

PERFORMANCE ASSESSMENT AND EFFICIENCY EVALUATION FOR THE URBAN WATER SUPPLY OPERATIONS OF INDIAN UTILITIES

By

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Department of Civil Engineering

Submitted

in fulfillment of the requirements of the degree of

DOCTOR OF PHILOSOPHY

to the



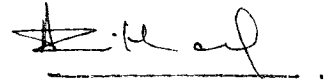
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New Delhi-110 016, India

July, 2005

CERTIFICATE

This is to certify that the thesis entitled “**Performance Assessment And Efficiency Evaluation For The Urban Water Supply Operations of Indian Utilities**”, being submitted by **Mr. Mukul Kulshrestha**, to the Indian Institute of Technology, Delhi, for the award of ‘**DOCTOR OF PHILOSOPHY**’ in Civil Engineering is a record of the bonafide research work carried out by him under my supervision and guidance. He has fulfilled the requirements for submission of this thesis, which to the best of my knowledge has reached the requisite standard.

The material contained in the thesis has not been submitted in part or full to any other University or Institute for the award of any degree or diploma.



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July 2005

To

My Parents,
My Wife Tripta,
&
My Children
Shaivi and Shrish

या आपो दिव्या उत व सुवन्ति खनित्रिगा उत व याः स्वज्ञाः।
समुद्रार्था वा शुचयः पावकास्ता आपो देवीरिह मामवन्तु॥

ऋग्वेद ७.४९.२

अर्थात् जो दिव्य जल आकाश से प्राप्त होते हैं, जो नदियों में सदा गमनशील हैं, खोदकर जो (कुएँ आदि से) निकाले जाते हैं और स्वयं स्रोतों के द्वारा प्रवाहित होकर पवित्रता बिखेरते हुए समुद्र की ओर जाते हैं, वे दिव्यता युक्त जल हमारी रक्षा करें।

आप इद्धा उ भेषजीरापो अगीचातनीः।

आपो विश्वस्य भेषजीस्तास्त्वा मुञ्छन्तुः क्षेत्रियात॥ अथर्ववेद ३.७.५

अर्थात् जल निःसंदेह औषधि है, जल रोगनाशक है, जल सब रोगों की दवा है, वह जल तुझे क्षेत्रयरोग से छुड़ा दे।

Acknowledgement

I am grateful to the Ministry of Human Resources Development, Government of India, for providing me the fellowship during the tenure of my Ph.D. Programme. I am also grateful to my parent institute MANIT-Bhopal for granting me leave to enable me to pursue the Ph.D. programme at IIT-Delhi.

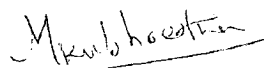
I must take this opportunity to thank the French External Ministry for providing me the Visiting Student Award for several months at ENPC, Paris, under its Cooperation in International Relations Affairs (*Direction des Relations Internationales*) programme. In particular, I acknowledge the help of Professor Jean-Marie Mouchel at ENPC, Paris. I also appreciatively acknowledge the pecuniary help of International Water Law Research Institute and the American Water Resources Association for financing my travel and stay at the University of Dundee, UK during September 2004. Thanks are especially due to Dr. Patricia Wouters and Andrew Allan for their assistance and encouragement.

I also thank my thesis supervisor at IIT-Delhi, Dr. Atul K. Mittal, and his wife Madam Neena Mittal-I truly enjoyed some of the lunches and dinners that they hosted for me, and which I often had at odd times due to my late working hours during the initial stages of my stay at IIT-Delhi. But for the help, suggestions and counseling of the my Research Committee members – Professor Mukesh Khare, Dr Ravishankar and the Chairman Professor A K Gosain, this thesis may not have seen the light of the day. Of particular help at several occasions were Professor K G Sharma, Head Civil Engineering Department, and Professor S G Deshmukh, QIP Coordinator, IIT-Delhi. I am profoundly grateful to all of them for all their help and kindness. Thanks are also due to Prof. Rema Devi, Dr A K Nema and Dr B J Alappat for all their warmth and benevolence.

I must now thank three very special people who were constant inspirations to the success of this thesis, and without whom the work would not have been as it appears now. My brother Mudit and his wife Barnali were of great help - not just technically at the conceptual level of idea, but also by generously sharing their rich experiences in the pursuit of Ph.D. programme, tips that proved very handy at times. My wife Tripta was a great help at home looking after the children and me, even while pursuing her own Ph.D. And, as always, she was a great source of strength for me. Rani was of particular help to all of us, and without her it would have been impossible for us to pursue our respective Ph.D.s. I must also thank my children Shaivi and Shrish for providing me with the relief vent when goings were hard- and there were plenty of such moments indeed.... our families amazingly provide us with such incredible social security arrangements. The blessings of my parents Sri Indra Mohan and Smt. Snehlata, and Tripta's mother, were always so very helpful to us in more than one ways.

