that the munici-palities on an average can reduce 27 per-cent in 2012-13 of their expenditure to maintain present level of services and this performance have improved than that of 2008-09 by 3 percent. The misutilization of resources in revenue expenditure is very common feature in the Indian context because of their administrative inefficiency. All misutilization issues have to be resolved through proper planning and monitoring. We also find that the problem of unproductive spending and under-provision of services is more pronounced in small size class municipalities. The overall misutilization of resources are higher in Class-II and Class-III towns, but the inefficient municipalities of Class-I towns misutilizes resources at a greater extent than their counterpart in Class-II and Class-III towns. The larger and the newer ULBs have a greater chance to become efficient in their performance than the smaller and the older ones.

LIMITATIONS OF THE STUDY

1. This study is based on only 30 sample municipalities out of the total 125 municipalities except Kolkata MC & Howrah MC.
2. It is only a few categories like water supply, toilets, solid waste management, road, street lights that we had relevant information. Availability of physical data from other various services like public health, education etc. would have enabled us to evaluate the performance of each of these services.
3. In this study, inefficiencies due to measurement errors, omitted variables, the presence of outliers and other statistical discrepancies were not taken into account.

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