Thanks are also due also to all my friends whose association made my stay at IIT-Delhi memorable. In the twilight of my memory shall always linger the fragrance of their love and the sweetness of their friendship. Manjula and Vinod were so very helpful, and I shall eternally remain thankful to them for enabling me in transforming my life smoothly to my pre-Ph.D. ways through their numerous discussions, by their sweet music, and by their ever-lasting concern and love. Nityanand, Anju, Radha, Amitabh, Priyanka, Munish, Poonam, Suresh Jain and others research scholars were of great help whenever it was needed. I also take this opportunity to thank the environmental laboratory staff, especially Sri Raje Singh, for their benevolence at work place.

Last, but perhaps most importantly, and with the deepest sense of reverence and gratitude, I acknowledge the incessant help and guidance of those invisible forces whose footprints have thus far guided this life. But for their inspiration and providence, life would not have been so pleasant and secure, despite odd times at workplace. I owe them my existence in perpetuity...



Mukul Kulshrestha

Abstract

The concept of measurement of utility performances and efficiencies of water supply services has so far not been investigated in India. The present work explores and establishes the need for measurement of performances in the context of recent international developments that include the Millennium Development Goals for water supplies, reviews the status of the water supplies in urban India, and identifies the linkages of various sector issues to performances. The work further endeavors to develop two frameworks for exploring efficiencies and measuring performances in the water supply operations of urban utilities across India.

Data Envelopment Analysis (DEA) has been applied for efficiency measurements. The methodology identifies appropriate DEA variables to explore inefficient units, computes the quantum of inefficiencies and investigates the potential for efficient levels of input usage, besides identifying suitable benchmarks. The results have been discussed in the context of policy alternatives and related issues in the Indian urban water supply sector.

The second framework employs a scorecard that has been developed to yield a single numeric performance score. The framework weights performance indicators and groups them into appropriate clusters that are derived from Principal Component analysis. The indicator values are weighted on a scale designed on the basis of the utility performances available in the standard literature. The scorecard integrates the weights and the scale values to measures performances of the water supply utilities, and also yields performance scores in terms of clusters that have physical relevance.

Both frameworks have been exemplified by case studies relating to the urban Indian water supply utilities. The results indicate that the current performances of most utilities are sub-optimal, and there exists significant scope for effecting savings and improving performances with respect to the best practices.

It is expected that the work will be of use to various stakeholders in the water industry including the government and the public bodies, regulatory authorities, funding institutions, development institutions and the consumers. The results of the study can provide a tool to decision-makers so as to promote sustenance in the water supply services.

List of Contents

List of Figures.....	iv
List of Tables.....	v
List of Abbreviations.....	vii
CHAPTER 1. INTRODUCTION.....	1—1
1.1 Need For Efficiency Improvements In Existing And Reformed Utilities.....	1—2
1.2 Necessity Of Performance Measurement For Water Supply Utilities.....	1—4
CHAPTER 2. SCOPE OF THE STUDY.....	2—1
CHAPTER 3. WATER SUPPLIES IN GLOBAL AND REGIONAL CONTEXT.....	3—1
3.1 Introduction.....	3—1
3.2 The Millennium Development Goals: Linkages To Water.....	3—4
3.3 The Global Response:How Effective Are International Development Targets?....	3—8
3.4 Indian Subcontinent: The Role In Fulfillment Of Global Targets.....	3—14
3.4.1 The Economics of Achieving Water and Sanitation MDGs in South Asia.....	3—17
3.4.2. Need For Internal Efficiency Improvements In The Existing Utilities..	3—20
3.4.2.1 The Need For Measurement Of Performances.....	3—21
3.5 Conclusions.....	3—22
CHAPTER 4. THE INDIAN URBAN WATER SUPPLY SECTOR: STATUS AND LINKAGES TO PERFORMANCE.....	4—1
4.1. The Indian Water Sector: An Introduction.....	4—1
4.2 Urbanization And Its Consequences For Water Supply Operations In India.....	4—4
4.3 Water Supply Related Sustainability Issues And Challenges Before India.....	4—9
4.3.1 Sector Problems Due To Poor Governance.....	4—11
4.3.2 Sector Problems Due To Low Tariffs.....	4—28
4.4 Need For Measurement Of Efficiencies In Water Supply Operations: Linkages To Performance Parameters.....	4—34
4.5. Reforms Programme Of The Government Of India.....	4—36
4.5.1. Reforms Programme: The Agenda of Efficiency Measurement For Operational Sustainability.....	4—39

CHAPTER 5. EFFICIENCY EVALUATION FRAMEWORK: APPLICATION OF DEA....	5—1
5.1 Introduction.....	5—1
5.2 Efficiency Measurement And Analysis: The Need.....	5—3
5.2.1. Stakeholders That Require Efficiency analyses.....	5—4
5.2.2 Significance of the Model for the Water supply sector in India.....	5—6
5.3 Data Envelopment Analysis For Benchmarking Utilities.....	5—9
5.3.1 The CCR Model.....	5—10
5.3.2 The BCC Model.....	5—12
5.3.3 Literature Review: Previous Efficiency evaluation studies in various sectors.....	5—13
5.3.4 DEA based efficiency analysis in the water supply sector.....	5—13
5.4. Methodology Adopted In This Chapter.....	5—15
5.4.1 Selection Of Inputs And Outputs.....	5—16
5.4.1.1 Analogy From The Power Sector.....	5—18
5.4.1.2 Inputs and Outputs for water supply services employed in the Literature.....	5—21
5.4.1.3 Inputs and Outputs specific to the Indian water supply services.....	5—22
5.5 Preliminary Data Exploration Using Regression Analysis (RA)	5—25
5.5.1 Model 1: Dependent variable OPEX.....	5—27
5.5.2 Model 2: Dependent variable UFW.....	5—29
5.5.3 Concluding Remarks on Model Validation.....	5—31
5.6 DEA Application To Urban Water Supply Utilities In India.....	5—32
5.6.1 Model 1: DEA application with OPEX as an input.....	5—32
5.6.2 Model 2: DEA Application With UFW As An Input.....	5—35
5.6.2.1 A Note on the Significance of UFW.....	5—35
5.6.2.2 DEA application for Model 2	5—38
5.6.3 DEA Application For Model 3.....	5—41
5.6.3.1 Effect of City size on Efficiency of Water Supply Utilities.....	5—43
5.7 Concluding Remarks: Policy Issues And Limitations Of The Analysis.....	5—49

CHAPTER 6. EVOLUTION OF A PERFORMANCE SCORECARD FOR RATING SERVICE DELIVERY IN THE INDIAN URBAN WATER SUPPLY SECTOR.....	6—1
6.1 Introduction.....	6—1
6.2. Literature Review.....	6—4
6.2.1 Performance Assessment (PA) Initiatives.....	6—4
6.2.2 Key Performance Indicators: The Debate of Numbers.....	6—7

6.3. Methodology Adopted For The Proposed Scorecard.....	6—10
6.3.1 Performance Indicators.....	6—12
6.3.2 The Associated Clusters.....	6—12
6.3.2.1 Formation of Clusters: The Use of PCA.....	6—14
6.3.2.2 A Brief Description of PCA.....	6—15
6.3.2.3 Data Used For PCA Analysis.....	6—16
6.3.2.4 PCA: Methodology Details.....	6—17
6.3.2.5 PCA: Results and Discussion.....	6—18
6.3.3 Indicator Weights.....	6—22
6.3.4 The Scoring Scale.....	6—23
6.4 The Case Study.....	6—25
6.4.1 The Sample Cities.....	6—25
6.4.2. Results and Discussion for the Case Study.....	6—26
6.4.2.1 A Discussion of Cluster Performances.....	6—30
6.5. A Theoretical Framework That May Be Used In Conjunction With The Proposed Scorecard.....	6—38
6.5.1. SWOT Analysis For PA In Water Industry.....	6—42
6.6. Concluding Remarks.....	6—44
 CHAPTER 7. CONCLUSIONS.....	 7—1
 CHAPTER 8. SUGGESTIONS FOR FUTURE WORK.....	 8—1
 REFERENCES.....	 R—1
 Appendix A1: Data employed in Model 1 of Chapter 5.....	 A—1
Appendix A2: Data employed in Model 2 of Chapter 5.....	A—2
Appendix A3: Data employed in Model 3 of Chapter 5.....	A—3
Appendix A4: Data employed for PCA in Chapter 6	A—4
Appendix A5: List of publications from the present work	A—5
Appendix A6: Brief CV of the Author	A—6